UNIVERSAL CYCLOPÆDIA AND ATLAS

VOLUME X

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CHARLES KENDALL ADAMS, LL. D.

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PECULIAR PHONETIC SYMBOLS

USED IN THE WRITING OR TRANSLITERATION OF THE DIFFERENT LANGUAGES.

ā, ē, etc.: long vowels; in the Scandinavian languages the accent (*á*, *é*, etc.) is used to denote length.

ą: a nasalized *a*; so used in the transliteration of the Iranian languages.

å: labialized guttural *a* in Swedish.

æ: open *a* of Eng. *hat*, used chiefly in O. Eng.

aí: used in Gothic to denote *e* (open), in distinction from *ái*, the true diphthong.

aú: used in Gothic to denote *o* (open), in distinction from *áu*, the true diphthong.

bh: in Sanskrit a voiced labial aspirate (cf. *ch*).

ƀ: voiced bilabial (or labio-dental?) spirant, used in discussions of Teutonic dialects.

ç: voiceless palatal sibilant, similar to Eng. *sh*, used especially in transliteration of Sanskrit.

č: frequently used, e. g. in Slavonic languages, to denote the sound of Eng. *ch* in *cheek*.

c: voiceless palatal explosive, commonly used in transliteration of Sanskrit and the Iranian languages.

ch: as used in the transliteration of Sanskrit, a voiceless palatal aspirate, an aspirate being an explosive with excess of breath; as used in German grammar, the symbol for a voiceless palatal or guttural spirant.

dh: voiced dental aspirate (cf. *ch*) in Sanskrit.

ḍ: voiced cerebral explosive, so used in transliteration of Sanskrit.

ḍh: voiced cerebral aspirate (cf. *ch*) in Sanskrit.

đ: voiced dental (interdental) spirant, equivalent to Eng. *th* in *then*; so used in the Teutonic and Iranian languages and in phonetic writing.

ë: a short open *e*, used in Teutonic grammar, particularly in writing O. H. G.

e: the short indefinite or "obscure" vowel of Eng. *gardener*; used in the reconstruction of Indo-Eur. forms, and in transliterating the Iranian languages.

gh: in Sanskrit a voiced guttural aspirate (cf. *ch*).

ǥ: voiced velar (back-guttural) explosive, used most frequently in Indo-Eur. reconstructions.

ȝ: voiced guttural (or palatal) spirant, equivalent to Mod. Greek γ, and used in transliteration of Iranian languages and O. Eng.

ḥ: a voiceless breathing, the Sanskrit *visarga*.

hw: a labialized *h*, similar to *wh* in Eng. *what*; used in transliteration of Gothic and the Iranian languages.

ḫ: voiceless guttural (or palatal) spirant, equivalent to German *ch*, and used in transliteration of the Iranian languages.

i̯: the semi-vowel *y*, or consonant form of *i*; used in phonetic writing and reconstructions of Indo-Eur. forms.

j: in the transliteration of Sanskrit and the Iranian languages a voiced palatal explosive; in the Teutonic languages a semi-vowel (= *y*), for which in Indo-Eur. reconstructions *i* is generally used.

jh: in Sanskrit a voiced palatal aspirate (cf. *ch*).

kh: in Sanskrit a voiceless guttural aspirate (cf. *ch*).

ƚ: the guttural ("thick" or "deep") of the Slavonic and some of the Scandinavian languages.

l̥: vowel *l*; used in transliterating Sanskrit, in reconstructing Indo-Eur. forms, and in other phonetic writing.

n̥: nasal vowel; used in reconstruction of Indo-Eur. forms and in phonetic writing.

ṇ: in Sanskrit the cerebral nasal.

ñ: in Sanskrit the guttural nasal (see following).

ŋ: the guttural nasal, equivalent to Eng. *n* in *longer*; used in transliteration of Iranian languages.

ñ: palatal nasal, similar to *gn* in Fr. *regner*; used in transliterating Sanskrit and in phonetic writing.

ö: palatalized *o*; used in German and in phonetic writing.

ǫ: short open *o* in Scandinavian.

ø: short palatalized *o* (ö) in Scandinavian.

ph: in Sanskrit, voiceless labial aspirate (cf. *ch*).

ɋ: voiceless velar (back-guttural) explosive; used in reconstructions of Indo-Eur. forms and in other phonetic writing.

ṛ: vowel *r*; used in transliterating Sanskrit, in reconstructions of Indo-Eur. forms, and in other phonetic writing.

š: voiceless cerebral sibilant, equivalent to Eng. *sh*; used in transliterating the Iranian languages and in phonetic writing.

ṣ: voiceless cerebral spirant; used in transliterating Sanskrit.

th: in Sanskrit a voiceless dental aspirate (cf. *ch*).

ṭh: in Sanskrit a voiceless cerebral aspirate (cf. *ch*).

ṭ: in Sanskrit a voiceless cerebral explosive.

ţ: a form of dental spirant used in transliterating the Iranian languages (represented in Justi's transliteration by ṭ).

þ: voiceless dental (interdental) spirant, equivalent to Eng. *th* in *thin*; used in Teutonic dialects and in phonetic writing.

u̯: consonant form of *u*; used in phonetic writing.

ž: voiced cerebral sibilant, equivalent to *s* in Eng. *pleasure*, and to *j* in Fr. *jardin*; used in Iranian, Slavonic, and in phonetic writing.

ʒ: a symbol frequently used in the writing of O. H. G. to indicate a voiced dental sibilant (Eng. *z*), in distinction from *z* as sign of the affricata (*ts*).

EXPLANATION OF THE SIGNS AND ABBREVIATIONS USED IN THE ETYMOLOGIES.

>, yielding by descent, i. e. under the operation of phonetic law.
<, descended from.
=, borrowed without change from.
: , cognate with.
+, a sign joining the constituent elements of a compound.
*, a sign appended to a word the existence of which is *inferred*.

ablat.	ablative
accus.	accusative
adjec.	adjective
adv.	adverb
cf.	compare
conjunc.	conjunction
deriv. of	derivative of
dimin.	diminutive
fem.	feminine
genit.	genitive
imper.	imperative
impf.	imperfect
indic.	indicative
infin.	infinitive
masc.	masculine
nomin.	nominative
partic.	participle
perf.	perfect
plur.	plural
prep.	preposition
pres.	present
pron.	pronoun
sc.	scilicet, supply
sing.	singular
subst.	substantive
vocat.	vocative

Anglo-Fr.	Anglo-French
Arab.	Arabic
Avest.	Avestan
Dan.	Danish
Eng.	English
Fr.	French
Germ.	German
Goth.	Gothic
Gr.	Greek
Heb.	Hebrew
Icel.	Icelandic
Ital.	Italian
Lat.	Latin
Lith.	Lithuanian
Mediæv. Lat.	Mediæval Latin
Mod. Lat.	Modern Latin
M. Eng.	Middle English
M. H. Germ.	Middle High German
O. Bulg.	Old Bulgarian (= Church Slavonic)
O. Eng.	Old English (= Anglo-Saxon)
O. Fr.	Old French
O. Fris.	Old Frisian
O. H. Germ.	Old High German
O. N.	Old Norse
O. Sax.	Old Saxon
Pers.	Persian
Portug.	Portuguese
Prov.	Provençal
Sanskr.	Sanskrit
Sc.	Scotch
Span.	Spanish
Swed.	Swedish
Teuton.	Teutonic

KEY TO THE PRONUNCIATION.

aa..... as *a* in *father*, and in the second syllable of *armada*.

aă..... same, but less prolonged, as in the initial syllable of *armada*, *Arditi*, etc.

a..... as final *a* in *armada*, *peninsula*, etc.

ă..... as *a* in *fat*, and *i* in French *fin*.

ay or ā.. as *ay* in *nay*, or as *a* in *fate*.

ăy or *ā*.. same, but less prolonged.

ā..... as *a* in *welfare*.

aw..... as *a* in *fall*, *all*.

ee..... as in *meet*, or as *i* in *machine*.

ĕe..... same, but less prolonged, as final *i* in *Arditi*.

e..... as in *men*, *pet*.

e..... obscure *e*, as in *Bigelow*, and final *e* in *Heine*.

ė..... as in *her*, and *eu* in French *-eur*.

i..... as in *it*, *sin*.

ī..... as in *five*, *swine*.

ĭ..... same, but less prolonged.

ō..... as in *mole*, *sober*.

ō..... same, but less prolonged, as in *sobriety*.

o..... as in *on*, *not*, *pot*.

oo..... as in *fool*, or as *u* in *rule*.

o͝o..... as in *book*, or as *u* in *put*, *pull*.

oi..... as in *noise*, and *oy* in *boy*, or as *eu* in German *Beust*.

ow..... as in *now*, and as *au* in German *haus*.

ö..... as in *Göthe*, and as *eu* in French *neuf*, *Chintreuil*.

ŭ..... as in *but*, *hub*.

ŭ..... obscure *o*, as final *o* in *Compton*.

ü..... as in German *süd*, and as *u* in French *Buzançais*, *vu*.

y or *l*.... see *l* or y.

yu..... as *u* in *mule*.

yŭ..... same, but less prolonged, as in *singular*.

ch..... as in German *ich*.

g..... as in *get*, *give* (never as in gist, congest).

hw..... as *wh* in *which*.

kh..... as *ch* in German *nacht*, *g* in German *tag*, *ch* in Scotch *loch*, and *j* in Spanish *Badajos*, etc.

ṅ..... nasal *n*, as in French *fin*, *Bourbon*, and nasal *m*, as in French *nom*, Portuguese *Sam*.

ñ or n-y.. Spanish *ñ*, as in *cañon*, *piñon*, French and Italian *gn*, etc., as in *Boulogne*.

l or y.... French *l*, liquid or mouillé, as (-i)ll- in French *Baudrillart*, and (*-i*)*l* in *Chintreuil*.

th..... as in *thin*.

th..... as in *though*, *them*, *mother*.

v..... as *w* in German *zwei*, and *b* in Spanish *Cordoba*.

sh..... as in *shine*.

zh..... as *s* in pleasure, and *j* in French *jour*.

All other letters are used with their ordinary English values.

NOTE.

The values of most of the signs used in the above Key are plainly shown by the examples given. But those of ö, ü, *ch*, *kh*, ñ, and *v*, which have no equivalents in English, can not be sufficiently indicated without a brief explanation, which is here given.

ö. The sound represented by this symbol is approximately that of -u- in *hurt* or -e- in *her*, but is materially different from either. It is properly pronounced with the tongue in the position it has when ā is uttered and with the lips in the position assumed in uttering ō.

ü. This vowel is produced with the lips rounded as in uttering oo and with the tongue in the position required in uttering ee, into which sound it is most naturally corrupted.

ch and *kh*. These are both rough breathings or spirants made with considerable force, *ch* being made between the flat of the tongue and the hard palate, and *kh* between the tongue and the soft palate. *ch* approaches in sound to English sh, but is less sibilant and is made further back in the mouth; *kh* is a guttural and has a hawking sound.

l or y. These are both used to represent the sound of French l mouillé, in (-i)ll- and (-i)l, which resembles English -y- in *lawyer*. Final *l*, that is, (-i)l, may be approximated by starting to pronounce lawyer and stopping abruptly with the -y-.

ñ or n-y. The consonants represented by ñ (Spanish ñ, French and Italian gn, etc.) are practically equivalent to English -ni- or -ny- in bunion, bunyon, onion, etc., and, except when final, are represented by n-y. Final ñ, as French -gn(e), may be produced by omitting the sound of -on in the pronunciation of *onion*.

v. This may be pronounced by attempting to utter English v with the use of the lips alone.

See PREFACE (vol. i., p. xli.) and the article PRONUNCIATION OF FOREIGN NAMES.

THE
UNIVERSAL CYCLOPÆDIA.

Raleigh: city; capital of North Carolina and of Wake County; on the Seaboard Air Line and the Southern and Raleigh and Cape Fear railways; 148 miles N. by W. of Wilmington, 286 miles S. S. W. of Washington, D. C. (for location, see map of North Carolina, ref. 2–H). It is in a cotton, corn, and tobacco-growing region, handles about 125,000 bales of cotton annually, and contains large railway-car works and repair-shops, 4 foundries, 3 large planing-mills, 3 cotton-mills, 1 hosiery-mill, 1 knitting-mill, cigar-factory, 2 drug-manufactories, furniture-factory, tobacco-factory, cottonseed-oil mill, 2 clothing-factories, manufactory of steam-engines, agricultural-implement works, 2 ice-factories, and other industries.

Buildings.—The public buildings include the Capitol, in a small park of magnificent oaks; a U. S. Government building (cost $400,000); the State penitentiary (cost over $500,000); one of three State hospitals for the insane; the State Agricultural and Mechanical College (which in 1899 had in all departments 27 professors and instructors and 252 students, a small library, an endowment fund of $125,000, land and buildings valued at $103,054, and an income from all sources of $37,000); the State fair-grounds; State Supreme Court and State library; State museum and hall of history; State arsenal; soldiers' home; Governor's mansion; Methodist orphanage; Catholic orphanage; and State institutions for the white blind and the colored deaf mutes and blind.

Churches and Schools.—There are 16 churches for white people and 12 for colored. The educational institutions include Shaw University for colored males and females (Baptist, opened in 1865), with an agricultural and mechanical, law, medical, and pharmaceal annex; Peace Institute (Presbyterian, chartered in 1857); Baptist Female University (1899); St. Mary's School (Protestant Episcopal, opened in 1842); the Raleigh Male Academy (non-sectarian, opened in 1878); St. Augustine's Normal School and Collegiate Institute (Protestant Episcopal, colored, opened in 1868); Latta University, colored; and 8 public schools (4 white and 4 colored). There are 5 libraries, including the State (founded in 1822), the Olivia Raney Memorial Library, one of the finest in the South, and the Supreme Court (founded in 1812), with an aggregate of over 75,000 volumes.

Public Improvements, etc.—The city has improved water and sewerage systems, gas, electric lights, street-railway, union depot, 4 hotels, many miles of broad paved streets, 2 parks, 4 public squares, 9 public halls, 3 national banks with combined capital of $325,000, 3 State banks with capital of $130,000, 2 trust companies, and 3 daily, 7 weekly, and 2 monthly periodicals. Pop. (1880) 9,265; (1890) 12,678; (1900) 13,643.

JOHN WILBER JENKINS, EDITOR "RALEIGH TIMES."

Raleigh, or **Ralegh**, Sir WALTER: explorer and author; b. at Hayes, parish of East Budleigh, Devonshire, England, in 1552, second son of Walter Raleigh by his wife Catharine (Champernoun), widow of Otho Gilbert; entered at Oriel College, Oxford, about 1568; enrolled himself in a volunteer corps of auxiliaries commanded by his relative, Henry Champernoun, 1569, and passed several years fighting in behalf of the Huguenots in France; served under Sir John Norris, and afterward under the Prince of Orange, in the Netherlands 1576–79. His half-brother, Sir Humphrey Gilbert, having meanwhile obtained from Elizabeth letters patent dated June 11, 1578, empowering him to discover and possess any countries in North America not previously occupied, Raleigh sailed with him for Newfoundland 1579, but was forced by storms (and perhaps by an engagement with a Spanish fleet) to return without having landed in America. He went to Ireland as captain of a company 1580; aided in suppressing the Earl of Desmond's rebellion; was associated with Sir William Morgan in the government of the province of Munster; presented himself at court 1582; obtained the favor of Elizabeth; was employed in confidential negotiations with the French ambassador and the Duke of Anjou; subscribed £2,000 to the second expedition to Newfoundland under Sir Humphrey Gilbert, which resulted in the occupation of that island and the death of Sir Humphrey by shipwreck 1583, and obtained from Elizabeth a new patent for discoveries and colonization in North America, by virtue of which an expedition, headed by Philip Amidas and Arthur Barlow, sailed from England Apr. 13, 1584, and explored Pamlico and Albemarle Sounds in the summer of that year. Their enthusiastic accounts of the newly discovered region being made known to Elizabeth, she bestowed upon it the name of Virginia, and conferred knighthood upon Raleigh 1585, who in the course of the year was made lord warden of the stannaries and seneschal of the counties of Cornwall and Devon; took his seat in Parliament for Devonshire; obtained the passage of a bill confirming his proprietary rights, and dispatched to Virginia an expedition of seven vessels and 108 colonists under Sir Richard Grenville, which made a settlement on Roanoke island. Re-enforcements were sent in the two following years, but the enterprise failed through the capture of two ships by the French, and from mismanagement on the part of the leaders of the colonists, some of whom returned home, and the remainder perished by starvation or massacre; the chief practical result being the introduction of tobacco and potatoes into England. He took an active part in the preparations for repelling the Spanish Armada as captain of the queen's guard, member of the council of war, and lieutenant-general of the forces in Cornwall; commanded a vessel which rendered good service in the actions with the Armada, July, 1588; accompanied Sir Francis Drake in his expedition to Portugal 1589; visited Edmund Spenser at Kilcolman Castle, Ireland, on his return, and in behalf of the poet presented to Elizabeth the first three books of the *Faerie Queene*. In 1590 he equipped a fleet of thirteen vessels, and with Frobisher cruised successfully against Spanish vessels in the West Indies. He was imprisoned for two months in the Tower of London 1592, on account of his secret marriage with Elizabeth Throgmorton, one of the queen's maids of honor, and, being forbidden to present himself at court, he organized an expedition of five vessels, with which he sailed from Plymouth Feb. 9, 1595, explored the coasts of Guiana, and ascended Orinoco river, and on his return published *The Discovery of the Large, Rich, and Beautiful Empire of Guiana* (4to, 1596). He served as rear-admiral at the taking of Cadiz, where he

was wounded, June, 1596; was readmitted at court May, 1597; sailed with the Earl of Essex to the Azores in the same year and took Fayal, but quarreled with his commander and contributed to the ruin of Essex; obtained a grant of the fine manor of Sherborne, Dorsetshire; went as ambassador to the Netherlands 1600; became governor of Jersey 1601; lost favor at court on the accession of James I., was accused of conspiring to raise Lady Arabella Stuart to the throne, committed to the Tower in July, and condemned to death at Winchester, Nov. 17, 1603; suffered confiscation of his estates, which were given to Carr, the new favorite; was kept thirteen years in the Tower, during which time he wrote and published his principal work, *The History of the World* (1614); recovered his liberty, though not his pardon, through the influence of Villiers, Jan. 30, 1616; obtained from James a commission as admiral, and sailed with a fleet of fourteen ships for the discovery of his promised El Dorado in Guiana Mar. 28, 1617; had several engagements with the Spaniards, in one of which he lost his oldest son; lost several vessels, and was foiled in his objects; landed at Plymouth on his return June, 1618; was imprisoned on complaint of the Spanish ambassador, Gondomar, in consequence of his conduct in Guiana, and it having been decided by the judges that the sentence of death pronounced in 1603 was still valid, he was executed at the palace yard, Westminster, Oct. 29, 1618. Raleigh was a man of splendid genius and extensive attainments, wrote many miscellaneous, literary, and political essays, and a few poems of high order. His *Complete Works* were edited at Oxford in 8 vols. (1829). Biographies have been written by William Oldys, Arthur Cayley, P. F. Tytler, James A. St. John, and Edward Edwards, the two latter having appeared almost simultaneously in 1868. Revised by C. K. Adams.

Ral'lidæ [Mod. Lat., named from *Ral'lus*, the typical genus, from the Fr. *râle*, rail. See Rail]: a family of birds including the rails and gallinules. The neck is moderately elongated; the head rather small; the bill more or less elongated, compressed, and with the culmen advancing to a greater or less extent upon the forehead and decurved toward the apex; the nostrils are lateral, rather inferior, and in a membranous groove; the wings moderate and rounded, rather short; the tail rather short, inclined upward, and rounded; the tarsi rather long and slender, and in front covered with transverse scutellæ; the toes three in front, and well developed, the hinder comparatively short and rather elevated; the claws curved and sharp.
Revised by F. A. Lucas.

Ralph, James: poet and pamphleteer; b. in Philadelphia, Pa., about 1698; became a schoolmaster in his native city, where he made some pretensions to literary ability; was an early friend of Benjamin Franklin, with whom he sailed for England 1724, abandoning his wife and child; published in 1728 a poem entitled *Night*, which was sufficiently bad to merit notice by Pope in the *Dunciad*; sought favor with the Whig politicians by writing pamphlets and plays; was patronized by Frederick, Prince of Wales, and received a pension on the accession of George III. D. at Chiswick, Jan. 24, 1762. Author of *Zeuma*, a poem (1729); *The Use and Abuse of Parliaments* (2 vols., 1744); *History of England* (2 vols. folio, 1744–46); and *The Case of Authors by Profession or Trade Stated* (1758). Revised by H. A. Beers.

Rāma: See Rāmāyana.

Ramadan: Arabian form for Ramazan (*q. v.*).

Ra'mah [from Heb. *Rāmāh*, liter., lofty place]: the name of several places in Palestine, two of which are historically interesting and important. One of these, first mentioned in Josh. xviii. 25, and identified by Robinson in 1838, is on the top of a high hill about 5 miles N. of Jerusalem. It belonged to the tribe of Benjamin. The other, where Samuel was born (1 Sam. i. 1), has not yet been identified with certainty.

Rāmā'yana [Sanskr. adjec. *rāmāyaṇa*, concerning Rāma, sc. noun *ākhyāna*, story]: the name of a celebrated poem of ancient India. It is the first great Indic literary or personal epic, as distinguished from the popular epic, exemplified in the *Mahābhārata*. Much critical work is yet to be done ere all the specific problems concerning the genesis of the poem can be solved; but their ultimate solutions are sure to be most illuminating for the student of the genesis of epic poetry. Respecting the general theory of the origin of the poem, see Epic Poetry. The original nucleus of the *Rāmāyana* differs wholly from that of the Mahābhārata (*q. v.*) in two most important respects: First, it is the work of one man; and, second, it is of unitary design and character. The man is called Vālmīki—a fact quite bare of significance, as compared with the fact that he is namable; and whereas the *Bhārata* is inordinately episodical, and is in effect a great cyclopædia of Indic legend, the *Rāmāyana* concerns itself with the legends clustering about the one great name of Rāma.

Vālmīki's material (like that of the *Bhārata*) is truly popular. It consists of the legends of Rāma of the race of Ikshvāku in the land of Kosala. These were the subject of many little epic songs sung by the bards (*sūtas*) at the courts of the Ikshvāku princes. A Brahman, Vālmīki, of pre-eminent poetic gifts, made himself master of these songs, transfused them into a consistent whole, and so created an epos. This was learned by the professional rhapsodists, and by them recited in public. The date of the written redaction we do not know; but it was doubtless made while the institution of wandering minstrels or professional reciters of the poem was still in full vogue, and while their oral traditions of the poem possessed as much authority as the then extant written copies. It is probable that the fixation of the poem in writing took place independently in different localities, and that each of the now extant recensions is an independent reflex of one of the locally or otherwise varying oral traditions.

The most important recensions are three: One is the Bengal recension, edited by Gorresio; and another, the so-called "northern," which has the widest currency, and is the basis of the Bombay editions. The poem, like some mediæval cathedral, has suffered additions and changes at the hands of successive generations, but not in such wise as greatly to obscure its original compass and design. In its present forms the *Rāmāyana* consists of seven books, of which, however, the first and last are doubtless later additions. The seven books contain about 25,000 double verses—say about twice as much as the *Iliad* and *Odyssey* together; but Jacobi believes that a reconstructed text would contain, after casting out all provable additions, some 8,000 or 10,000 double verses.

Story of the Poem (after Monier-Williams).—To Daçaratha, King of Ayodhyā, by his three wives, are born four sons: Rāma, the eldest; and, by Kaikeyī, Bharata. Rāma is taken to the court of King Janaka, and by his strength, shown in bending a wonderful bow, wins for his wife Sītā. He returns, and preparations are made to install him as successor to his father's throne. Kaikeyī now demands of Daçaratha—by way of fulfillment of an old promise that he would grant her any two requests she might make—that Rāma be banished, and her own son Bharata be made king. Rāma dutifully goes into exile with Sītā. The king dies in grief. Bharata goes and proffers Rāma the kingdom, and is refused.

Sītā is carried off by Rāvana, the demon-king of Lankā. The ape Hanumant seeks and finds her. Rāma makes alliance with Sugrīva, king of the apes, and with his aid, and that of Vibhīshana, brother of Rāvana, he invades Rāvana's capital, slays him, and recovers Sītā. He then returns to Ayodhyā and assumes his crown.

Here are two parts fundamentally different. Up to Rāma's refusal of the kingdom all is natural, human, and possible. From the rape of Sītā on, all is unnatural and fantastic to the last degree. This instructive combination is an instance of what has taken place also among other peoples—the mingling of heroic-legendary elements with mythological elements. The first part gives us the story of Rāma as a popular hero; the second blends the conceptions of Rāma the hero with those of Rāma the divinity. As early as the Rig-Veda, Sītā appears as the personified Furrow. She is a genius of the corn-field and wife of the rain-god. The battles of Rāma and Rāvana are only another form of the battles of the rain-god Indra with the demon of drought. What to the nomad herdsman of Vedic times was a penning up of the heavenly waters, that was to the husbandman of epic times a carrying away of the goddess of their corn-fields. Hanumant, son of the wind-god, is a rain-god, the genius of the monsoon, who recovers Sītā, i. e. brings back to life the dead and parched fields.

Place and Date.—The place of the human part of the poem is Kosala, the region about Ayodhyā (Oudh). There is not the slightest allusion to the most important fact in the pre-Christian political history of India, the empire of the great Mauryan dynasty of the neighboring Magadhay, founded by contemporaries of Buddha, nor to its capital, Pātaliputra. In short, the whole political and geographical

background of the poem leads to the conclusion that the date of the original *Rāmāyana* can not be later than the fifth century B. C.

The Bengal recension was published by Gorresio, with Italian translation (12 vols., Paris, 1843–70). The "northern" recension has often been printed in India, especially in Bombay (1854, 1864, 1873, 1888); best and cheapest is the last (of 1888), by K. P. Parab, at the Nirnaya Sāgara Press. There is a good English translation by R. T. H. Griffith (5 vols., London, 1870–74). Excellent epitomes are given by Monier-Williams in his *Indian Epic Poetry*, pp. 60–90, and in his *Indian Wisdom*, pp. 337–361. A critical work is *Das Rāmāyana Geschichte und Inhalt, nebst Concordanz der gedruckten Recensionen*, by Hermann Jacobi (Bonn, 1893). This article endeavors to report some of his best results.

CHARLES R. LANMAN.

Ramazan' [Turk. Pers. *ramazān* = Arab. *ramadān*, name of a month, probably deriv. of *ramad*, be hot]: the Mussulman fast. It is incumbent on every adult believer unless specially exempt, and continues through the entire month of Ramazan, because in that month the Koran was revealed to the Prophet. No food or drink of any sort must enter the mouth from dawn, "from the moment one can distinguish a white hair from a black one," until sunset. One must neither smoke nor inhale perfumes, and must carefully abstain from swallowing his saliva. The Mussulman calendar being lunar, Ramazan in the space of thirty-three years traverses all the seasons. In summer it falls heavy upon the laboring classes; it is, however, observed in general with most accurate fidelity. As far as possible, night and day are made to change places, the mosques remain open all night, and the streets are thronged. It is terminated by the festival of the Kutchuk or Little Bairam, a period of rejoicing.

E. A. GROSVENOR.

Rambouillet, Hôtel de, ō′tel′de-raŭń′boo′yā′: the name generally given to a social circle which gathered around Catherine de Vivonne, Marquise de Rambouillet, and her daughter, Julie d'Angennes, Duchesse de Montausier. Catherine de Vivonne, a daughter of the Marquis of Pisani, French ambassador at Rome, by a Roman lady, was born in 1588 at Rome, and married in 1600 to the Marquis de Rambouillet. Offended by the tone and manners of the French court, she determined to form a court of her own. Her house soon became the place where all who had genius, wit, learning, talent, or taste assembled, and from these reunions originated the French Academy, the highest authority of French literature, and the salons, the most prominent feature of French civilization. The influence of the Hôtel de Rambouillet on conversation and language, manners and morals, was very great, and must, generally speaking, be called highly beneficial; but it occasioned imitations which were merely ridiculous. (See PRÉCIEUSES.) See Röderer, *Histoire de la Société polie en France pendant le 17e Siècle* (1835), and Charles Livet, *Précieux et Précieuses* (1859).

Revised by A. G. CANFIELD.

Rameau, raă′mō′, JEAN PHILIPPE: composer; b. Sept. 25, 1683, at Dijon, France, where his father was an organist; traveled from 1701 to 1717 in Italy and Southern France as violinist in the orchestra of a troupe of strolling actors; was appointed organist successively in Lille, Clermont, and Paris, and published in 1722 his *Traité de l'Harmonie*, in 1726 *Nouveau Système de Musique théorique*, and in 1732 *Dissertation sur les différentes Méthodes d'Accompagnement.* Having acquired by these works a great name as a reformer of theoretical music, he began composing for the stage. In 1732 his opera *Hippolyte et Aricie* had complete success, and he composed about twenty operas and ballets, besides minor pieces of music, which gave him rank beside Lully, who at that time reigned almost absolutely on the stage. D. in Paris, Sept. 12, 1764.

Ramen'ghi, BARTOLOMEO: painter; b. 1484; commonly called *Bagnacavallo*, from a town near Ravenna, where he was born. He was a pupil of Francia. Most of his remaining pictures are in Bologna; in S. Petronio a *Christ on the Cross*, several in fresco in other churches, and *Holy Family* in the Pinacoteca. D. 1542.

Rameses: See RAMSES.

Ram'ie, or **China Grass** [*ramie* is from Malay]: the fiber of *Bœhmeria nivea*, an Asiatic plant of the family *Urticaceæ.* This fiber is stronger than hemp and more durable when woven than linen. The fabric known as grass cloth is made in China from this fiber. Ramie-fiber, superior in quality even to that of Java, has been produced in the southern parts of the U. S. It can be harvested three times a year, producing in all some 1,500 lb. of fully prepared ramie per acre. It is perennial, requires comparatively little labor and attention, has few insect enemies, and stands a rainy season or a drought with little injury. A new process of preparing it for manufacture has been discovered in the U. S.

Rammohun Roy: scholar; b. at Burdwan, Bengal, about 1774; belonged to a wealthy Brahmanical family; studied Sanskrit, Persian, and Arabic; resided for some time in Tibet; edited *The Bengal Herald* in English: was in 1830 sent to the British court from the sovereign of Delhi. D. at Bristol, Sept. 27, 1833. He early renounced the Brahmanical faith. Much attention was attracted in 1820 to his *Precepts of Jesus, the Guide of Peace and Happiness*, published in English, Sanskrit, and Bengalee, and written from a Unitarian standpoint. He founded the BRAHMO SOMAJ (*q. v.*).

Ra'moth Gil'eăd [from Heb. *Rāmōth*, liter., high things, heights + *Gile'adh*, liter., hard, stony region (or hill of witness)]: first mentioned in Deut. iv. 43; a Levitical city and one of the three cities of refuge on the east side of the Jordan (see map of Palestine, ref. 8–F). Ahab, seventh King of Israel, fell in battle there about 897 B. C., and his son Jehoram, ninth King of Israel, was severely wounded there about 884. It is commonly identified with Es-Salt (Arabic adaptation of *Saltus Hieraticus*, sacred forest), about 23 miles N. E. of Jericho, up the wadi Shaib, only 2 or 3 miles from the summit of Jebel Osh'a, the view from which is considered the finest in Palestine. Es-Salt has a population of about 4,000, of whom 500 are Christians. It seems better, however, to identify it with Jal'ud, which is the equivalent of Gilead. It lies about 5 miles N. of Es-Salt.

Rampart: See FORTIFICATION.

Rampur: a native state of India under the protection of the Indian Government; in the Northwest Provinces, between 28° 26′ and 29° 10′ N. lat., and between 78° 54′ and 79° 33′ E. lon. (see map of N. India, ref. 5–E). It is a hot, fertile, and unhealthful region. Area, 945 sq. miles. Pop. (1891) 551,242. Its capital, Rampur, consists mostly of mud huts, and is famous for fine shawls. Pop. (1891) 76,733.

Ramsauer, JEAN: See the Appendix.

Ramsay, ALLAN: poet; b. at Leadhills, Lanarkshire, Scotland, Oct. 15, 1686; was in early life a wigmaker at Edinburgh; afterward became a bookseller, and printed many poems, Scottish and English, usually on "broadsides" or single sheets. He ultimately acquired considerable celebrity, and his bookshop having become a favorite resort of the literary men of Edinburgh, he enlarged his business, becoming a publisher, and started the first circulating library in Scotland. The first collected volume of his poems appeared in 1720; others were soon added, of which the most popular were *The Tea-table Miscellany* (4 vols., 1724), *The Gentle Shepherd, a Scots Pastoral Comedy* (1725), and *A Collection of Thirty Fables* (1730). To him must be credited the preservation of many relics of ancient Scottish literature. In 1724 he published *The Evergreen*, an important collection of old Scotch songs. D. in Edinburgh, Jan. 7, 1758. The best edition of his poetical works is that of George Chalmers (London, 2 vols., 1800; new ed. Paisley, 1874).—His son, ALLAN, b. in Edinburgh in 1713, was an eminent portrait-painter at London; became principal painter to George III. 1767, and was at one time considered (though without reason) a rival of Sir Joshua Reynolds. He figured in literary circles as a friend of Dr. Johnson, and published some pamphlets and essays, chiefly political. D. at Dover, Aug. 10, 1784.

Revised by H. A. BEERS.

Ramsay, Sir ANDREW CROMBIE, LL. D., F. R. S.: geologist; b. in Glasgow, Scotland, Jan. 31, 1814; educated at Glasgow; appointed a member of the Geological Survey of Great Britain 1841; Professor of Geology at University College, London, 1848; lecturer at the Royal School of Mines 1851; was president of the Geological Society of London 1862–63, and of the British Association for the Advancement of Science 1880; became director-general of the Geological Survey 1872; was knighted in 1881. He was the author of numerous memoirs on theoretical questions in geology; of works on the geology of Arran (1841), North Wales (1858), and Switzerland (1860); of *Physical Geology and Geography of Great Britain* (1863); and of a large *Geological Map of England and Wales* (1859). D. Dec. 9, 1891.

Revised by G. K. GILBERT.

Ramsay, David, M. D.: physician and author; b. in Lancaster co., Pa., Apr. 2, 1749; graduated at Princeton 1765; studied medicine at the University of Pennsylvania; settled as a physician at Charleston, S. C., 1773; served in the war of the Revolution as a field-surgeon, participating in the siege of Savannah; was a leading member of the South Carolina Legislature 1776–83, and of the council of safety at Charleston, on the capture of which city he was treated by the British as a hostage and kept eleven months in close confinement in St. Augustine, Fla., 1780–81; was a member of the Continental Congress 1782–84, and again 1785–86; was acting president of Congress during most of the latter period, on account of the sickness of Hancock; published a *History of the Revolution of South Carolina* (2 vols., Trenton, 1785), *History of the American Revolution* (2 vols., Philadelphia, 1789), a *Life of Washington* (New York, 1807), a *History of South Carolina* (Charleston, 1809), and *History of the United States 1607–1808* (3 vols., Philadelphia, 1816–17), besides medical and other essays. His first wife was a daughter of President Witherspoon, of Princeton; his second was Martha, daughter of Henry Laurens, and of her he published a memoir in 1811. During the last fourteen years of his life Dr. Ramsay was a member of the South Carolina Legislature, and for much of the time president of the Senate. D. in Charleston, May 8, 1815.

Ramsay, Francis Munroe: See the Appendix.

Ramsay, William Mitchell, D. C. L.: scholar; b. in Glasgow, Scotland, Mar. 15, 1851; was educated at the Universities of Aberdeen, Oxford, Göttingen, and Berlin; held the traveling studentship of Oxford University in 1879; was fellow of Exeter College in 1882; resided and traveled in Asia Minor 1880–84, and made frequent excursions to that land 1885–91; was Lincoln Professor of Classical Art and Archæology in Oxford 1885; and since 1886 has been Professor of Humanity in Aberdeen University. Dr. Ramsay has published numerous articles in magazines of Europe and the U. S.: *Historical Geography of Asia Minor* (1890); *The Church in the Roman Empire before 170 A. D.* (1893); and *St. Paul's Travels: the Narrative, its Author, and Date*; Morgan lectures in Theological Seminary, Auburn, N. Y. (London, 1895). C. K. Hoyt.

Ram'ses, or **Ram'eses** (Egypt. *Rā-messu*): the name of thirteen Kings of Egypt belonging to the nineteenth and twentieth dynasties. Ramses I., the first king of the nineteenth dynasty, ascended the throne at the close of a period of confusion consequent upon the religious reforms attempted by Khunaten (*q. v.*), during which the Nubians and the Shasu or Eastern nomads had thrown off the yoke of Egypt. All that is known of him is that he waged war in a small way in Nubia, where he left memorial stelæ; that he made a treaty with the Hittites; and that he did some building at Thebes, where he commenced the great hypostyle hall at Karnak. His chief claim to distinction is that he was the father of Seti I., one of the greatest of Egyptian warriors and conquerors, who claimed to have extended his sway till it included all that Thothmes III. had held. Seti thus handed on a united and powerful kingdom to Ramses II., whom he had already associated, in his twelfth year, with himself as king. Ramses II. ruled for sixty-six or sixty-seven years. He was a powerful monarch, a great builder, and a liberal patron. The Greek writers ascribed to him many wonderful deeds under the name of Sesostris, but this name was a sort of conglomerate in which the personalities of several kings were combined, such, e. g., as Usertasen II. of the twelfth, Ramses II. of the nineteenth, and Ramses III. of the twentieth dynasty. The name of Ramses II. is found on monuments or buildings from Beirut to Napata and from one end of Egypt to the other, as well as throughout the length of Nubia. (See Ipsambul.) In many cases, however, his name was inserted in the inscriptions of other kings by a process of usurpation in which he was the worst offender in Egyptian history. His principal residence appears to have been at Tanis, where he erected a granite temple which he adorned with a colossal statue of himself. At Thebes he erected the Ramesseum, besides extending the buildings of his predecessors. He built also at Abydos (see Memnonium), at Memphis, and Heliopolis, besides a multitude of other places. The Ramesseum, a large temple on the W. of the Nile opposite Karnak, was devoted to the worship of the manes of the great Ramses. On its walls were inscribed the accounts of his wars, especially the account of the expedition against the Hittites which is commemorated in the famous poem of Pentaur.

His warlike operations began while he was coregent with Seti I., when he led expeditions into Nubia and Libya. Near Beirut are inscriptions which record his advance to that point in his second and fourth years. In his fifth year he marched against the Hittites, whose principal seat was in the region about Carchemish. With them were allied all the peoples of the entire region. At Kadesh, on the Orontes, battle was joined, and in the conflict Ramses was successful over Mâutenure, the Hittite king, largely by reason of his personal daring and prowess, if we may credit the monumental record. In his eighth year another expedition was undertaken against certain cities in Palestine, Ascalon being the principal place captured. In his twenty-first year Ramses entered into an offensive and defensive alliance with Chetasar, the Hittite king, and to confirm this treaty, which remained in force during the rest of his reign, he took to wife the daughter of the Hittite. In consequence, more intimate relations of friendship and trade were established between Egypt and the East. After a reign of sixty-seven (Josephus, sixty-six) years, Ramses died, and was succeeded by his son Meneptah (Egypt. *Mer-en-Ptah*, beloved of Ptah), who is usually regarded as the Pharaoh of the Exodus, under whom the kingdom rapidly lost prestige.

Ramses III. was the second king of the twentieth dynasty, and ten others bearing the same name followed in immediate succession. The period which preceded the reign of Ramses III. was almost one of anarchy, and in it even a Syrian appears to have succeeded in gaining temporary royal power. During the period following his death the power exercised by the priests was such as to lead to a speedy deterioration of the kingdom, and to a final usurpation of the throne by Her-Hor (*q. v.*), the priest-king. Ramses III. waged war with the Libyans and with his neighbors to the N. E., the Hittites and their allies, while Punt and Ethiopia were forced to pay tribute. His reign was brilliant, and was commemorated on the walls of Ramses's memnonium at Medinet Habu (*q. v.*), at Thebes, which in its various extensions presented the annals of the king. For ethnological purposes its mural decorations, giving life-like portraits of prisoners taken in war, are very valuable. See Petrie's *Racial Types from Egypt* (1887).

The most notable events of the following reigns were the thefts practiced in the necropolis at Thebes and elsewhere, in the times of Ramses IX. and X., which were made the subject of investigations. The results of these inquiries have come down to us, showing the extent of the depredations.

The mummies of the first three Ramses are at the Gîzeh Museum, having been among those found in 1881 near Deir el-Bahri, W. of Thebes. Charles R. Gillett.

Ramses, or **Raamses**: the name given in Ex. i. 11 to one of the "store-cities" built by the Israelites for the Pharaoh of the Oppression, who usually has been identified with the great Ramses II. of the nineteenth dynasty. Its location is unknown, but it was probably a frontier town like Pithom (*q. v.*). By some it is supposed to have been located in the Wadi Tumilat, W. of Pithom, while others identify it with Tanis, which in some inscriptions bears the name Pi-Ramses, dwelling or house of Ramses. C. R. G.

Ramsgate: town; in the county of Kent, England; on the southeast coast of the Isle of Thanet; 72 miles E. by S. of London (see map of England, ref. 12–L). It is an important fishing-station, with a harbor of refuge 51 acres in extent inclosed between two piers. Among its features are an iron promenade-pier, a beautiful Roman Catholic church designed by Pugin, a Benedictine monastery, and a Jewish college. It is much frequented as a watering-place by Londoners. Pop. (1891) 24,676.

Ramus, Petrus (Fr. *Pierre de la Ramée*): humanist and mathematician; b. at Cuth, department of Somme, France, in 1515, in humble circumstances; studied under great difficulties at the University of Paris, and published in 1543 his *Animadversionum in Dialecticam Aristotelis Libri XX.* and *Institutionum Dialecticarum Libri III.*, in which he attacked Aristotle and the scholastic method of philosophizing with great boldness. The university, the Church, the Parliament, took great offense; the books were condemned, and the author forbidden to teach. By the favor of the king he was nevertheless afterward appointed at the university, and continued till his death his opposition against the empty subtleties of the philosophy of his time. Among other works were *Geometria* (1569) and *Scholæ Mathematicæ* (1569). In 1561 he embraced Protestantism,

and was killed in the massacre of St. Bartholomew, Aug. 24, 1572. See Waddington, *Pierre de la Ramée* (Paris, 1855); Lobstein, *Petrus Ramus ats Theolog* (Strassburg, 1878).

Rancagua, răăn-kaa'gwăă: city; capital of the province of O'Higgins, Chili; near the river Rapel; 43 miles by rail S. of Santiago (see map of South America, ref. 8–C). It is the center of a rich agricultural district, and is noted as the scene of one of the most important events of the war for independence. The patriot Gen. O'Higgins was besieged here by the Spaniards under Osorio, and help promised by Carrera did not arrive. After two days' battle in the streets (Oct. 1–2, 1814) O'Higgins escaped with only a fragment of his force, leaving the town in ruins. This disaster ended the first republic. Pop. about 8,000. H. H. S.

Rancé, răăń'sā', Dominique Armand Jean Lebouthillier, de: founder of the order of Trappists; b. in Paris, Jan. 9, 1626; enjoyed while yet a boy several large ecclesiastical benefices, and was ordained a priest in 1651, but led, nevertheless, a very dissipated life until in 1660 he gave all his property to the poor, renounced his benefices, and retired to the monastery of La Trappe, of which he became abbot in 1663. He introduced rules of the severest asceticism and founded what was practically a new order. D. Oct. 27, 1700. He wrote *Traité de la Sainteté et des Devoirs de la vie monastique* (1683) and *Relation de la Vie et de la Mort de quelques Religieux de ta Trappe* (4 vols., 1696). See Marsollier, *Vie de Rancé* (1703); Gaillardin, *Trappistes* (1844); Pfannenschmidt, *Geschichte der Trappisten* (1873); and *The Century Magazine* (Aug., 1888).

Randall, Alexander Williams: lawyer and public official; b. at Ames, Montgomery co., N. Y., Oct. 31, 1819; studied law; settled at Waukesha, Wis., 1841; became postmaster of that town and its representative in the Legislature; was judge of the second district 1856; Governor of Wisconsin 1857–61; rendered eminent service in raising volunteers at the beginning of the civil war; minister to Italy 1861–65; Assistant Postmaster-General 1865–66, and Postmaster-General 1866–69, after which he practiced law at Elmira, N. Y. D. at Elmira, July 25, 1872.

Randall, James Ryder: journalist; b. in Baltimore, Md., Jan. 1, 1839; received his education at Georgetown College, D. C. Traveled for his health in South America and subsequently removed to New Orleans, where he was employed on the Sunday *Detta*. His popular Southern war song, *Maryland, my Marytand*, was published in Apr., 1861. Other poems from his pen were *The Sole Sentry*, *Arlington*, and *There's Life in the Old Land Yet*. In 1866 he became editor-in-chief of *The Constitutionalist* at Augusta, Ga., which position he held for many years. Revised by H. A. Beers.

Randall, Samuel Jackson, LL. D.: statesman; b. in Philadelphia, Pa., Oct. 10, 1828. He received an academic education; engaged in mercantile business; and entered political life at an early age. He was a member of the city council for several years; State Senator in 1858–59; elected to Congress as a Democrat in 1862; and by re-elections held his seat till his death, in Washington, D. C., Apr. 13, 1890. For many years he was chairman of the House committee on appropriations and member of the committee on rules. In 1876, 1877, and 1879, he was elected Speaker of the House of Representatives, and in 1883 was defeated. He was widely known as a leader of his party, as a political debater, and as a parliamentarian.

Randolph: town (incorporated in 1793); Norfolk co., Mass.; on the N. Y., N. H. and Hartford Railroad; 15 miles S. of Boston (for location, see map of Massachusetts, ref. 3–I). It contains a public library, founded in 1876 by the heirs of Royal Turner, built of Randolph and Quincy granite, and containing over 13,000 volumes; a high school founded on a bequest by Amasa Stetson; several grammar and primary schools; a savings-bank with deposits of over $1,000,000; a weekly newspaper; and manufactories of boots, shoes, harness, steel-roller forgings, and boxes. Pop. (1880) 4,027: (1890) 3,946; (1900) 3,993.

Editor of "Register and Holbrook News."

Randolph: village (settled in 1820); Cattaraugus co., N. Y.; on the Erie Railroad; 17 miles E. of Jamestown, 52 miles S. of Buffalo (for location, see map of New York, ref. 6–C). It is in an agricultural and dairying region, has manufactories of furniture and prepared paint, and contains five churches, the Chamberlain Institute (Methodist Episcopal, opened in 1849), the Western New York Home for Orphan Children, a State bank with capital of $50,000, and a weekly newspaper. It was settled as a trading-point for lumbermen on the Alleghany river, 6 miles S. Pop. (1880) 1,111; (1890) 1,201; (1900) 1,209.

Randolph: town (comprising the villages of Randolph Center, and North, South, East, and West Randolph); Orange co., Vt.; on a branch of the White river, and on the Central Vermont Railroad; 28 miles S. of Montpelier (for location, see map of Vermont, ref. 5–C). It is in an agricultural region, is the seat of a State normal school, and has 2 Congregational, 2 Methodist Episcopal, 2 Protestant Episcopal, and Baptist, Christian, and Roman Catholic churches, high and graded schools, a national bank with capital of $75,000, a savings-bank, and 2 weekly and 2 monthly periodicals. Of the group of villages West Randolph contains the railway-station, and is the business center. The town has a large farming trade, and manufactures of butter-tubs, screens, lumber, and woodwork. Pop. (1880) 2,910; (1890) 3,232; (1900) 3,141. Editor of "News and Herald."

Randolph, Edmund Jennings: statesman; b. at Williamsburg, Va., Aug. 10, 1753; nephew of Peyton and son of John Randolph, attorney-general of Virgina, a leading royalist; studied law; entered the Continental army at Cambridge as an aide to Gen. Washington Aug., 1775; represented Williamsburg in the Virginia convention of May, 1776; became attorney-general of the State in July; was a delegate to the Continental Congress 1779–83, and to the convention which formed the Federal Constitution 1787; presented to that body the so-called "Virginia plan," but without success; refused to sign the Constitution, though he advocated its ratification in the Virginia convention; was elected Governor of Virginia 1788; was the first attorney-general of the U. S. on the organization of the Federal Government 1789; succeeded Jefferson as Secretary of State 1794, and resigned in Aug., 1795, in consequence of disapproval by his colleagues of his dealings with the minister of the French republic, on which subject he published a *Vindication of Mr. Randotph's Resignation* (Philadelphia, 1795). D. in Frederick co., Va., Sept. 12, 1813. An interesting description of his person, character, and public services was given by William Wirt in his *British Spy*. Also see Conway, *Omitted Chapters of History, disctosed in the Life and Papers of Edmund Randolph* (New York, 1888).

Randolph, John, of Roanoke: statesman; b. at Cawsons, Chesterfield co., Va., June 2, 1773; studied law at Philadelphia under Edmund Randolph; was elected to Congress as a Democrat in 1799, and re-elected, with the exception of two terms, until 1825; was chairman of the committee of ways and means 1801; was the chief manager of the impeachment of Judge Chase 1804; became conspicuous for his wit and eloquence, no less than for the bitterness of his speech and his numerous eccentricities; was prominent as a champion of State-rights and as a partisan of Jefferson's administration until 1806, when he separated from his political associates, opposed the election of Madison, the embargo, and the war with England in 1812, in consequence of which he was defeated in that year in his candidacy for re-election, but was returned at the election of 1814; opposed the Missouri Compromise with great vehemence, fastening upon its Northern supporters the epithet "doughfaces"; visited England in 1822, and again in 1824; sat in the U. S. Senate 1825–27; had a duel with Henry Clay, Apr. 8, 1826, growing out of his denunciation of the political alliance between the latter and J. Q. Adams; supported Gen. Jackson in the election of 1828; sat in the convention of 1829 for revising the constitution of Virginia; went as minister to Russia 1830, but spent most of his time in London; returning in 1831, was again elected to Congress 1832, but before taking his seat died in Philadelphia, Pa., June 24, 1833. He was never married. By his will he emancipated and provided for his slaves, numbering over 300. Several biographies have been published, among which are that by Hugh A. Garland (1850) and that by Henry Adams (1882).

Randolph, Peyton: statesman; b. in Virginia in 1723; graduated at William and Mary College; studied law at the Temple in London; was appointed in 1748 royal attorney-general for Virginia; was elected to the house of burgesses; became chairman of a committee to revise the laws of Virginia; framed the remonstrance of the house of burgesses to the king against the passage of the Stamp Act 1764, but after its passage discountenanced Patrick Henry's celebrated "five resolutions" 1765; resigned the office of attorney-general in 1766, and was Speaker of the house of burgesses for several years thereafter; was chairman of the

committee of vigilance chosen Mar. 10, 1773, and an efficient worker in promoting through correspondence a concert of action with the other colonies; presided over the Virginia convention at Williamsburg, Aug., 1774; was chosen a delegate to the Continental Congress; was first president of that body upon its meeting at Carpenters' Hall, Philadelphia, Sept. 5, 1774, though from ill-health he soon resigned that post; presided over the second Virgina convention at Richmond, Mar. 20, 1775; was again chosen president of the Continental Congress when it reassembled at Philadelphia, May 10, 1775, but resigned May 24, returning to Virginia to preside over the house of burgesses; resumed his seat in Congress a few months later. D. in Philadelphia, Oct. 22, 1775.

Randolph, THOMAS: poet; b. near Daventry, England, in 1605; d. 1635. He was educated at Westminster and at Trinity College, Cambridge, of which he became a fellow. His plays include *Amyntas*, a pastoral comedy, and *The Muses' Looking-glass*, a morality in defense of stage-plays. His best-known poem is his *Ode to Sir Anthony Stafford*. He was a friend and disciple of Ben Jonson. H. A. B.

Randolph-Macon College: an educational institution chartered in 1830 and opened in 1832, endowed and sustained by the Virginia and Baltimore conferences of the Methodist Episcopal Church South. It was first located in Mecklenburg co., Va.; suffered severely during the civil war, and was removed in 1866 to Ashland, Hanover County, and re-endowed.—RANDOLPH-MACON WOMAN'S COLLEGE, Lynchburg, Va., is an endowed institution for women with courses of instruction parallel to those for men at Ashland. It was founded in 1891.—RANDOLPH-MACON ACADEMY, Bedford City, Va., was established in 1889 as a fitting school for the college; and RANDOLPH-MACON ACADEMY, at Front Royal, Va., practically a duplicate of the one at Bedford City, was established in 1891. These institutions are all under one president, and controlled by one board of trustees.

Range-finders and Position-finders: See the Appendix.

Rangoon': chief city of Burma, and third port in importance in British India; on the eastern arm of the Irawadi delta, 20 miles from its mouth (see map of S. India, ref. 4–L). It is in unimpeded connection with the main stream and with the coast, and is accessible for large craft. It is the center of a system of canals, and the terminus for two railways running northward, one to Prome, the other to Mandalay. It is provided with street-cars, fire brigades, and other modern improvements; but is badly built and unsanitary, with the houses often on bamboo piles, and the narrow streets intersected by canals. The teak forests in the region about it and the excellent character of the port early caused the development of a considerable ship-building industry, which has latterly declined. The principal exports are rice, teak, cotton, spices, and skins. Rangoon is the chief port of importation for the trade of Upper Burma and Yunnan. The city has few noteworthy buildings or monuments, but near by is the Shway-Dagôn Pagoda, a massive and imposing structure, with a tower 321 feet high capped by an enormous gilded crown and containing a bell weighing 30 tons. The pagoda is the repository of eight hairs from the head of Gautama Buddha, and is a favorite object of pilgrimage and seat of an annual fair.

Rangoon was in 1753 selected by Alompra as capital of Pegu, and given its present name *Ran-kun*, or "end of the war." Before that it was named after the pagoda, which was built, according to tradition, about 585 B. C. The city was occupied by the British in 1821, but soon returned to the Burmese. It was again taken in 1852, and has since been held by the British. It has prospered under their rule, and the population increased from 25,000 in 1852 to 180,324 in 1891. The city forms a separate administrative district of 22 sq. miles. The population is chiefly Buddhist.

MARK W. HARRINGTON.

Rangpur': district of Bengal, British India; between 25° 16′ and 26° 21′ N., and bounded E. by the Brahmaputra. Area, 3,486 sq. miles. Pop. 2,100,000. The surface is very low, and in the wet season entirely inundated. Cotton does not succeed. Indigo is the principal product; fifty large factories are in operation, M. W. H.

Ran'idæ [Mod. Lat., deriv. of Lat. *ra'na*, frog]: the family of anurous batrachians which contains the true frogs.

Ran'ke, JOHANNES, M. D., Ph. D.: physiologist and anthropologist; b. at Thurnau, Bavaria, Aug. 23, 1836; studied at the Universities of Munich, Tübingen, Berlin, and Paris, graduating M. D. in 1861 at the first named, from which he received Ph. D. in 1882. He was appointed Extraordinary Professor of Physiology in the University of Munich in 1869. He was the co-editor of the *Beiträge zur Anthropologie und Urgeschichte Bayerns* (1877); and has been editor of the *Archiv für Anthropologie* since 1882. His principal work is *Grundzüge der Physiologie des Menschen*.

S. T. ARMSTRONG.

Ranke, LEOPOLD, von: historian; b. at Wiehe, Thuringia, Dec. 21, 1795; studied at Halle and Berlin; was appointed teacher at the gymnasium of Frankfort-on-the-Oder in 1818, and Professor of History at the University of Berlin in 1825. His principal writings are *Geschichte der romanischen und germanischen Völker von 1494–1535* (1824); *Fürsten und Völker von Südeuropa im 16. und 17 Jahrhundert* (1827); *Die serbische Revolution* (1829), one of his most brilliant productions; *Ueber die Verschwörung gegen Venedig im Jahre 1688* (1831); *The Popes of Rome, their Church and State* (3 vols., 1834–37; translated into English by Mrs. Austin in 1840, by Scott in 1846, and by E. Foster in 1848); *History of Germany in the Time of the Reformation* (6 vols., 1839–47; translated into English by Mrs. Austin); *Memoirs of the House of Brandenburg, and History of Prussia during the Seventeenth and Eighteenth Centuries* (3 vols., 1847–48; translated into English by Sir A. Duff Gordon); *Jahrbücher des deutschen Reichs unter dem sächsischen Hause* (3 vols., 1837–40); *Französische Geschichte vornehmlich im 16. und 17. Jahrhundert* (5 vols., 1852–55); *A History of England principally in the Seventeenth Century* (6 vols., 1859–68; English translation 1875); *Geschichte Wallensteins* (1869); *Weltgeschichte* (1881–88). The complete edition of his works comprises forty-seven volumes. His very first productions immediately attracted great attention, both on account of the high merit of their style and composition, and on account of the ingenuity evinced in gathering and sifting the materials. It is also to this latter point that the expression "the school of Ranke" principally refers—to the method of studying history rather than that of writing it. D. in Berlin, May 23, 1886.

Rankine, JOHN: See the Appendix.

Rankine, WILLIAM JOHN MACQUORN: physicist and engineer; b. in Edinburgh, Scotland, July 5, 1820. In his early education his father, a retired lieutenant of the rifle brigade, was his chief instructor. He early displayed fondness for the natural sciences, and was fortunate in having the eminent Prof. J. D. Forbes as his tutor in natural philosophy. To him he dedicated his earliest and a somewhat remarkable paper, advocating the use of cylindrical wheels for railway carriages. Civil engineering naturally attracted his attention, and from 1841 to 1851 he was employed on the railways of Scotland. One of the most noticeable of his physico-mathematical researches was based on an hypothesis of "molecular vortices," by which was deduced the laws of elasticity, and of heat as connected therewith; from this he took at once prominent rank as an original investigator. His theoretical results, conforming closely to those subsequently obtained experimentally by Regnault and Dr. Ure, were in their ultimate form published in *The Philosophical Magazine*, Dec., 1851 (*On the Centrifugal Theory of Elasticity as applied to Gases and Vapors*). Important papers on kindred subjects succeeded this, among which are *On a General Law of the Transformation of Energy* and *Outlines of the Science of Energetics*. In 1855 Rankine became Regius Professor of Civil Engineering and Mechanics in the University of Glasgow. Soon after taking the chair he turned his attention to the production of a series of manuals for engineering students and practical men. D. in Glasgow, Dec. 24, 1872.

Ransom, MATTHEW WHITAKER: U. S. Senator; b. in Warren co., N. C., Oct. 8, 1826; graduated at the University of North Carolina, and admitted to the bar 1847; became a planter and politician; attorney-general of North Carolina 1852–55; member of the Legislature 1858–60; commissioner to the Montgomery convention 1861; entered the Confederate service as lieutenant-colonel; rose to be major-general; surrendered at Appomattox Court-house; elected as a Democrat in Jan., 1872, to the U. S. Senate for the term expiring in 1877; re-elected for 1877–83, 1883–89, and 1889–95; U. S. minister to Mexico Aug. 29, 1895–97.

Ransom, ROBERT: officer; b. in North Carolina, Feb., 1829; graduated at the Military Academy, and promoted brevet second lieutenant of First Dragoons July 1, 1850; became captain First Cavalry Jan., 1861, resigned May 24, 1861, and

joined the Confederate army, in which he became a major-general, serving with distinction throughout the civil war along the seaboard and in the Army of Northern Virginia. After the war he engaged in mercantile pursuits and farming until 1878; was civil engineer in the service of the U. S. on works of river and harbor improvements from 1878 until his death Jan. 14, 1892. JAMES MERCUR.

Ransom, THOMAS EDWARD GREENFIELD: soldier; b. at Norwich, Vt., Nov. 29, 1834; educated at Norwich University, a military institute presided over by his father; became in 1851 a civil engineer; later a real-estate agent at Chicago; raised a company of volunteers in Apr., 1861; elected major of the Eleventh Illinois Volunteers, and lieutenant-colonel of the same regiment on its reorganization in July; distinguished himself in the surprise of Charleston, Mo., on the night of Aug. 19, when he was severely wounded; was at the capture of Fort Henry; made colonel for gallantry in the assault upon Fort Donaldson; distinguished at the battle at Shiloh; became chief of staff to Gen. McClernand and inspector-general of the Army of the Tennessee June, 1862; afterward on Gen. Grant's staff near Vicksburg; appointed brigadier-general to date from Nov., 1862; took part in the Red river campaign, commanding McClernand's corps during that general's illness, and in the Atlanta campaign at the head of a division, and subsequently in command of the Seventeenth Corps. D. at Rome, Ga., Oct. 29, 1864.

Ransome Stone: See STONE.

Ranun'culus [Lat. for a little frog or tadpole, applied to certain plants, probably because they grow where tadpoles abound]: a genus of herbaceous dicotyledons of the CROWFOOT (*q. v.*) family. The flowers, which are mostly yellow, have five sepals, five petals, many stamens, and many separate flattened pistils each with a solitary erect seed. About 200 species are known, widely distributed in all parts of the world, and of these more than one-fourth occur in North America. *R. aconitifolius* and *R. asiaticus* are the ranunculi of gardens, cultivated for their flowers, in which the stamens have been changed to petals. The common buttercups, with bright yellow flowers, are *R. acris* and *R. bulbosus*, naturalized in the U. S. from Europe. Among the common species indigenous to the U. S. are *R. septentrionalis*, with large yellow flowers, *R. sceleratus*, *R. abortivus*, with small yellow flowers, and *R. delphinifolius*, an aquatic with divided leaves and yellow flowers. The common white-flowered aquatic species with dissected leaves has recently been placed in the allied genus *Batrachium* under the name *B. Trichophyllum*. The small-flowered, creeping buttercup, common in wet places, has likewise been removed to an allied genus, *Cyrtorhyncha*, as *C. cymbalaria*. CHARLES E. BESSEY.

Ranvier, rȧȧn'vi-ā', LOUIS, M. D.: pathologist; b. at Lyons, France, in 1835; graduated M. D. from the Paris School of Medicine in 1865; was appointed to the chair of histology in the College of France. Among his works are *Traité technique d'histologie* (Paris, 1875); *Leçons sur l'histologie du système nerveux* (1878); and, with Cornil, *Manuel d'histologie pathologique* (1869–72). S. T. A.

Ranz des Vaches, rȧȧnz'dā-vaash' [Swiss Fr. (: Fr. *rangs des vaches*), liter., rows of cows]: the name of the melodies which the Swiss herdsmen play upon their alp-horn.

Rapallo, CHARLES A.: See the Appendix.

Rape: See JURISPRUDENCE, MEDICAL.

Rape [from Lat. *ra'pa*, beet, turnip]: the *Brassica napus*, a plant of the family *Cruciferæ*, and closely related to the Swedish turnip and colza, from which it may be distinguished most easily by the fact that its young leaves are smooth and glaucous-blue. The navew is of the same species as the rape. Rape is largely raised in Europe for the oil of its seeds. Its stalks are valuable forage, and are good to plow under for manure. Its oil-cake is used as sheep-food and as a fertilizer. The oil is used for machinery, for lighthouse lamps, etc., and the seed is fed to cage-birds. Lately it has been recommended in the U. S. for pasture and as a soiling crop. Revised by L. H. BAILEY.

Raphael [from Heb. *Rĕfāĕl*, God heals, through the Greek Ῥαφάηλ, as the name of a man, 1. Chron. xxvi. 7]: according to the Apocrypha, one of the chief angels. In the book of Tobit he is "one of the angels which present the prayers of the saints" (xii. 15). He binds Asmodeus, accompanies Tobias on his journey, and brings healing to Tobit. A similar *rôle* is attributed to him in the book of Enoch. Raphael binds Azazel, one of the fallen angels, stands near the Eternal One, is the angel of the spirits of men, heals the earth, and "is set over all the diseases and wounds of the children of men" (x. 7; xx. 3; xl. 5; liv. 6; lxxxviii. 1). In Jewish theology Raphael is also one of the chief angels—the patron of the healing art. In the Midrash he is said to have been one of the three angels sent to Abraham. Catholic theology formally accepted him as one of the archangels at the council of Rome (745) and of Aix-la-Chapelle (759). See *The Apocrypha*, ed. Wace (London, 1888, i., p. 171); Brecher, *Das Transcendentale, Magie und magische Heilarten im Talmud* (Vienna, 1850); Hamburger, *Real-Encyct. für Bibel und Talmud* (ii., 966); Weber, *System der Altsynagog. Paläst. Theologie* (Leipzig, 1880, p. 164); Rönsch, *Buch der Jubiläen* (pp. 385, *seq.*). RICHARD GOTTHEIL.

Raphael, or **Raffaello**: the name by which *Raffaello Sanzio*, or *Santi*, the painter, is usually known. He was born at Urbino, Italy, Apr. 6, 1483, and probably received his first instruction in art from his father, Giovanni Santi, who died when he was eleven years of age, leaving him to the care of his uncles. It is uncertain who directed the young Raphael's studies after his father's death to the time he entered Perugino's studio at Perugia about 1500 or a little earlier. Some writers mention Timoteo della Vite, others Signorelli. Perugino's influence is evidently predominant in the first work to which we can fix a date, the *Marriage of the Virgin*, commonly called the *Sposatizio*, painted in 1504, now in the Brera at Milan. At this period of his studies Raphael went to Florence, and the work of the great masters living there became known to him; on his return to Perugia he painted in 1507 the *Entombment* for the Baglioni family. In this picture (now in the Borghese gallery at Rome) he shows the influence of Florentine art. His fame as one of the most promising artists of the day was established, and he was called to Rome by Julius II. to carry out the grand schemes for the decoration of the Vatican in 1508. The hall of the Segnatura was the first committed to him; in this he painted the so-called *Disputa del Sacramento* and the *School of Athens*, besides adorning the vault with allegorical figures. The pope was so well satisfied that he commissioned Raphael to decorate the remaining rooms. The designs were made by Raphael, who painted the most important parts and put in final touches; but he was greatly assisted by Giulio Romano, Francesco Penni, Giovanni da Udine, and Perino del Vaga. The Sala di Costantino was painted after his death by his pupils. Besides the work at the Vatican, Raphael finished other important pictures in the course of twelve years. Of these the principal are the Madonnas *di Foligno*, *del Pesce*, *della Sedia*, *di S. Sisto*, *di Loreto*, *dell' Impannata*, and *La Perla*; the *Santa Cecilia*; *Lo Spasimo*, the *Transfiguration*; the frescoes of the Sibyls in Santa Maria della Pace, the Psyche frescoes, and the *Galatea* in the Farnesina, the cartoons for the Sixtine tapestries, besides innumerable subjects for engraving. Raphael also was distinguished as a portrait-painter. Leo X., who succeeded Julius II. in 1513, continued to treat Raphael with the highest favor. At the death of Bramante, the year following this pope's accession, Raphael became the architect of St. Peter's, and fitted himself by deep study for this new office, to which was added in 1515 that of director of the excavations among the ruins of ancient Rome. His love of antique art led him to pursue with the greatest zeal these fresh researches, but the strain of so much work was too much for his fragile constitution. He caught a fever, and died, after a few days' illness, on Good Friday, Apr. 6, 1520. Raphael received more consideration from his contemporaries than any other artist; he became rich and famous; every honor was showered on him, and he might even have allied himself by marriage with one of the princes of the Church. His death at the early age of thirty-seven made a profound sensation. He was buried with great pomp in the Pantheon. Those who wish to form a true estimate of the genius of Raphael must study his drawings and cartoons, which preserve the essence and spirit of his work, so often lost by re-painting or by his assistant's interpretation in the frescoes and pictures. Among works of reference are Paulus Jovius, *Raphaelis Urbinatis Vita* (in Tiraboschi's *Storia della Lett. ital.* (Florence, 1812, vol. vii.); Rehberg, *Rafael Sanzio aus Urbino* (Munich, 1824); A. Springer, *Raffael und Michelangelo* (2d ed., Leipzig, 1883); I. Eugene Muntz, *Raphael, sa Vie, etc.* (Paris, 1881); Crowe and Cavalcaselle, *Life and Works of Raphael* (1883); Kugler's *Handbook*, ed. by Sir A. Layard (1887). W. J. STILLMAN.

Raphides: See Rhaphides.

Rapidan' River: a stream of Virginia which rises by several head-streams at the base of the Blue Ridge, and flows between Green and Orange Counties on its right, and Madison and Culpeper on its left. Ten miles above Fredericksburg it joins the Rappahannock, after a course of about 80 miles.

Rapid City: city; capital of Pennington co., S. D.; on the Rapid river and the Fremont, Elkhorn, and Mo. Valley Railroad; 45 miles S. E. of Deadwood, about 140 miles W. by S. of Pierre (for location, see map of South Dakota, ref. 7–B). It is in the famous Black Hills; is the seat of the State School of Mines, created by act of the territorial legislature in 1885: and contains 2 national banks with combined capital of $125,000, a State bank with capital of $50,000, and a daily and 5 weekly newspapers. Pop. (1890) 2,128; (1900) 1,342.

Rapid-fire Guns: See Machine and Rapid-fire Guns.

Rapp, George: founder of the sect of Harmonists (*q. v.*); b. at Iptingen, Würtemberg, Germany, Oct., 1770; founded in early manhood a communistic religious association to restore the practices of the primitive Christian Church; came into conflict with the authorities; emigrated to the U. S. in 1803 with a number of his associates; founded the town of Harmony, Butler co., Pa., and later the town of Economy, now Harmony, in Beaver co. D. at Economy Aug. 7, 1847.

Rappahannock River: a stream which rises in the foothills of the Blue Ridge, near the northwest border of Fauquier co., Va., and flows southeast, generally parallel to the Potomac, reaching Chesapeake Bay through a broad estuary. Its largest branch is the Rapidan. At its rapids at Fredericksburg a fine dam affords extensive water-power. Below Fredericksburg it is a noble tidal stream, the navigation of which is important. It is about 250 miles in total length.

Rapto'res, sometimes **Raptatores** [Mod. Lat. pl., from Lat. *raptor*, a robber]: a group, or order, of birds containing the birds of prey, comprising the hawks (*Falconidæ*), owls (*Strigidæ*), secretary-bird (*Gypogeranidæ*), and American vultures (*Cathartidæ*). These last differ from the others in many important particulars, and should, very likely, be placed apart. The *Raptores* are birds of powerful flight, characterized by a hooked, cered beak, and, with few exceptions, powerful feet and sharp, curved claws. The palate is desmognathous, there are two carotids, the oil-gland is present, as are also cæca, except in *Cathartidæ*. The female is generally larger than the male; the young are helpless when hatched. There are about 500 species, distributed throughout the world. Accipitres (*q. v.*) is by many authors restricted to the hawks or diurnal birds of prey. F. A. Lucas.

Raritan River: a river in New Jersey, which rises in two branches in Morris co., flows S. E. through Somerset and Hunterdon Counties, and falls into Raritan Bay at Perth Amboy. It is navigable as far as New Brunswick.

Raschîd: See Haroun al Raschîd.

Rash: a popular name for the acute exanthematous or eruptive diseases, or more frequently for the eruption itself which attends such diseases. Nettle-rash or urticaria, scarlet rash (roseola), and canker-rash (scarlet fever) are the diseases generally called by this name, which, though convenient for nursery use, is of no scientific value.

Rashi [a combination of the initial letters of his title and name]: the celebrated Jewish commentator Rabbi Solomon Ben Isaac; b. at Troyes, in Champagne, France, in 1040. Little is known about his life, except that he studied at the theological schools of Mayence and Worms. He died July 13, 1105. He wrote commentaries on all the books of the Bible except Chronicles; which, though they contain much of the traditional rabbinic exegesis, seek to determine the simple meaning (*Peshat*) of the text. They have been held in the highest esteem not only by Jewish writers, but also by Nicolaus de Lyra, Luther, Sebastian Münster, etc. His commentary on the Pentateuch was the first Hebrew book printed (1475). He also wrote a commentary on twenty-three of the treatises of the Babylonian Talmud, which is printed in every edition of that work. Among his other writings may be mentioned a commentary to *Bereshith Rabba*; *Happardēs*, containing decisions on ritual and legal matters; and a few hymns. In his commentaries Rashi cites a large number of Provençal words which have been collected by Arsène Darmesteter, and which are of value in determining the pronunciation of the particular dialect used by the Jews in that part of Provence. See Zunz, *Zeitschrift für die Wissensch. des Judenthums* (Berlin, 1822, iii., p. 277); Graetz, *History of the Jews* (Philadelphia, 1894, p. 286); Siegfried, *Raschi's Einfluss auf Nicolaus von Lira und Luther* (in Merx, *Archiv*, i., p. 428); Maschkowski, *Raschi's Einfluss auf Nikolaus von Lyra* (in *Zeitschrift für alttest. Wissenschaft*, xi., p. 268); Clément-Mullet, *Documents pour servir à l'histoire de Raschi* (Troyes, 1855); Arsène Darmesteter, *Glosses et Glossaires Hébreux-Français du Moyen Âge* (in *Romania*, i., pp. 146, *seq.*).

Richard Gottheil.

Rask, Rasmus Kristian: scholar; b. at Brændekilde, on the island of Fünen, Denmark, Nov. 22, 1787; studied at the University of Copenhagen. In 1808 he published his *Introduction to the Study of the Icelandic Language*, which, with his edition of the *Eddas* (1818), the first critical and complete one published, forms the foundation for the study of Icelandic literature and language. In 1813 he began his extensive travels. He spent first two years in Iceland, the result of which was his celebrated *Researches concerning the Origin of the Icelandic Language* (1818), which received the gold medal of the Danish Scientific Society, and in which the first observations of the transpositions of sounds in the Teutonic languages were published. He next spent two years in Stockholm, where he published a grammar of the Anglo-Saxon language (1817), translated into English by B. Thorpe (1830), and studied Finnish, and then, in 1817, he proceeded by St. Petersburg, where he remained over a year, studying the Slavonic dialects, to Astrakhan, through Persia, and to India, which he traversed in its whole length from 1820 to 1822, returning home, by Ceylon, in 1823. He brought to Copenhagen a great number of rare Oriental manuscripts, one of the greatest treasures of the Royal Library; but incomparably greater was his working knowledge of most of the languages composing the Indo-European family, from the English to the Mantchu. But his health was broken, and the results of his enormous linguistic acquisitions were fragmentary. He wrote essays on the Zend language, the genuineness of the *Zend-Avesta*, the ancient Egyptian and Hebrew chronology, and published grammars of the Spanish (1824), Frisian (1825), Italian (1827), and English (1832) languages. His richest and most original work is his *Introduction to a Scientific Orthography of the Danish Language* (1826), in which he gave comparative philology a new and powerful impulse, and foreshadowed many ideas later established as truths. He undoubtedly anticipated Grimm in the discovery of the law of the permutation of consonants. D. in Copenhagen, Nov. 14, 1832. *Samlede Afhandlinger* (vols. iii., 1834–38). Revised by D. K. Dodge.

Raskōl'niks [from Russ. *raskolenik'*, schismatic, heretic]: members of the *Raskól'*, or schism, which dates officially from the year 1666. During the long period of the Mongol yoke numerous errors crept into the ritual and liturgical books of the Russian Church. In the seventeenth century, during the reign of Alexis Mikhailovich, the patriarch Nikon introduced numerous reforms, which were met by great opposition. Nikon fell, but the council which deposed him in May, 1667, confirmed his reforms. From that time the schism in the Russian Church became established. The Raskōlniks objected to the alterations in and the printing of the church-books, to the form of the cross, and to various other matters. Thence they took the name of *Staroobryadtsy*, or Old Ritualists (from *stary*, old, and *obryad*, a rite); but, as they professed to be the preservers of old faith, as well as of old rites, they called themselves also *Starovertsy*, or Old Believers (from *vera*, faith). When Peter I. introduced his reforms into Russia the Raskol waxed stronger, its old religious opposition being fortified by a political resistance to the census, to military conscription, to shaving, to giving up the national dress. Peter I. vainly endeavored to crush their opposition. Since his time their treatment has fluctuated. Peter III. was their avowed protector. Catherine II. treated them leniently for a time, granting them the official designation of *Edinovertsy*, or Like-Believers, and allowing them to retain their old ritual. After the insurrection of Pugachef, an outbreak of schismatic and rebellious fury, they met with less favor. Nicholas I. in vain tried severe measures. Toward the end of his reign advances were made to them by the Poles and the Russian socialists, but the only result was the installation in 1846, at Belokrinitsa in Bukovina, of a Raskōlnik metropolitan, Ambrose, formerly Metropolitan of Bosnia. His successor, Cyril, visited Moscow in 1863, and there held

a Raskōlnik council-general; but just then the Polish insurrection broke out, and the Old Believers sent him away and addressed to the throne an assurance of loyal devotion. They were rewarded by tolerant measures, and large concessions were made to them.

Little is known as to the numbers of the Raskōlniks. The official census shows over 1,000,000, but it is said that more than 12,000,000 really exist. They form the most industrious, honest, and sober portion of the Russian community. They belong almost exclusively to Great Russia. Those in Poland, Livonia, Little Russia, and White Russia are all colonists from Great Russia. They evince a truly Russian faculty of organization, forming readily into communities ruled by practical systems of self-government. At a very early period they split into two great bodies—the *Popovtsy*, or Priestly, and the *Bezpopovtsy*, or Priestless (from *bez*, without, and *pop*, a priest). The former were obliged to depend for their priests upon fugitive "popes" from the establishment; the latter dispensed with the services of ecclesiastics, using those of elders instead. For about a century neither body possessed any legalized establishments, but about 1771, after the great plague of Moscow, each branch was allowed to have a cemetery in the capital, and to build there a church and a convent, and these still exist as the headquarters of the Raskol. In addition to these bodies the Raskol comprises the *Dukhovnyie Khristiane* (spiritualist Christians), who are divided into a number of minor sects. Some of these are respectable, such as the *Molokany* (said to be so called from *molokó*, milk, because they do not abstain during fasts from milk and its products) and the *Stundists* (from the German *Stunde*), both of which bodies hold what may perhaps be called Protestant doctrines. The *Dukhobortsy*, or spirit-wrestlers, seem to have been originally harmless mystics, but they afterward changed their character, and were in consequence mostly transferred to the Caucasus. The worst of these sects have either been crushed by the police or are rarely met with, such as the *Detoubytsy*, or child-killers, who put new-born babes to death in order to insure their salvation. One of these sects, that of the *Skoptsy*, or self-mutilators, a set of gloomy fanatics greatly addicted to money-getting, has isolated adherents in all parts of Russia. See the history of the Russian Church by Philaret, translated into German by Blumenthal (2 vols., Frankfort, 1872); Wallace's *Russia* (New York, 1878), pp. 306–324; A. F. Heard, *Russian Church and Russian Dissent* (1887); *The Stundists* (London, 1893).

Raso'res [Mod. Lat., from Lat. *ra'dere*, *ra'sum*, scrape, scratch]: a former group of birds containing originally the fowls and pigeons, and later the fowls alone. See GALLINÆ.

Rasp: See FILE.

Raspberry [obsolete *rasp* (the fruit); cf. Ital. *raspo*, raspberry), connected with verb *raspare*, scratch: Fr. *râper*, a word of Teutonic origin]: a name applied to those species of the rosaceous genus *Rubus*, in which the "fruit" or collection of drupelets falls away, in a thimble-like mass, from the receptacle, leaving the latter on the bush. Raspberries are important fruits in the U. S. Up to about the middle of the nineteenth century the cultivated varieties belonged to the European species, *Rubus idæus*, but very nearly all the varieties grown in the U. S. are offsprings of native species, *R. strigosus*, the wild red, and *R. occidentalis*, the wild black or black-cap. The commonest pure form of the former in cultivation is the Cuthbert. The black species is represented by Gregg, Ohio, and many others. An intermediate class, hybrids between the two, has become prominent, and it now comprises some of the best varieties, of which Shaffer may be taken as a type. This class has been described as a distinct species under the name of *Rubus neglectus*. *Rubus strigosus* is the American representative of *R. idæus*, with which it is very closely allied. The leaves are thinner and the fruit less firm and usually smaller than in the European species, and the calyx is glandular, while the other is not. The canes are also more bristly-hairy, and the fruit does not have the tendency to ripen throughout the season, which is often a marked trait of the European berry. The cultivation of the European varieties is attended with difficulty in the northern parts of the U. S., chiefly because of the severity of the winters. Another species of raspberry, *R. phœnicolasius*, has been introduced from Japan. See WINEBERRY.

The raspberry requires a warm, well-drained, and fertile soil. The chief point to be considered in the growing of the raspberry is the fact that the stem or "cane" bears only one good crop of fruit; therefore the stems are cut away after the fruit is harvested, or at latest before the following summer, and new shoots from the root, which have grown while the others were in fruit, are allowed to take their places. That is, the stems grow one year and bear the next year, after which they are worthless. From two to eight shoots or canes are allowed to grow to each plant, depending upon the age of the plant, strength of the soil, and method of training. The style of pruning and training varies. Red raspberries propagate naturally by suckers or sprouts thrown up from the roots, while the black-caps multiply by means of "tips," or new plants which spring from the tips of the recurving stolon-like canes when these come in contact with the ground. All raspberries are readily multiplied by means of root-cuttings. (See CUTTINGS.) Raspberries are important fruits for evaporating and for making into commercial conserves. There are no special manuals devoted to raspberry-culture in the U. S. L. H. BAILEY.

Rassam, HORMUZD: archæologist; b. of Chaldæan Christian parents at Mosul, Turkey, in 1826. In 1845 he became acquainted with Austen H. Layard, who was then beginning his explorations in Assyrian ruins, and in 1847 he accompanied Mr. Layard to England. In 1864 he was sent by the British Government on a mission to Abyssinia, to secure the release of several Europeans who were held in confinement by King Theodore, but was himself imprisoned by Theodore 1866–68. Rassam's *Narrative of the British Mission to Theodore*, etc. (2 vols., London, 1869), is his chief publication. After the death of George Smith in 1876, Rassam made repeated trips for the British Museum to the Babylonian-Assyrian region, and enriched the museum with many important discoveries. Most notable among these are the bronze gates of Balawat, from the time of Shalmaneser II., 858–824 B. C., and the tablet from the temple of the Sun-god in Sippar, commonly known as the Abu-Habba tablet, recording the restoration of the temple by Nabu-apal-iddin, a contemporary of Shalmaneser II. See T. G. Pinches, *The Bronze Gates discovered by Mr. Rassam at Balawat* (*Transactions of the Society of Biblical Archæology*, vii., 83–118, London, 1882), and *The Bronze Ornaments of the Palace Gates of Balawat*, parts i.–v., published by the Society of Biblical Archæology (London). D. G. LYON.

Ras'tadt or **Rastatt**: town in the grand duchy of Baden, Germany; on the Murg, 3 miles from its junction with the Rhine, and 15 miles S. W. of Carlsruhe (see map of German Empire, ref. 6–D). It is surrounded by fortifications, built in 1840–48 by Austrian engineers as a protection to the northern entrance of the Black Forest. It was the residence of the last margraves of Baden, whose palace (planned after that of Versailles) still exists. In 1714 the treaty which ended the war of the Spanish Succession was signed at Rastadt, and in 1797–99 a congress met which terminated without any result, the event being marked by the assassination of the French plenipotentiaries. Steel wares, tobacco, and beer are manufactured. Pop. (1895) 13,268.

Rat [O. Eng. *ræt*: Germ. *ratte* < O. H. G. *ratto*. The relation to the Romanic word, Fr. *rat*: Ital. *ratto*, is not clear]: any one of the larger species of the family *Muridæ*, the smaller being known as mice. The best known of these are the common brown rat (*Mus decumanus*) and the black rat (*Mus rattus*). The common rat was originally a native of India and Persia, but its present distribution is almost coextensive with that of man. It is generally believed that it extended into Europe about the middle of the eighteenth century, and found its way to America about 1775. It was anticipated in its incursions by the black rat, but its superior strength and aggressiveness have driven that species before it, and have supplanted it in almost all countries. It is very prolific, breeding four or five times during the year, and having about a dozen young each time. It is almost omnivorous, feeding upon grains, vegetables, and meat. The black rat (*Mus rattus*) is smaller than the brown species, and is much more timid. It also was originally peculiar to Asia. With prefixes or qualifying terms the name rat is applied to various other species of *Muridæ* and to rodents of other families. The wood-rats belong to the genus *Neotoma*, the pouched rats or gophers (see GOPHER) to *Geomys* or *Thomomys*, the cotton-rats of the southern parts of the U. S. to *Sigmodon*, the kangaroo-rats (see KANGAROO-RAT) to *Dipodomys*, *Perodipus*, and allied genera, the spiny rats of South America to *Echimys*, and the bamboo-rats of India to *Rhizomys*. Revised by F. A. LUCAS.

Ratafi'a [Fr.; Malay, *araq*, arrack + *tafia*, a spirit distilled from molasses]: a name given to a large class of liqueurs, or sweet alcoholic drinks strongly flavored with aromatics.

Ratel: any one of three carnivorous mammals of the family *Mustelidæ* and genus *Mellivora*, found in Africa and India, known as honey-badgers. The typical species, *M. ratel* or *capensis*, a native of South Africa, has a stout, badger-like body and short tail; its total length is about 3 feet. The back is iron-gray, with a white crown and streak down each side. F. A. L.

Rathbun, Richard: See the Appendix.

Ratich, Wolfgang: See the Appendix.

Ratio [= Lat. *ra'tio*, reckoning, account, calculation, relation, deriv. of *re'ri*, *ra'tus*, reckon, believe, think, judge]: the numerical measure of the relation which one quantity bears to another of the same kind. The only way in which two quantities can be compared is by division. The operation of dividing one quantity by another of the same kind consists in dividing *the number of times* that any assumed unit is contained in the former by *the number of times* the same unit is contained in the latter. The operation of finding a ratio is therefore purely numerical, and the resulting ratio is consequently an abstract number. If the terms of the ratio are commensurable, their ratio is *exact*; if the terms are incommensurable, the expression of their ratio by quotient of two abstract numbers is only *approximate*; but it is to be remarked that the approximation to the true value may be made to any desirable degree of exactness.

Prime and ultimate ratios were used by Newton as the method of analysis in his *Principia*. It is a simplification of the method of exhaustion as used by ancient geometers. To conceive an idea of this method, let us suppose two variable quantities whose values approach each other so that their ratio continually approaches a, and finally differs from a by less than any assignable quantity; then is a the ultimate ratio of the two quantities. Again, if two variable quantities simultaneously approach two other quantities, which on the same hypothesis remain constant, the ultimate ratio of the variable quantities is the same as that of the constant quantities. The ratios are called *prime* or *ultimate*, according as the ratio of the variable quantities is receding from or approaching to the ratio of the constant quantities.
Revised by S. Newcomb.

Rationalism [from Lat. *rationa'lis*, rational, reasonable, deriv. of *ra'tio*, *ra'tionis*, reckoning, thinking, judgment, reason, deriv. of *re'ri*, *ra'tus*, reckon, think, judge]: that tendency in modern thought which claims for the unaided human reason the right of deciding in matters of faith. It asserts the prerogative of the intellect to be supreme arbiter in all departments of revealed truth. It requires certainty as the condition of its favor, and promptly rejects what does not come before it with all the exactness and clearness of a mathematical demonstration. Like naturalism, supernaturalism, and other terms expressive of the relation of reason and faith, the term rationalism was first used in its present sense by the philosopher Kant. The scene where rationalism has exerted its chief sway is Germany. The sources were various, not only embracing different countries, but likewise different departments of investigation. The deism of England, one of the most polished and powerful of all forms of free thought, was industriously propagated in Germany, where the works of Lord Herbert, Hobbes, Shaftesbury, Tindal, Woolston and Wollaston were circulated in the language of the people and read by wide circles. In Holland the philosophy of Descartes and Spinoza was very powerful, and its influence was very decided east of the Rhine, particularly in the universities of Germany. The pantheism of Spinoza was very attractive to many minds, and was regarded as a welcome relief from the cold and heartless banishment of God from his own creation. France, however, was the chief foreign country which contributed to the rise and sway of German rationalism. The influence of Voltaire and the Encyclopædists was very great, and Berlin became as much a home to these men as Paris had ever been. The domestic causes were, first of all, the philosophy of Leibnitz, popularized and simplified by Wolf at Halle University: the destructive theology of Semler; the influence of the skeptical court of Frederick the Great, with its French surroundings; the *Wolfenbüttel Fragments*, published by Lessing; and the *Universal German Library*, issued by Nicolai. Rationalism was in the ascendant in Germany from 1750 to 1800, but with the beginning of the new century it began to lose its hold upon the best minds. Schleiermacher was the transitional theologian from the old rationalistic to the new evangelical faith of Protestant Germany. His *Discourses on Religion: Speeches to its Cultured Despisers* (Eng. trans. London, 1893) diverted public attention from the rationalistic criticism to the necessity of feeling and a sense of dependence on God. Jacobi was really the first to introduce the sense of dependence into the domain of religious philosophy, but Schleiermacher was the first to apply it to the man of general culture. Neander, the Church historian, was the first positive theologian of the so-called "mediatory" school. His historical works breathe a fervent and devout spirit, at the same time that they evince the profound scholarship of the original student. In 1835 a new impulse was given to rationalistic criticism by Strauss's *Life of Jesus* (n. e., Eng. trans. London, 1893)—a work proceeding directly from the Hegelian school. It advocated the mythical origin of the Gospels. This work was promptly replied to by Neander, Ullmann, Tholuck, and many other representatives of evangelical thought. The most recent phase of rationalistic thought is materialistic. The views of Büchner, Carl Vogt, Moleschott, and others have gained a wide influence. Evangelical theology is, however, in the ascendant again in most of the German universities. On the literature of rationalism compare Farrar, *Critical History of Free Thought* (Bampton lectures, 1863); Lecky, *History of the Rise and Influence of the Spirit of Rationalism in Europe* (2 vols., London, 1865); Hurst, *History of Rationalism* (New York, 1865; 9th ed., rev., 1875); Fisher, *Faith and Rationalism* (New York, 1879); Pfleiderer, *The Development of Theology in Germany since Kant* (London, 1890). J. F. Hurst.

Rat'isbon, or **Regensburg**: town of Bavaria; on the right bank of the Danube, opposite the influx of the Regen; 82 miles by rail N. N. E. of Munich (see map of German Empire, ref. 6–F). It is surrounded with walls pierced by six gates, and has a Gothic cathedral begun in 1275, but not finished till the middle of the seventeenth century: a town-house, in which the imperial diet assembled from 1662 to 1806; a magnificent stone bridge over the Danube, 1,100 feet long, connecting the town with the suburb of Stadt-am-Hof; and a monument of Kepler, who was born here. Gold, silver, brass, iron, steel, earthen and porcelain ware, leather, tobacco, and glass are manufactured, and there is an active trade in wheat and salt. Originally a Celtic town, it was made a frontier fortress by the Romans. In 1245 it was made a free imperial city. It was stormed by both the French and the Austrians in 1809, and was ceded to Bavaria in 1810. Pop. (1895) 41,474. See Walhalla.

Rat'itæ [Mod. Lat., liter., fem. plur. of Lat. *rati'tus*, marked with a raft (sc. *a'ves*, birds), deriv. of *ra'tis*, raft]: an order or sub-order of birds, considered by many authorities as a sub-class, contrasting with all the other living forms of the class, and containing the ostriches, cassowaries, and kiwis. It is distinguished, according to Huxley, by the sternum being devoid of a crest, and ossifying only from lateral and paired centers, the parallelism or identity of the long axes of the adjacent parts of the scapula and coracoid, and the non-development of an acromial process to the scapula, and of a clavicular process to the coracoid; the vomer has a broad cleft; the hinder and posterior ends of the palatines and the anterior ones of the pterygoids are very imperfectly or not at all articulated with the basisphenoidal rostrum. It may be further added that in all the living representatives the feathers are characteristic, the barbs being disconnected. The group embraces the largest of birds, all of which are incapable of flight, and progress by running. The species, though comparatively few, represent several well-defined families—viz., *Struthionidæ*, embracing the African ostriches; *Rheidæ*, including the South American ostriches or nandus; *Casuaridæ*, with the cassowaries and emus of the Papuan Archipelago, Australia, etc.; and *Apterygidæ*, including the kiwis of New Zealand; the order was also well represented in former geological epochs, especially in New Zealand, by the gigantic *Dinornithidæ*, which seem to have been destitute of true wings.
Revised by F. A. Lucas.

Raton: town; Colfax co., N. M.; on the Atch., Topeka and S. Fé Railroad; 111 miles N. by E. of Las Vegas (for location, see map of New Mexico, ref. 8–T). It is in a coal-mining region, and contains the machine-shops of the railway company, a national bank with capital of $50,000, and three weekly newspapers. Pop. (1890) 1,255; (1900) 3,540.

Ratram'nus, also called **Bertramus** by an error of copyists: a learned monk of the famous abbey of Corbie, near

Amiens, best known by his treatise *De Corpore et Sanguine Domini*, written to confute the transubstantiation doctrine of Paschasius Radbert (about 844 A. D.). It was translated into German (Zurich, 1532), and has repeatedly appeared in English under the title *The Book of Bertram the Priest, concerning the Body and Blood of Christ in the Sacrament* (London, 1549, 1582, 1623, 1686, 1688, 1832; Baltimore, Md., 1843). He died after 868. His writings occupy about 170 pages in vol. cxxi. of Migne's *Patrologia*.

Revised by S. M. Jackson.

Rattan [from Malay *rōtan*, rattan]: the slender stem of various plants of the genus *Calamus*, many of which are climbers or trailers, often many hundreds of feet in length, others quite short, all having a beautiful head of feathery leaves. *C. viminalis*, *C. rudentum*, *C. rotang*, *C. verus*, *C. scipionum*, and *C. draco* are among the species. The third and the last mentioned yield a part of the dragon's-blood of commerce. The young shoots of some of the species are used as a potherb; some produce good fruits; but the chief use is that of the stalks. From Borneo to Bengal great quantities are gathered for the Chinese, the European, and the American markets. In China mats, sails, and cables are among the articles made from them. In the U. S. they are used in making chairs, baskets, canes, umbrella-ribs, etc., and splinters of rattan are used in carriage-trimming and other ornamental work. Tropical America has numerous rattan-like palms of the genus *Desmoncus*, armed with strong thorns. They are locally used like the true rattans. See Palm Family.

Rattazzi, raăt-taăt'sĕe, Urbano: statesman; b. at Alessandria, Italy, June 29, 1808; studied law at Turin, and began to practice as an advocate at Casale; was elected a member of the Sardinian Parliament in 1848; opposed in the most decided manner the Austrian authority in Italy, and became a member of the cabinet of Gioberti, but retired immediately after the battle of Novara; entered the cabinet of Cavour (1853–58) as Minister of Justice, but resigned on account of his opposition to Cavour's policy of an alliance with France; formed a cabinet in opposition to Ricasoli in 1862, and again in 1867, but held the place only for a few months. D. at Frosinone, June 5, 1873. By the radicals he was accused of being subservient to France; by the clericals of being in compact with Garibaldi; thus his position was often very difficult, but he was a man of eminent ability and in possession of great talent as a speaker.—His wife, Marie Studolmine de Solms, a daughter of the Princess Lætitia Bonaparte, was the author of a biography of Rattazzi, *Rattazzi et son temps* (1881), and other works.

Rattigan, Sir William Henry: See the Appendix.

Rattlesnake: any snake of the family *Crotalidæ* provided with a rattle to the tail. The rattle is composed of articulated horny segments in varying number—from two or three up to thirty or more. The popular belief that the number of segments indicates the age of the animal is erroneous. The species of the group are peculiar to America, and are especially numerous in the arid regions of the southwestern parts of the U. S. According to Prof. Cope, eighteen species and a number of sub-species are found within the limits of the U. S.; of these fifteen belong to the genus *Crotalus*, which has the head covered with small scales, and three to the genus *Crotalophorus*, which has large plates upon the head similar to those of ordinary snakes. The common rattlesnake of the Eastern States is *Crotalus horridus*; in the Southern States, from North Carolina to Florida, *Crotalus adamanteus* is also found. A species of *Crotalophorus* (*C. catenatus*) is also found in the Western States, and extends as far eastward as Western New York, although the other species of the group are confined to the western and southwestern parts of the U. S. The venom of the rattlesnake varies in intensity with the climate, season, and the condition of the animal itself. It is most to be feared in warm weather. See Poison of Serpents.

Revised by F. A. Lucas.

Raumer, row'mer, Friedrich Ludwig Georg, von: historian; b. at Wörlitz, in the duchy of Anhalt, Germany, May 14, 1781; studied law at Berlin, Halle, and Göttingen; received employment in the civil service of the Prussian Government in 1801; appointed Professor of History at Breslau in 1811 and at Berlin in 1819; was a member of the German Parliament at Frankfort in 1848, and afterward of the Prussian upper house. D. in Berlin, June 14, 1873. His principal works are *Geschichte der Hohenstaufen und ihrer Zeit* (6 vols., 1823–25); *Geschichte Europas seit dem Ende des 15. Jahrhunderts* (8 vols., 1832–50); *Briefe aus Frankfurt und Paris 1848–49* (1849); *America and the American People* (2 vols., 1845; translated into English by W. W. Turner); *Vermischte Schriften* (3 vols., 1852–54).

Raumer, Karl Georg, von: geologist; brother of Friedrich Ludwig Georg von Raumer; b. at Wörlitz, Apr. 9, 1783; studied geology at Halle and Göttingen, and at the mining-school of Freiberg under Werner; appointed Professor of Mineralogy in 1811 at Breslau, in 1819 at Halle, and in 1827 at Erlangen, where he died June 2, 1865. Most widely known are his geographical works, *Lehrbuch der allgemeinen Geographie* (1832) and *Beschreibung der Erdoberfläche*, both often reprinted.

Ravaillac, raă'vaă'yaak', François: assassin of Henry IV. of France; b. at Angoulême, department of Charente, France, in 1578; entered the order of the Feuillants, but was expelled as a visionary and fool, and became noted for his fanatical hatred of the Protestants, which feeling by degrees concentrated itself on the person of Henry IV., their former leader. Several times he sought in vain to approach the king; at last he succeeded. On the afternoon of May 14, 1610, the king rode out to pay a visit to Sully, who was sick in bed. In the narrow rue Laferronnerie his coach was stopped for a moment by some heavily laden carts in front of it. Ravaillac jumped up on the hind wheel and plunged a dagger into the heart of the king, who died immediately. The murderer was captured soon after, confessed the crime, and was put to death May 27, having been subjected to cruel tortures without revealing the secret instigators of the deed.

Raven [O. Eng. *hræfn*: O. H. Germ. *hraban* > Mod. Germ. *rabe*. Cf. Lat. *cor'vus*, crow, and Gr. *κόραξ*, raven]: a bird (*Corvus corax*) which differs from the crow chiefly by its larger size and the lanceolate feathers of its chin and throat. It is found over the greater part of the northern division of the Old World, as well as North America, although it is rare on the Atlantic seaboard. It generally associates in pairs, but sometimes is to be seen in small flocks. It builds a rude nest, usually on a cliff, and deposits therein from four to six eggs of a light greenish blue, blotched with brownish spots. It is capable to some extent of mimicking the human voice. It was formerly, and is still by some superstitious persons, looked upon as a bird of evil omen.

Ravenel, Henry William: botanist; b. in St. John's parish, Berkeley co., S. C., May 19, 1814; educated in South Carolina College; planter for twenty years at St. John's, then resided at Aiken, where he died July 17, 1887. He published *Fungi Caroliniani Exsiccati* (500 species, 1853 to 1860) and *Fungi Americani Exsiccati* (800 species, 1878 to 1882), the latter in connection with M. C. Cooke, of England. He published many papers in botanical journals and the *Proceedings* of scientific societies. C. E. B.

Ravenna: city: in Northern Italy, in the province of Ravenna, between the rivers Lamone and Ronco; 44° 24′ N. lat. and 12° 10′ E. lon. (see map of Italy, ref. 3–E). It is connected with the great towns of the Peninsula by rail and with the Adriatic by a canal completed in 1747. Its walls are 3 miles in circumference, with five gates. It stands in a marshy plain over 4 miles from the water, and is one of the most malarial cities of Italy, though anciently it was bathed by the Adriatic and famous for salubrity.

Ravenna is, according to tradition, older than Rome. The Romans subdued it 187 B. C., and Augustus made it the headquarters of the Roman fleet on the Adriatic, constructing the Portus Classis and connecting it with the Po by an inland canal. Honorius abandoned Rome (404), and made Ravenna the capital of the Western Empire, induced thereto by its apparent capability of defense. It was the seat of many important ecclesiastical councils; until 679 its archbishop claimed equality with the pope. Taken by Odoacer, King of the Heruli (476), it was captured from him after a three years' siege by the Ostrogoth Theodoric the Great (493). It then attained so high a degree of splendor as to call itself *Ravenna Felix*. Belisarius took it (538). Narses, another general of Justinian, made it the capital of the exarchate of Ravenna, and it was governed by the Emperors of Constantinople till 752. Then the last exarch was expelled by Atolph, King of the Lombards, himself expelled (755) by Pepin of France, who bestowed the city upon the popes. Nevertheless, it generally adhered to the Ghibellines in the papal wars. It became an independent dukedom (1318); was seized by Venice (1440), whereupon its prosperity rapidly increased. Pope Julius II. regained it (1509).

It continued part of the states of the Church (with the exception of intervals during 1797–1815) until it was incorporated in the kingdom of Italy in 1860.

No Italian city seems more apart from the currents of modern life. Ravenna is not so much a city as a museum. Here better than at Rome may be studied primitive Christian art from the fifth to the ninth century. In the Cathedral of Sant' Urso, partly of the fourth century but reconstructed in the eighteenth, are frescoes by Guido Reni; the original campanile still remains. Close by is the octagonal-domed baptistry of the fourth century, containing the famous fifth century mosaic, representing the baptism of our Saviour in the Jordan. Near the Church of San Francesco, built on the ruins of a temple of Neptune about 450, but completely modernized, is the mausoleum of DANTE ALIGHIERI (*q. v.*), who died at Ravenna in 1321. In SS. Nazario e Celsò, erected (440) in the form of a Latin cross by Placidia, daughter of Theodosius the Great, are the sarcophagi of that empress (d. 450) and of Honorius I. and Constantius III. The round tower of St. Giovanni Battista was constructed in 438. Santo Spirito and Sta. Maria in Cosmedin, embellished with mosaics of the sixth century, were built by Theodoric for the Arian bishops. Sant' Apollinare Nuovo, erected by Theodoric about 500 as the Arian cathedral, is resplendent with mosaics, mostly of the sixth and ninth centuries. San Vitale (consecrated in 547), a work of Justinian, is a partial copy of St. Sophia in Constantinople. Its gorgeous mosaics, admirably preserved, give the whole New Testament story; especially interesting are those of Justinian and his suite, and of his empress Theodora and her retinue. In the Carthusian monastery is the library founded in 1714, with over 50,000 volumes and 700 MSS. Among the latter is an autograph MS. of Dante of the fourteenth century. Half a mile outside the Porta Serrata is the rotonda or mausoleum of Theodoric. The cupola, 36 feet in diameter, and weighing over 200 tons, is hollowed from a single block of stone. Also outside the walls is the imposing Sant' Apollinare in Classe, on the site of a temple of Apollo, dedicated in 549 and restored in 1779, a specimen of the purest early Christian art. Two miles from the city is La Colonna dei Francesi, the square pillar raised in 1557 to commemorate the battle of Ravenna (1512), in which Pope Julius II. was defeated by Gaston de Foix. S. of Ravenna toward Rimini extends the Pineta, the vastest and most ancient pine forest in Italy. It begins not far from Sant' Apollinare in Classe, on the site of the ancient harbor, and stretches 25 miles along the Adriatic, with a breadth of from 1 to 2 miles. Pop. (1881) of city, 18,571; of commune, 60,573. E. A. GROSVENOR.

Ravenna: village (settled in 1799); capital of Portage co., O.; on the Penn., the Erie, and the Pitts. and W. railways; 16 miles E. N. E. of Akron, 38 miles S. E. of Cleveland (for location, see map of Ohio, ref. 3–I). It contains 6 churches, 3 large public schools, a Roman Catholic school, 2 national banks with combined capital of $250,000, gas and electric light plants, water-works system owned by the village, and a semi-weekly and 2 weekly newspapers. The manufactories include glass-works, coach and hearse factory, carbon-works, flour and planing-mills, foundry, machine-shop, novelty-works, large dyeing establishment, 2 brick and tile works, 2 shoe-factories, and basket, chair, sad-iron, and spoke and hub factories. Pop. (1880) 3,255; (1890) 3,417; (1900) 4,003. EDITOR OF "REPUBLICAN."

Ravenscroft, JOHN STARK, D. D.: bishop; b. near Blandford, Prince George co., Va., in 1772; taken to Scotland in infancy; received there a classical education; returned to Virginia 1788; studied at William and Mary College; admitted to the bar, but ultimately studied theology; took orders in the Episcopal Church 1817; a minister in Mecklenburg co., Va., 1817–23, and pastor of churches successively at Raleigh, N. C., and at Williamsburg, Va., when he became Bishop of North Carolina. D. at Raleigh, Mar. 5, 1830. Two volumes of his *Sermons* were edited by Dr. (afterward Bishop) J. M. Wainwright in 1830, preceded by a memoir. See biographical sketches in *American Church Review* and in Batterson's *Sketch-book of the American Episcopate*. Revised by W. S. PERRY.

Ravenstein, ERNEST GEORGE: geographer and statistician; b. at Frankfort-on-the-Main, Germany, Dec. 30, 1834; son of an eminent local geographer and cartographer; educated chiefly in his native town; removed to London about 1852; held an appointment in the intelligence department of the War Office 1855–75; member of the councils of the Royal Geographical and Royal Statistical Societies; founded the German Gymnastic Society 1861, and for ten years was its president; has published *The Russians on the Amur* (London, 1861); *Geographie und Statistik des Britischen Reiches*, in Wappäus's *Handbuch der Geographie* (Leipzig, 1862); *London*, one of Meyer's *Handbooks for Travelers* (1872, subsequent editions); *Cyprus* (London, 1876); *The Laws of Migration* and other papers in *Transactions* of the Royal Geographical and Statistical Societies; *A Handbook of Gymnastics and Athletics* (London, 1864); also a map of Eastern Equatorial Africa (twenty-five sheets), published by the Royal Geographical Society (1882–83); a *Systematic Atlas* for private study and superior schools, fifty-two sheets (London, 1893); a topographical map of England and Wales (1893).

Ravignan, răă'veĕn'yaăń', GUSTAVE XAVIER DELACROIX, de: pulpit orator; b. at Bayonne, France, Dec. 2, 1795. He first studied and practiced law, but in 1822 entered the Jesuit seminary at Montrouge and was ordained priest in 1828. After some years of teaching his talent as orator revealed itself, and in 1836 he succeeded Père Lacordaire at Notre Dame, Paris, where he remained till 1848. He was also an ardent champion of the Jesuits in pamphlets, and active in charitable works and foundations. D. Feb. 26, 1858. See his *Life*, by Père de Pontlevy (2 vols., Paris, 1860; Eng. trans., New York, 1873). A. G. CANFIELD.

Rawal Pindi: a district of British India, in the Northern Punjaub. It lies on the south slopes of the Western Himalayas; is noted for its fertility and salubrity; embraces 4,681 sq. miles, and since the extension of the railway has carried on considerable trade with Afghanistan (see map of North India, ref. 3–C). Pop. over 1,000,000. Its largest town is Rawal Pindi; pop. (1891) 73,460; best known in recent times for the great durbar held there (1885) by the Viceroy of India, in honor of the Amir of Afghanistan.

Revised by C. C. ADAMS.

Rawdon-Hastings, FRANCIS, Marquis of Hastings: soldier and statesman; b. in Ireland, Dec. 7, 1754; was educated at Oxford; entered the army 1771; was sent to America in 1773; was present at the battle of Bunker Hill; became aide-de-camp to Sir Henry Clinton; participated in the battles of Long Island and White Plains and the attacks upon Forts Washington and Clinton; soon afterward raised in New York a corps called the Volunteers of Ireland, of which he took command; distinguished himself at Monmouth; was made general and sent to the Southern States with re-enforcements for Cornwallis 1780; took a prominent part at the battle of Camden Aug. 16; remained in the Carolinas after Cornwallis's return northward; attacked and defeated Gen. Greene at Hobkirk's Hill Apr. 25, 1781; relieved Fort Ninety-six; fortified himself at Orangeburg; incurred much obloquy on account of the execution of Col. Isaac Hayne July 31; sailed for England Aug., 1781; was captured by a French cruiser and taken to Brest; was made Baron Rawdon and aide-de-camp to the king 1783; succeeded his father as Earl of Moira in 1793; was given command of a force of 10,000 men sent to the relief of the Duke of York in Flanders in 1794; was intrusted with the direction of the expedition to Quibéron in 1795; was made lord-lieutenant of Ireland in 1805; made an unsuccessful effort to form a cabinet on the assassination of Mr. Perceval in 1812; was honored with the order of the Garter and appointed Governor-General of British India in 1813; successfully conducted the Nepaul, Pindaree, and Mahratta wars; was created Marquis of Hastings in Dec., 1816; retired from the government of India after a successful administration of nearly ten years in 1823, and became Governor of Malta in 1824. D. on board the Revenge in the Bay of Baia, near Naples, Nov. 28, 1826.

Rawlins: city: capital of Carbon co., Wyo.; on the Union Pac. Railroad; 136 miles W. N. W. of Laramie, 710 miles W. of Omaha (for location, see map of Wyoming, ref. 11–I). It is in a mining and stock-raising region, has an elevation of 6,540 feet above sea-level, and contains a valuable sulphur spring, quarries of limestone and building-stone, a national bank with capital of $75,000, and two weekly newspapers. The city has large trade, especially with Northwest Colorado. Pop. (1880) 1,451; (1890) 2,235; (1900) 2,317.

Rawlins, JOHN AARON: soldier; b. at East Galena, Ill., Feb. 13, 1831; the son of a farmer and charcoal-burner. He had but limited opportunities for obtaining an education, and at the age of twenty he began to attend school; in Nov., 1854, began the study of law, and in 1855 was ad-

mitted to the bar, and began practice in Galena. He won success in his profession, and became a leading Democrat of the Douglas school. On the outbreak of the civil war he favored coercion of the Southern States by force of arms, and a speech made by him at a mass-meeting in Galena induced Capt. Ulysses S. Grant to offer his services to the Government. While engaged in raising a regiment Gen. Grant offered him a position on his staff as assistant adjutant-general, with the rank of captain, which was accepted, and with the exception of two months, during illness, he was with Gen. Grant in all his battles and campaigns until the close of the war. He was advanced in rank until in 1865 he was appointed chief of staff to the lieutenant-general, with rank of brigadier-general U. S. army, and later became brevet major-general. When Gen. Grant was elected President he appointed Gen. Rawlins to a place in his cabinet as Secretary of War. In the few months of his administration he displayed the same executive ability which led to his selection. D. at Washington, D. C., Sept. 6, 1869.

Rawlinson, George: historian; brother of Sir Henry Creswicke Rawlinson; b. at Chadlington, Oxfordshire, England, about 1815; educated at Swansea and at Ealing School; graduated with classical honors at Oxford 1838; became fellow of Exeter College 1840, and Bampton lecturer 1859; elected Camden Professor of Ancient History at Oxford 1861, and appointed canon of Canterbury cathedral Sept., 1872; resigned his professorship in 1889. Author of a number of historical works: *The Five Great Monarchies of the Ancient Eastern World* (4 vols., 1862–67; 2d ed. republished in New York, 1871); *A Manual of Ancient History* (1869); *The Sixth Great Oriental Monarchy, or the Geography, History, and Antiquities of Parthia* (1873); *The Seventh Great Oriental Monarchy, or The Geography, History, and Antiquities of the Sassanian or New Persian Empire, collected and illustrated from Ancient and Modern Sources* (1876); *History of Ancient Egypt* (2 vols., 1881); *Egypt and Babylon* (1885); and a *History of Phœnicia* (1889). Canon Rawlinson contributed largely to the *Speaker's Commentary*, and in connection with his brother and Sir Gardner Wilkinson published a translation of Herodotus (4 vols., 1858–60; 3d ed. 1876), valuable for the notes and illustrations. Revised by W. S. Perry.

Rawlinson, Sir Henry Creswicke, D. C. L.: Orientalist and diplomatist; b. at Chadlington, Oxfordshire, England, in 1810; educated at Ealing School. He entered the Bombay army in 1826, and on account of his knowledge of Oriental languages was sent to Persia Nov., 1833, to aid in the instruction of the army of that country; resided several years at Kermanshaw, near the celebrated rock inscription of Behistun, which he was the first to decipher (1838); sent to Kandahar as political agent 1840; held that capital to its allegiance during the Afghan war; went as political agent to Turkish Arabia 1843; appointed consul at Bagdad Mar., 1844, and consul-general 1851–55; returned to England Feb., 1855; knighted and made a director of the East India Company 1856; member of Parliament 1858; member of the council of India 1858–59; was envoy to Persia 1859–60; again sat in Parliament 1865–68; president of the Royal Geographical Society 1871–73, and again 1875–76, and president of the Society of Biblical Archæology from its foundation in 1873. He translated the Persian text of the inscriptions of Darius, first published in the *Transactions* of the Royal Asiatic Society for 1846; contributed to the same journal many memoirs on the same subject or illustrative of the history and geography of the East; edited (with E. Norris and George Smith) 5 folio vols. of cuneiform inscriptions (1861–70); furnished valuable material to his brother's edition of Herodotus (1858–60), and published a volume of essays on Oriental politics, entitled *England and Russia in the East* (1874). He was nominated vice-president of the Council of India in 1876, and received a baronetcy in 1891. D. in London, Mar. 5, 1895.

Rawlinson, Sir Robert, K. C. B.: civil engineer and sanitarian; b. at Bristol, England, Feb. 28, 1810; in 1831 entered the Liverpool dock engineer's office, and in 1836 was employed on the London and Birmingham Railway under Robert Stephenson. He was then assistant surveyor to the corporation of Liverpool until 1844, when he was made engineer of the Bridgewater Canal. In 1848 he was appointed by the Government an inspector under the Public Health Act, and made the first inspection and the first report at Dover in 1849. His most important work was the devising and establishing a new system of main sewering. In 1855 he was sent as engineer sanitary commissioner to the British army in the Crimea. By the efforts of the commission the monthly percentage of mortality among 4,000 sick soldiers was reduced from 8·61 in March to 1·01 in June. He served on numerous commissions, and was a member of the Army Sanitary committee. He was chief engineering inspector under the local government board, and commissioner under the Rivers Pollution Prevention Act. He was knighted in 1883, and upon his retirement in 1889 received the decoration of K. C. B. He was president of the Institution of Civil Engineers in 1894. D. May 31, 1898.

Ray [viâ O. Fr. from Lat. *ra'ja*, ray, skate]: the vernacular name of species of the family *Raiidæ* and kindred groups. See Raiidæ and Fisheries; also Stingray.

Ray, Isaac, M. D., LL. D.: alienist; b. at Beverly, Mass., Jan. 16, 1807; graduated at the medical department, Harvard University, 1827; began practice of medicine at Portland; removed to Eastport 1829; devoted his attention to the subject of insanity; published *The Medical Jurisprudence of Insanity* (1838; 5th ed. 1871); became superintendent of the State insane asylum at Augusta 1841, and of the Butler Asylum at Providence, R. I., 1845, filling that post until Jan., 1867, after which he settled in Philadelphia, Pa. Author of *Conversations on Animal Economy* (1829), *Education in Relation to the Health of the Brain* (1851), and *Mental Hygiene* (1863), besides many contributions to professional journals and a valuable series of official annual reports. D. in Philadelphia, Mar. 31, 1881.

Revised by S. T. Armstrong.

Ray (sometimes written **Wray**), John, F. R. S.: biologist; b. at Black Notley, near Braintree, Essex, England, Nov. 29, 1627; son of a blacksmith; graduated at Cambridge, where he became a fellow of Trinity College 1649; took orders in the Church of England at the Restoration; resigned his fellowship from conscientious scruples 1662; resided for some years with his friend and pupil, Francis Willughby, at Middleton Hall, Warwickshire, and afterward at his birthplace; devoted himself to botany and zoölogy, making extensive tours with Willughby in Great Britain and on the Continent; became a fellow of the Royal Society 1667; published a *Catalogus Plantarum Angliæ* (1670), the most formal work of the kind which had then appeared; proposed a new system of botanical classification in his *Methodus Plantarum Nova* (1682), which was substantially adopted by Antoine de Jussieu in the next century; edited (with an English translation of the former) the *Ornithologia* and *Historia Piscium* of his friend Willughby, and published his great work, the *Historia Plantarum* (in 3 vols., 1686–1704). He also prepared valuable *Glossaries of North and South Country Words*, which were edited by Rev. Walter W. Skeat, for the English Dialect Society (1874). He also wrote *The Wisdom of God manifested in the Works of the Creation* (1691, often reprinted), and a *Synopsis Methodica Animalium, Quadrupedum et Serpentini Generis Vulgarium* (1693), which gave him a similar rank in the history of zoölogical classification to that he had previously gained in botany. D. at Black Notley, Jan. 17, 1705. The Ray Society, organized in 1844 for the purpose of issuing new editions of rare books on zoölogy and botany, has published thirty sumptuous volumes, two of which (vol. ii. of 1844 and vol. ii. of 1848), devoted to the *Memorials* and *Correspondence* of Ray, were edited by Dr. E. Lankester.

Rayleigh, Lord: physicist. See Strutt, John William.

Raymond, Andrew Van Vranken, D. D.: clergyman and educator; b. at Vischer's Ferry, N. Y., Aug. 8, 1854; educated at Union College and New Brunswick Theological Seminary; pastor of the First Reformed church, Paterson, N. J., 1878–81; of Trinity Reformed church, Plainfield, N. J., 1881–87; of the Fourth Presbyterian church, Albany, N. Y., 1887–94; since 1894 president of Union College, Schenectady, N. Y. C. K. H.

Raymond, Henry Jarvis, LL. D.: journalist; b. at Lima, N. Y., Jan. 24, 1820; graduated with honors at the University of Vermont 1840; wrote for Horace Greeley's *New Yorker* while studying law in New York 1840–41; became assistant editor of *The New York Tribune* on its establishment in Apr., 1841. In 1848 he became office-editor of the New York *Courier and Enquirer*; projected *Harper's Magazine*, for which he wrote the prospectus; was elected to the New York assembly as a Whig 1849; distinguished himself in debate; re-elected 1850; chosen Speaker; devoted

special attention to promoting legislation for the improvement of the school and canal systems; retired from *The Courier and Enquirer* 1850; on Sept. 18, 1851, issued the first number of *The New York Times*. Raymond took an active part in the Baltimore Whig convention of 1852; elected lieutenant-governor of New York 1854; prominent in the organization of the Republican party 1856, having been the author of the *Address to the People* issued by the Pittsburg convention; warmly urged Seward for the presidential nomination 1860, but gave efficient support to Lincoln when nominated and during his administration, though often differing from him on questions of war-policy; elected a member and Speaker of the New York Assembly 1861; presided over the Union convention at Syracuse 1862; defeated by Gov. Morgan in his candidacy for the U. S. Senate 1863; chairman of the New York delegation in the national Republican convention 1864; elected to Congress in 1864, but separated from the majority of his party in that body by giving a partial support to the policy of Johnson; took part in convoking the Philadelphia "Loyalists' convention" of 1866, and wrote its *Address and Declaration of Principles*; refused to be a candidate for re-election to Congress 1866; declined the mission to Austria offered to him in 1867. D. in New York, June 18, 1869. He published a *History of the Administration of President Lincoln* (1864), which in a revised edition was entitled *The Life and Public Services of Abraham Lincoln* (1865), and a few other works.

Raymond, Jerome Hall: See the Appendix.

Raymond, John T. (original name, *John O'Brien*): actor; b. in Buffalo, N. Y., Apr. 5, 1836. He was educated in the common schools; made his first appearance at the Rochester (N. Y.) theater as Lopez in *The Honeymoon*; afterward appeared at Charleston, S. C., as Asa Trenchard in *Our American Cousin*, with Edward Sothern as Lord Dundreary. On July 1, 1867, he played with Sothern the same character in the same piece at the Haymarket theater, London, and afterward made a tour of the British provinces. He returned to the U. S. in the autumn of 1868, and appeared in New York as Toby Twinkle in *All that Glitters is not Gold*. His artistic triumph was achieved in 1874, when he brought out at the Park theater, New York, *The Gilded Age*, founded on Mark Twain's novel. As Col. Mulberry Sellers, he acted with much humor and originality. The piece did not prove popular in England. He appeared on the stage for the last time in Hopkinsville, Ky. D. at Evansville, Ind., Apr. 10, 1887. B. B. Vallentine.

Raymond, Miner, D. D., LL. D.: minister and educator; b. in New York, Aug. 29, 1811; spent childhood and youth in Rensselaerville, N. Y.; studied 1830–34, and taught 1834–41 at Wilbraham Academy, Mass.; joined the New England conference of the Methodist Episcopal Church 1838. He was principal of Wilbraham Academy from 1848 to 1864, then became Professor of Systematic Theology in the Garrett Biblical Institute at Evanston, Ill.; published *Systematic Theology* (3 vols., 1877–79). D. Nov. 25, 1897.

Raymund Lully: See Lul, Raimon.

Raynal, rā′naal′, Guillaume Thomas François: historian; b. at St.-Geniez, department of Aveyron, France, Apr. 12, 1713; studied theology at the college of the Jesuits at Toulouse; entered their order and began to preach, but went in 1747 to Paris, and, enjoying the company of Diderot, Holbach, Helvetius, etc., he entered on an entirely opposite course. Of his numerous historical works, *Histoire du Divorce de Henri VIII. avec Catherine* (1763) attracted some attention, and his *Histoire philosophique et politique des Établissements et du Commerce des Européens dans les Deux-Indes* (first published anonymously in 4 vols., 1770, then in an enlarged edition under his name, 5 vols., 1780) was condemned by the parliament of Paris, and a warrant of arrest issued against the author. He fled to Switzerland, lived subsequently at the court of Frederick II., but was allowed to return to France in 1788; received several marks of distinction from the authorities. D. at Chaillot, near Paris, Mar. 6, 1796. He also wrote *Tableau et Révolutions des Colonies anglaises dans l'Amérique septentrionale* (2 vols., 1781), which was translated into English, and sharply criticised by Thomas Paine.

Raynouard, rā′noo′aar′, François Juste Marie: poet and philologist; b. at Brignolles, Provence, France, Sept. 18, 1761. He was bred a lawyer, elected to the Legislative Assembly in 1791, and was a deputy in 1806 and 1811. His poem, *Socrate dans le temple d'Aglaure* (1803), and his tragedies, *Caton d'Utique* (1794), *Les Templiers* (1805), and *Les États de Blois* (1814), gave him a literary reputation, and he was chosen to the Academy in 1807. He contributed to a better knowledge of the Provençal language by his important works, *Choix de Poésies originales des Troubadours* (6 vols., 1816–21); *Lexique roman, ou Dictionnaire de la Langue des Troubadours* (6 vols., 1838–44); *Grammaire romane* (1816); *Recherches sur l'ancienneté de la langue romane* (1816). D. at Passy, Paris, Oct. 27, 1836. A. G. C.

Razor-clam: the common name of various bivalves of the genus *Solen*, in allusion to the shape of the shell.

Razzionere, Pablo de: See Cespedes.

Ré, rā: an island of France, department of Charente-Inférieure; in the Bay of Biscay, in front of the harbor of La Rochelle. It is 18 miles long, 4 miles broad, treeless, with steep coasts; is strongly fortified, and has about 15,000 inhabitants, who are mostly employed in fisheries, oyster-farming, wine-cultivation, and the manufacture of salt.

Reaction Keys: See Recording Apparatus, Psychological, in the Appendix.

Read, David B.: See the Appendix.

Read, George: jurist; b. in Cecil co., Md., Sept. 18, 1733; became a lawyer at Newcastle, Del., 1754; attorney-general of Delaware and member of the Delaware Legislature for many years; a member of the Continental Congress 1774–77, and a signer of the Declaration of Independence; president of constitutional convention of Delaware 1776; member of the convention that framed the Federal Constitution; appointed judge of appeals 1782; U. S. Senator 1789–93; and chief justice of Delaware from 1793 to his death, Sept. 21, 1798.

Read, John Meredith, Jr.: diplomatist; b. in Philadelphia, Pa., Feb. 21, 1837; graduated at Brown University 1858, and at the Albany law school 1859; adjutant-general of New York during the civil war; published *An Historical Inquiry concerning Hendrick Hudson* (1866); wrote much for periodicals; appointed consul-general at Paris in 1868; acted as consul-general of Germany during the Franco-German war, and afterward for nearly two years directed the consular affairs of that empire, including protection of German subjects and interests during the sieges of Paris; appointed U. S. minister to Greece in 1873, but returned in 1879, the office having been abolished; president of the Social Science Congress at Albany, N. Y., in 1868, and vice-president of the one at Plymouth, England, in 1872. D. Dec. 27, 1896.

Read, Opie Percival: See the Appendix.

Read, Thomas Buchanan: poet and painter; b. in Chester co., Pa., Mar. 12, 1822; studied sculpture at Cincinnati, but soon turned his attention to painting, which he practiced in New York (1841), and soon afterward at Boston; removed to Philadelphia 1846; went to Florence, Italy, in 1850, and resided there with few intermissions until 1872, when he returned to the U. S. D. in New York, May 11, 1872. Author of *Poems* (1847); *The New Pastoral* (1855); *The Wagoner of the Alleghanies* (1862); and *A Summer Story, Sheridan's Ride and Other Poems* (1867). Among his paintings are the well-known portraits of Mrs. Browning and of Longfellow's children; the portraits illustrating his compilation, *Female Poets of America* (1848); and the painting illustrating his *Sheridan's Ride*.

Reade, Charles: novelist; b. in Ipsden, Oxfordshire, England, in 1814; educated at Magdalen College, Oxford, and graduated 1835; was elected to a Vinerian fellowship at Oxford 1842; was called to the bar at Lincoln's Inn 1843; published in 1852 *Peg Woffington*, a novel which gave him an immediate reputation, and afterward issued many novels and tales, among which are *Christie Johnstone* (1853); *Never Too Late to Mend* (1856); *Love me Little, Love me Long* (1859); *The Cloister and the Hearth* (1861); *Hard Cash* (1863); *Griffith Gaunt* (1866); *Put Yourself in his Place* (1870); *A Terrible Temptation* (1871); *A Woman Hater* (1878); and *The Jilt and Other Tales* (1884). Reade displayed great skill in plot and incident, had a picturesque style, and often wrote with a social or political object in view. Most of his novels were successfully dramatized by himself or by Boucicault, and he wrote several independent plays. He gained some note from his lawsuits on questions connected with the rights of authors and the limits of permissible literary criticism, and from his vigorous advocacy of international copyright with the U. S. D. at Shepherd's Bush, London, Apr. 11, 1884.

Reade, John: See the Appendix.

Reade, William Winwood: nephew of Charles Reade; traveler and novelist; b. at Ipsden, England, in 1839; published several novels, one of which, *The Veil of Isis, or the Mysteries of the Druids* (1861), displayed much ethnological knowledge, combined with a strong anti-theological bias; traveled on the west coast of Africa 1862–63; published on his return *Savage Africa* (1863); made a journey from Sierra Leone to the sources of the Niger 1868–70; published *The Martyrdom of Man* (1872); and *The African Sketch-book* (1873); accompanied the Ashantee expedition as correspondent of *The Times* 1873–74. D. at Wimbledon, Apr. 24, 1875. His latest publications (1875) were *The Story of the Ashantee Campaign* and a novel, *The Outcast.*

Reading, red'ing: town; capital of Berkshire, England; on the Kennet, near its junction with the Thames; 36 miles by rail W. of London (see map of England, ref. 12–I). It contains ruins, surrounded by public gardens, of a Benedictine abbey, founded by Henry I., who was buried there. The abbey was used as a palace by Henry VIII. and his successors until its destruction during the Cromwellian wars. Among modern structures are the Renaissance municipal buildings, containing a free library, science and art schools, etc., the assize courts, and the grammar school (rebuilt 1871). Reading has manufactures of silk, velvet, and ribbons, and has trade in wheat, flour, malt, timber, wool, and cheese. It has a huge biscuit-factory, and adjoining the town is an extensive seed-nursery covering 10,000 acres. Reading is the seat of a suffragan bishopric in the diocese of Oxford, and returns one member to Parliament. Pop. (1891) of municipal borough, 55,752; of parliamentary borough (1901), 72,214.

Reading: town (incorporated in 1644); Middlesex co., Mass.; on the Boston and Maine Railroad; 12 miles N. of Boston, 15 miles S. E. of Lowell (for location, see map of Massachusetts, ref. 2–H). It contains a high school with preparatory college course, a public library (founded in 1868) with over 7,000 volumes, a national bank with capital of $50,000, a savings and co-operative bank, and a weekly newspaper. The town has important manufactures, which include shoes, furniture, machinery, magnetic goods, organ-pipes, and brushes. Pop. (1880) 3,181; (1890) 4,088; (1900) 4,969. Editors of "Chronicle."

Reading: city (founded in 1748, incorporated as a borough in 1783, chartered as a city in 1847); capital of Berks co., Pa.; on the Schuylkill river, the Schuylkill Canal, and the Penn., the Phila. and Reading, and the Wilmington and Northern railways; 54 miles E. by N. of Harrisburg, 58 miles N. W. of Philadelphia (for location, see map of Pennsylvania, ref. 5–I). It is in an agricultural region, has large trade and excellent shipping facilities, and is noted for its manufactures, especially of iron and steel. E. of the city is Mount Penn, and S. of it is the Neversink Mountain. On the summit of the latter are two large hotels. A gravity railway, 8 miles long, has been constructed from the city to the summit of Mt. Penn and around the mountain. The summit is 1,140 feet above sea-level, and is surmounted by a stone tower 50 feet high. At the lower terminus of the railway the city has converted a tract of wild land into a beautiful park. There is another public park, of 50 acres, at the head of Penn Street. Local transit is afforded by trolley cars throughout the city, five electric railways extending into the suburbs, and one crossing the Neversink Mountain to Klapperthal, a large and beautiful park. The city is supplied with water from springs and mountain streams and by pumping from the Maidencreek. There are six reservoirs and over 75 miles of distributing-mains. The water-plant is valued at $1,500,000. There are gas, electric, and steam-heating plants, volunteer fire department with electrical fire-alarm, and six cemeteries. Reading contains 60 churches, a training-school for teachers, a high school for boys and one for girls, 45 public schools, public-school property valued at $535,500, business colleges, 13 private schools, 2 libraries (the Reading, founded in 1808, and the Berks County Law, founded in 1843) containing over 10,000 volumes, 3 opera-houses, 3 hospitals, 3 homes for orphans, 7 national banks with combined capital of $1,450,000, 2 State banks with capital of $225,000, 20 building and savings associations, 4 trust companies, a board of trade, and 6 daily, 1 Sunday, 11 weekly, a bi-weekly, and six monthly periodicals. The census returns of 1890 showed that 434 manufacturing establishments (representing 84 industries) reported. These had a combined capital of $14,718,678, employed 12,976 persons, paid $5,466,923 for wages and $12,014,493 for materials, and had products valued at $20,864,585. The principal industry was the manufacture of iron and steel, which had 11 establishments, combined capital of $4,391,734, and products valued at $7,122,397. Fifteen foundries and machine-shops had capital of $1,833,120, and products valued at $1,769,949. Other important manufactures were hardware, woolen hats, textiles, malt liquors, cigars, hosiery, brass, and planing-mill products. The principal shops of the Philadelphia and Reading Railroad Company are located in the city. In 1894 the assessed valuation was $41,408,805; value of city property, $1,800,000; city debt, $420,000; water debt, $615,500. Pop. (1880) 43,278; (1890) 58,661; (1900) 78,961, with suburbs, 90,000. Jesse G. Hawley, proprietor of "Eagle."

Reagan, John Henninger: U. S. Senator; b. in Sevier co., Tenn., Oct. 8, 1818; settled in Texas during its existence as an independent republic; studied law, became surveyor, judge, member of the Legislature, and colonel of militia; was a member of the U. S. Congress 1857–61; Postmaster-General in the cabinet of the Confederate Government 1861–65, after which he was for some time a prisoner in Fort Warren; M. C. from Texas 1875–85, and re-elected. He was U. S. Senator for 1887–93. He was one of the authors of the Cullom-Reagan Interstate Commerce Act.

Re'al [= Span., deriv. of *real*, royal < Lat. *rega'lis*, royal, whence Eng. *regal* and *royal*]: in Spanish and Portuguese countries, a coin and money of account. The old silver real (the eighth of the *piastre*, *peso*, or dollar) was long a familiarly current coin in the U. S., where it was worth 12½ cents, and bore various popular names. In Spain the real is now about 5 cents. In Portugal 40 reis make one real, but it is never coined. In Spanish America the real has various local values.

Real Estate: See Property.

Real'gar [= Fr., from Span. *rejalgar*, from Arab. *rahj al ghār*, liter., powder of the mine]: mineral disulphide of arsenic, a resinous-looking ruby-red or orange-yellow mass, transparent or translucent, and of conchoidal fracture. It is also called *red orpiment* and *ruby sulphur*. It may be prepared artificially by melting together 1 part of sulphur and 2 parts of arsenious acid, and by melting metallic arsenic with sulphur or orpiment. Realgar is sometimes used as a pigment, though not so much as formerly.

Revised by Ira Remsen.

Realism [from Lat. *rea'lis*, pertaining to things or substances, real, truly existent, deriv. of *res*, thing, affair]: as opposed to nominalism, the doctrine that universals (notions of species and genera, such as *man*, *animal*) have real existences corresponding to them. In the Middle Ages the disputes of the Schoolmen (*q. v.*) over the solution of some questions of Porphyry developed this doctrine into sharp contrast with nominalism. The dispute was not an idle one, but involved the all-important theological and metaphysical question of personal individuality. At an earlier period, Boethius and St. Augustine had been decided Realists; so were all Platonists and Neo-Platonists. In the ninth century John Scotus Erigena and Remigius of Auxerre were Realists, while Rabanus Maurus and Eric of Auxerre indicated nominalistic proclivities. Roscellinus in the eleventh century boldly announced nominalism, and applied it to the Trinity, making three Gods, but no unity. Realism prevailed against him, if not by argument, at least by authority. The great Realists of the eleventh and twelfth centuries were Anselm, William of Champeaux, Gilbertus Porretanus, John of Salisbury; of the thirteenth century, Alexander of Hales, Bonaventura, Albertus Magnus, Thomas Aquinas, and Duns Scotus. Their doctrine was *universalia ante rem* (in God's mind), *in re* (in things), and *post rem* (in man's thought). Although in that age of authority we find most of the Schoolmen adopting and defending tenets with a blind zeal often devoid of any clear understanding, yet to the great thinkers here named must be conceded an insight into the true grounds of this doctrine as held by Plato and Aristotle. That universals are real in a different sense from individual things was held by all true Realists—a point not sufficiently considered by the Nominalists, who objected that one individual can not be predicated of another individual, using in this the very language of Aristotle (*De Cat.*, cap. v.), who carefully distinguishes the reality of universals (δεύτεραι οὐσίαι) from that of individuals (πρῶται οὐσίαι). It was held by Realists that individual things are fleeting and transitory; each thing has its history; it originates in some former thing, runs its course of action and interaction with other things, and finally disappears, giving place to

another, its suceessor. Hence each individual thing is only a momentary phase of some proeess whieh has many potentialities; these potentialities it realizes in the series of individual things, each thing realizing some of them. Thus the process, as embracing the rise and dissolution of many individuals, is generic or a universal; it possesses the potentiality of eaeh thing, and at the same time possesses the reality of eaeh; the reality of each thing is the reality of the universal process which causes it. Inasmuch as it—the process—annuls individual things, and likewise originates them, it includes in itself the total of reality, and is therefore real in a more complete sense than any individual thing. Again, it must be noted that what we call individual things are arbitrarily limited phases of processes. Each individual, so called, is identified by nominalism with only a portion of its history, as it were, for it ean be traeed by degrees back into another thing, in which it originated, and forward into another, in which it finally disappears. Moreover, it is eorrelated in spaee with other things, and it is arbitrary in the Nominalist to assume that he has an individual thing before him when he has only a dependent part of the whole process of interrelated things. Thus the word process, to whieh natural science in our day has arrived (Darwinism teaching that things are to be studied in their history and development, evolution and the correlation of forces being doetrines of the supreme reality of universals in the shape of a law or persistent foree), interprets realism, and reinstates it as a more advanced stage of thinking than nominalism. Realism may be (*a*) psychologieal, holding in regard to artificial things—e. g. table or chair—that the general notion or name conventionally signifies the purpose or design which creates such things, and therefore corresponds to what reality they possess; (*b*) natural, a realism which recognizes the natural objective processes in nature and mind. Mind is considered immortal as individual (not as a thing), for the reason that it is a total process within one reality; each thinking being has potentially in his mind the universal reason, and is able to realize the same by his own activity. In thus realizing his possibilities by culture and education he does not annul his individuality (as the process of forces annuls things), but rather intensifies his conseiousness of self, and deepens his subjeetivity by the same act in whieh he realizes his universality. This doctrine is expressed by Aristotle's "enteleehies." First enteleehy (self-contained being—"End-in-itself"—entire process in one reality) has all the possibilities and the power to develop them, but has not energized as yet (the man as infant or savage); second entelechy has developed its potentialities through self-activity (the man as cultured, civilized, and enlightened).—Realism, as contrasted with idealism in the school of common sense, is the theory that we cognize external objeets by direct perception instead of by means of interposed ideas.

WILLIAM T. HARRIS.

Realism in Fine Art: the art or practiee of expressing the real in contradistinction to the imagined, the ideal, or the traditional. Thus, in the choiee of subject, the representation of a glory of angels may be ealled imaginative or imaginary. The frieze of the Parthenon is a strongly idealized treatment of a procession, very abstract indeed, and not at all a complete statement of the faets. The pieture of a saint with his or her attributes is generally very traditional. In opposition to these, realism would choose religious enthusiasm seen among living and humble people, or a faithful portrait of a military or civic parade, or a sailor risking his life in the way of duty. That is to say, the realist paints what he has seen and known, and whatever ideas of dignity or humility he may wish to convey will be given to the common scenes and the actual persons of his own experience. Apart from the choice of subject, realism chooses a manner of representing men and things which will give them nearly as they are to ordinary human observation. A realistic study of slaves or poverty-stricken peasantry would insist on their dull and fatigued expression, their stooping and often malformed bodies, and their hard and hopeless toil. The same subject, the same scene and incident, might be treated so as to insist upon the close communion with nature, the healthful out-of-door life, the strength of body of both men and women. Also, to come still further away from the mere choice of subject, the peasants or the slaves in the realistic picture will be shown ugly because of monotonous work and poor food, ill-clothed and dirty, unpleasing and even repulsive to look at. The same men and women may be invested with beauty of form and color, and may be so painted and so grouped as to give a very beautiful resulting composition, without obvious and admitted falsehood.

Realism in art is generally assumed to be a debasing theory and practice. The term is more often used in reproach, and applied to artists whose work is not approved. In this there is a constant though unconscious reference to the French term *réalisme*, which is commonly used in this evil sense. Some years ago a photograph from a drawing by Couture was handed about the studios; it represented a student of art seated on a cast of the head of an Apollo and drawing carefully from the head of a large hog, while cabbages and old boots lay about as further models for study. The title written below was *Un Réaliste*, and the idea was, of course, that realism turned away from the highest beauty to see truth in the ugly, or at least the indifferent; but this again is a mere satire of assumed vulgarity in choice of subject; and no one would have been quicker than Thomas Couture to state that choiee of subject has little to do with fine art, and that it would be better to treat a group of swine ideally than a group of men of heroic stature and beauty realistieally. In all the French horror of *le réalisme* there is the assumption that it is in some way opposed to *l'idéal*; that is to say, that realism is the antagonist of idealism. As all artists are in pursuit of the ideal in one form or another, this antagonism can hardly exist to the degree supposed. Rembrandt in his etchings was a realist as to the figures of men and women; he took them as he saw them, ill-grown, ill-nourished, clothed in hideous garments: but in light and shade and the composition of light and shade he was an idealist in the highest sense. The student who compares the *Adam and Eve* of Rembrandt with a photograph or a cast from the Parthenon frieze is free to say, as he is apt to feel, that the one is vulgar realism and the other is noble idealism; but a further consideration brings with it the sense that one is as idealistic as the other—it is only a question what the ideal is.

Again, a landscape painting may show the rocky structure of two low hills on the Newport coast, and the thin bed of morass which fills the hollow between them. It is perfectly traceable how the hills are built up and how they are wearing away; and the bit of swamp which separates them is as obviously there merely because the rock is impervious to water, and holds vegetable mould and pulverized rock together in a soft, spongy, saturated mass, as if we could sound it and take up a shovelful for examination. This treatment of the natural facts with a strong insistence on their true character is certainly realistic; but the means taken to show it are probably very idealistic, probably so because it is unlikely that the whole story would be as clear to the eye of the observer at any one point of the natural landscape as it is made to the student of the picture. The picture as a piece of coloring and line composition is an ideal work, of course, but it will be ideal also in the matter of this insistence on a high and important truth, which truth could only be shown in its fullness by a very decided abandonment of mere copying.

The conclusion is that in fine art there is none of that clear distinction between realism and idealism that is maintained in metaphysics. Idealism is merely the higher realism, the realism of very intelligent and clear-seeing men.

RUSSELL STURGIS.

Reality: the fundamental truth, underlying all things. See METAPHYSICS.

Real Presence (sc. of Christ in the Eucharist), **The Doctrine of the**: part of the professed belief of the Roman Catholic, Greek Catholic, and other ancient Churches. According to it "Christ is contained whole and entire under either species—i. e. that his body, blood, soul, and divinity are given both under the form of bread and under that of wine" (*Addis and Arnold*). In the Anglican Church the real presence is maintained, but so defined as to avoid the imputation of being a belief in the corporal presence—i. e. in "the presence in the holy sacrament of the Lord's Supper of the body and blood of Christ in a corporeal or materially substantive manner" (*Hook*). On the contrary, the real presence is not "to be sought for in the sacrament, but in the worthy receiver of the sacrament" (*Hooker*); but as, "with the natural bread in the sacrament, there is present the spiritual bread which is Christ's body," it is none the less real. See EUCHARIST and TRANSUBSTANTIATION.

SAMUEL MACAULEY JACKSON.

Real Property or **Realty**: See PROPERTY.

Reaping and Mowing Machines: machines usually operated by horses, used instead of sickles or scythes in cutting grain and grass. They have many features in common, and are considered together in this article. The first account of reaping-machines is given by Pliny the Elder, A. D. 23, who describes, as used in Gaul, a cart with a series of

FIG. 1.—Reaper used by ancient Gauls.

stationary projecting combs in front (shown in Fig. 1), which cut, or rather tore off, the heads of grain, leaving the straw standing. A machine operating on the same principle of stripping the heads is now in common use in Australia, except that mechanical means are provided for elevating the grain to a threshing and cleaning device and for putting the grain into bags. Pitt made the first English reaping-machine in 1786, and up to 1826 twelve improved or modified machines were brought out by as many inventors in England. Boyce, in 1799, was the first to take out a patent. Up to 1828, however, all these machines were failures, and in 1835 there were only three machines that had succeeded in doing field work. In the U. S. twenty-eight patents were granted on reapers and mowers up to 1835, and over 20,000 have been granted since. Reaping-machines are the product of the combined skill of many inventors. Their essential parts are a cutting apparatus, gathering device, platform, carriers or rakes for elevating or depositing the grain in gavels or in wagons, and a divider for separating the swath to be cut from the grain. Rev. Patrick Bell,

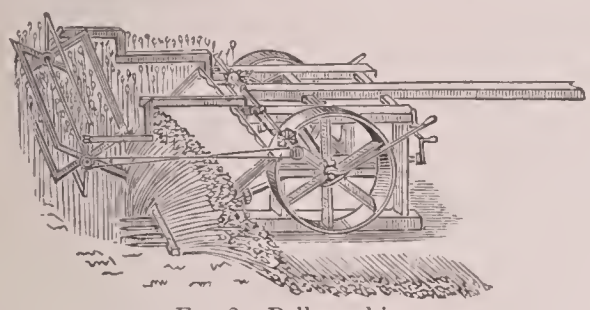


FIG. 2.—Bell machine.

of Scotland, in 1828 and 1829, built a reaping-machine with a reel, and scissors to cut the grain, and an endless carrier

FIG. 3.—The reaper invented and built by Cyrus H. McCormick, Steele's Tavern, Va., 1831.

to receive and deposit it at the side (Fig. 2). It remained unknown until the London Exhibition of 1851, after which it was tried, but failed in the competition with better machines. In 1831 the machine of Cyrus H. McCormick was invented and successfully operated. This machine, for the first time, was an organized instrument, containing practical devices that have been incorporated in every successful reaper made since (Fig. 3). As built and tested in the field in 1831 it contained the reciprocating knife moving through fixed fingers to sever the grain, the platform to receive the grain, the reel to hold the grain for the knife and to incline it upon the platform, and the divider projecting ahead of the knife to separate the grain to be cut from that to be left standing. The horses traveled ahead of

FIG. 4.—The McCormick reaper of 1845. The raker is carried on the machine.

the machine and beside the standing grain. It was mounted upon two wheels, and the motion to move the operating parts was derived from the outer wheel. A raker walked beside the machine and drew the grain from the platform in bundles. Later a stand to support the raker was added (Fig. 4). Obed Hussey, in 1833, invented a vibratory zigzag sickle (Fig. 5), sliding through double finger-guards, which has been very generally adopted. His open-top finger-guard, a valuable feature, was not patented until 1847. In 1845 and 1847 patents were taken out by C. H. McCormick for his inventions. In 1849 Purviance made a movable platform by which the reaper could be converted into a mower. Mr. Dorsey, in 1855, dispensed with the reel and adopted the quadrant-shaped platform, invented by Seymour, and a continuously revolving rake and series of beaters so arranged that, while they and the rakes brought the grain to the cutters and the platform, the rake, instead of rising, followed the cut grain, and deposited it in gavels. In the same year Samuel Johnson, of Brockport, N. Y., made a practical application of the single-arm, vibratory sweep-rake (Fig. 6), and so arranged it and the beaters that they acted either as rakes or beaters at the will of the operator. Sieberling, in 1861, took out patents for a drop which was composed of slats, which deposited the grain at intervals upon the ground immediately behind the cutter bar. His invention was subordinate to prior English patents. In 1865 W. N. Whiteley adapted a revolving and controllable rake to the two-wheeled, jointed-bar machines, substantially as now used on all reapers. In 1868 he invented an automatic open switch for the controllable-reel rakes, as now in gen-

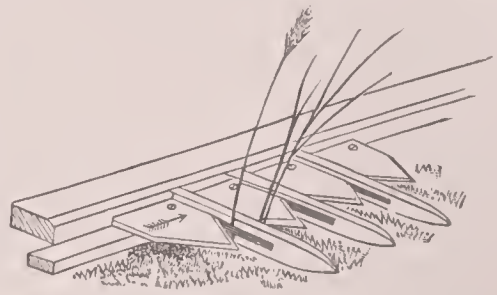


FIG. 5.—Hussey's cutter.

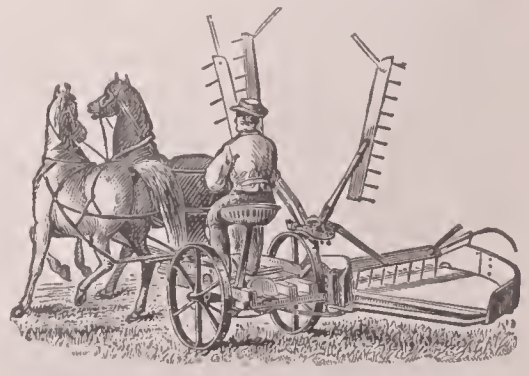


FIG. 6.—Vibratory sweep-rake reaper.

eral use. Several forms of rake, as Wood's chain-rake and Miller's table-rake, have been introduced into the U. S. and other countries. C. W. and W. W. Marsh invented and patented a machine in 1858 in which the cut grain was received on an endless apron and carried thereby to another apron, which elevated the grain to a stand on the machine, where two men, while riding along, bound it into bundles. This machine (Fig. 7) considerably advanced the art of cutting grain. The automatic wire self-binder, marking a progressive step in harvesting machinery, followed the Marsh harvester. The wire bands proved to be objectionable in both wheat and straw. Magnets were required in the mills to remove the pieces of wire from the wheat, and cattle were injured by the wire when eating the straw. Marquis L. Gorham invented a cord-binding attachment which, with various improvements by J. F. Appleby, has been generally adopted by the manufacturers of binders, with one or two notable exceptions. All self-binding machines are now so perfected that they give universal satisfaction. In all this class of machines the grain is delivered by the elevating aprons upon a slanting table, where iron packers work continuously through slots in the table and rake the grain down to the knotter and upon a trip-finger, which automatically sets the knotter in motion when enough grain has accumulated for a bundle. The knot is tied in the cord by a single revolution of a bill-shaped hook with a hinged tongue that is moved by a cam. The self-binder (Fig. 8) has rapidly replaced the self-rake reaper (Fig. 9). Briggs and Carpenter, Feb., 1836, secured patents for a heading-machine; since then over 100 have been granted on these machines, which have proved to be well adapted to cutting large harvests in dry climates. The essential parts are a cutting device from 16 to 20 feet long, mounted upon wheels, a reel, an endless horizontal apron, which carries the severed heads to a second apron, extending 4 to 6 feet at an upward angle, whereby the heads are deposited in a large wagon-box, the side next to the header being low, the opposite side high.

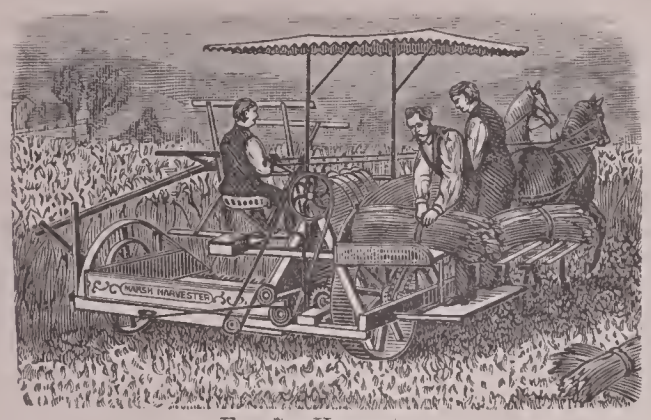


Fig. 7.—Harvester.

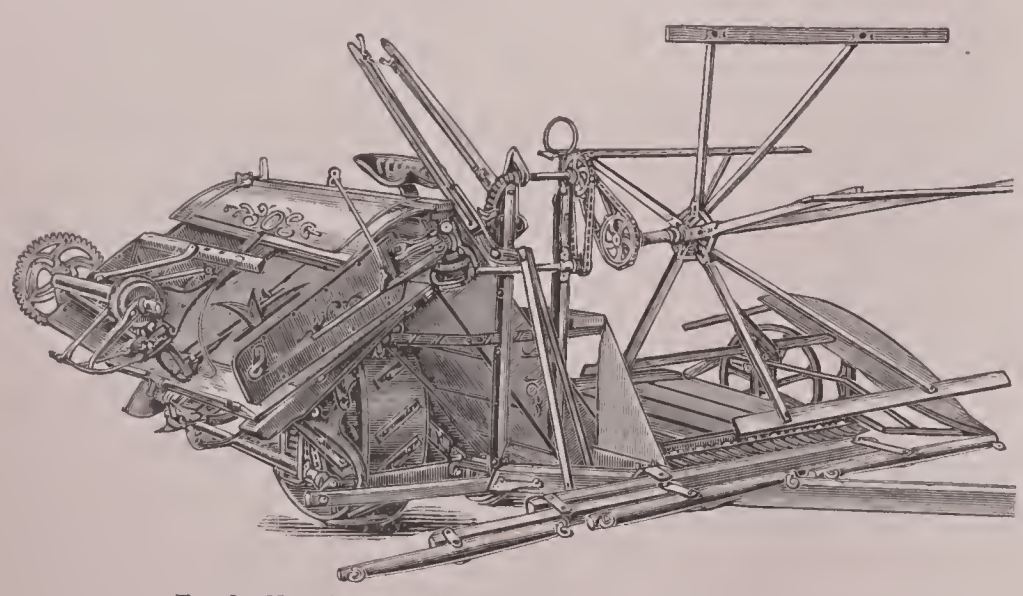


Fig. 8.—New Osborne harvester and binder (the self-binder).

A large, long tongue extends to the rear, supported by a truck, and with wheel-steering device similar to that used on steamboats. Four horses abreast, attached to the tongue near the trucks, push the machine. The cutting device is like that shown in Fig. 10. Six men and ten horses are able to cut and stack the grain from 15 to 30 acres daily. The combined harvester (Fig. 10) unites the header, the thresher and separator, the fanning-mill, the sacker, and straw-carrier in one machine. The large machines are propelled either by a traction-engine or by thirty to thirty-six horses. If steam-power is used, seven men are required; if horse-power, four. Of the combined harvesters 10 per cent. are steam-power, 90 per cent. horse-power. Either will cut from 60 to 125 acres and thresh from 1,700 to 3,000 bush. daily. The average life of one of these harvesters is about eight years if used forty to fifty days each season. From the grain-cradle to the steam-harvester is a long way, yet the larger part of the harvests of the world is secured by the aid of the former, or implements still more primitive.

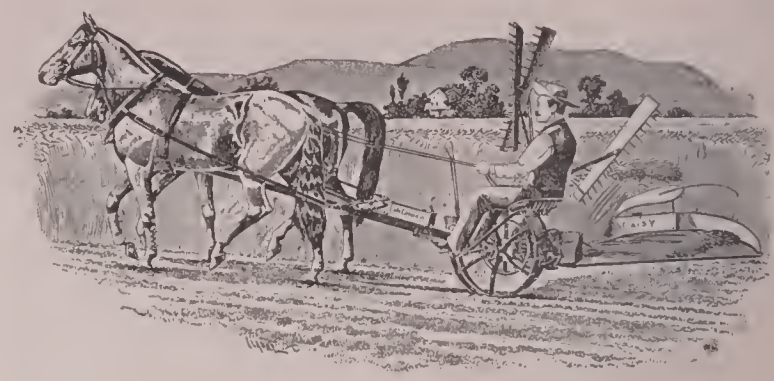


Fig. 9.—A modern self-rake reaper.

Fig. 10.—Combined harvester (shown as at work in the field).

The corn-harvester (Fig. 11) is the greatest improvement in the late inventions of harvesting machinery. It is the binder modified, strengthened, and adapted to the heaviest and most difficult work—that of cutting, elevating, and binding corn 8 to 14 feet high, weighing from 15 to 25 tons per acre.

Simultaneously with the reaper came the mowing-machine. At first it was practically the reaper dismantled of its platform and other parts not needed for cutting grass. As it required a higher speed to cut grass than grain, no satisfactory combined mower was made until a device was invented for changing the knives from a low to a high speed. Separate machines for mowing are now the rule; they are without reels or platforms. The cutter-bar is hinged at the inner end to allow it to follow the inclinations of the ground. Levers are provided for elevating or depressing the cutter-bar and for controlling the dip or angle of the guards and knives. Cyrenus Wheeler produced a successful mower in 1853, which was soon followed by the Buckeye and others, which were modifications of Hussey's and Wheeler's machines. Rear-cut machines were most common prior to 1880; since that time front-cutting machines have come into general use (Fig. 12). In 1870 Rudolph Eichemeyer's oscillating gear mower converted, by means of cams in the main wheels, their rotary motion into reciprocating motion required by the knife, thus obviating the necessity of gear-wheels.

Though efforts to cut grain and grass by machinery in Great Britain antedate those made in America, yet the U. S. so far excels in the construction of harvesting machinery that none of any description is imported. Since 1875, at

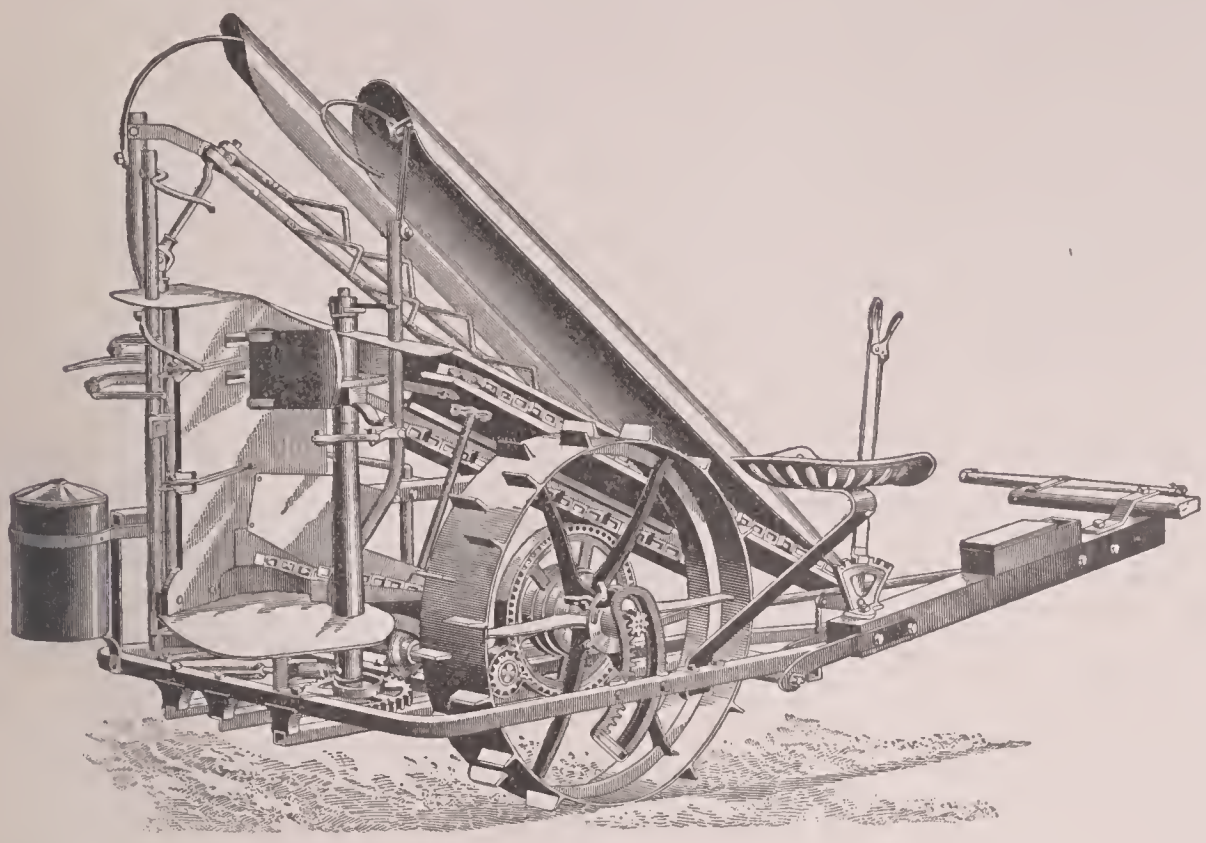


Fig. 11.—Vertical corn-binder.

which date American machines had been fairly perfected, about a dozen large and as many more small establishments have manufactured for home use over 100,000 machines annually, while supplying other nations with the larger share

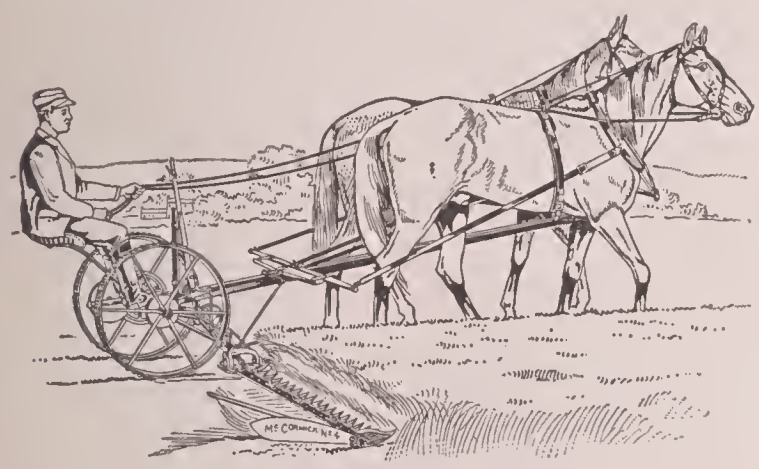


Fig. 12.—Modern mowing-machine.

of their harvesting appliances. The total average number of machines made each year exceeds 300,000. I. P. Roberts.

Reason [M. Eng. *resoun*, from O. Fr. *resoun, raison* > Fr. *raison* < Lat. *ra'tio*, reckoning, thinking, judgment, reason, deriv. of *re'ri, ra'tus*, reckon, calculate, think, judge]: in its first or most general signification, the conscious intelligence of man as contrasted with the instinct of brutes or with the necessitated action of inanimate things. In this sense stress is laid on the ability to adapt means to ends. From it are derived the expressions "reasonable" and "according to reason"—i. e. according to a proper regard for the adaptation to ends; "rational," meaning correct appreciation of this adaptation; "irrational," lacking such appreciation. Its second signification is that of ground—the "reason why anything is or is done." This includes (*a*) the ground as motive of action, (*b*) as efficient cause or sufficient reason. Aristotle's formal cause (*τὸ τί ἦν εἶναι*), the ideal totality of the possibilities of a thing within which exists mutual adaptation of parts, is the distinction upon which rests this and the former use of the term reason. The verb to reason, in the sense of to argue or adduce grounds, and the noun ratiocination come from the second meaning. (See Cause.) The third use of the word is as an equivalent of Aristotle's *νοῦς*: (*a*) *νοῦς ποιητικός, actus purus*, active or divine reason, the thinking occupied with creating and contemplating divine ideas; (*b*) *νοῦς παθητικός*, passive reason, including the activities of the mind in mere feeling or desire, sense-perception, imagination, and reflection. This active reason is nearly what Victor Cousin calls the impersonal reason, that to which "we owe the knowledge of universal and necessary truths, of principles which we all obey and can not but obey"—"the light that lighteth every man that cometh into the world." The fourth meaning of reason is akin to that of active reason, and distinguishes it from understanding. Kant, its author, makes the latter deal exclusively with the results of sense-perception, while reason deals with the supersensuous. With him, reason (*Vernunft*) is not a faculty of cognition, but only "regulative" of the practical conduct of life. Hegel and others restore it to its function of highest faculty of cognition, but preserve its function as practical, inasmuch as they make it to be the recognition of universal and necessary principles, not in a mere abstract sense, but as realized in the institutions of civilization, including under this head family, society, state, art, religion, and science. It is of interest to note that the Germans and English use the word reason (or German *Vernunft*) to mean the higher faculty of cognition, whose object is God or the infinite, and the word intellect, as equivalent to understanding (Germ. *Verstand*), to mean the "mere human" knowing of finite and relative objects; while the Italian philosophers make the intellect (*intelletto*) cognizant of divine things, but the reason (*ragione*) only of the finite.

William T. Harris.

Reasoning: See Logic.

Réaumur, rā'ō'mür', René Antoine Ferchault, de: physicist and naturalist; b. at La Rochelle, France, Feb. 28, 1683; educated in the Jesuits' College at Poitiers; studied law at Bourges; settled in 1703 at Paris; devoted himself with great enthusiasm to the study of natural history, physics, and mathematics; became a member of the Academy in 1708; received a pension of 12,000 livres a year from the Government for his *L'Art de convertir le Fer forgé en Acier* (1722), by which he first made his countrymen acquainted with the art of making steel of iron. D. on his estate, Bermondière, in the province of Maine, Oct. 17, 1757. He is best remembered by the thermometer which is called after his name. (See Thermometry.) Of his works the most remarkable is *Mémoires pour servir à l'Histoire naturelle des Insects* (6 vols., Paris, 1734–42).

Rebec [viâ O. Fr. from Ital. *ribeca, ribeba*, from Arab. *rabāba*, rebec, fiddle with one or two strings]: a musical instrument introduced by the Moors into Spain, whence its use spread over Europe. It was a precursor of the violin, and was of various sizes. From the neck it grew larger until the base was reached. It was played with a bow.

Rebolledo, rā-bōl-yā'dō, Bernadino, de, Count: poet; b. at Leon, Spain, in 1597. From the age of fourteen he was a soldier, serving against the Turks and in Barbary, and afterward during the Thirty Years' war. In 1647 he was ambassador to Denmark, and later to Sweden. He was on intimate terms with Christina of Sweden, and had a part in her conversion. From 1662 he was Minister of State at Madrid, and enjoyed many emoluments and honors. As a poet he strove to keep clear of the eccentricities of Gongorism, but fell into the opposite fault of being prosaic. He published at Antwerp in 1650 a volume of verses entitled *Ocios*; in 1652, at Cologne, a didactic poem called *Selva militar y*

política; a version of the book of Job, called *La constancia victoriosa*, and one of Jeremiah, *Trenos de Jeremias* (both Cologne, 1655). He wrote also a poetical version of the Psalms, a life of Christ in verse, and several ballads and epigrams. D. in Madrid in 1676. His works were printed in three volumes, at Madrid, in 1778. A. R. MARSH.

Récamier, rā'kăă'mi-ā', JEANNE FRANÇOISE JULIE ADELAÏDE BERNARD, Madame: b. at Lyons, France, Dec. 4, 1777; a woman of great charm of person and mind, she married in 1793 Jacques Récamier, a Paris banker, three times her age, and made her house the gathering-place of a group of brilliant personages, among whom Chateaubriand and Ballanche were conspicuous. The reactionary political and religious ideas there current made her the object of Napoleon's displeasure, and in 1811 she was ordered to leave Paris. At the restoration she returned to Paris and established herself modestly in the old Abbaye-aux-Bois, where she again became the center of a brilliant intellectual circle. Her beauty and intelligence gained her many worshipers and suitors, among whom Chateaubriand and Prince August of Prussia are famous. D. May 11, 1849. See Madame Lenormant, *Souvenirs et correspondance tirés des papiers de Madame Récamier* (2 vols., Paris, 1860), and *Madame Récamier, les amis de sa jeunesse* (Paris, 1872), both translated into English by Isaphene M. Luyster (Boston, 1867 and 1879); also Chateaubriand, *Mémoires d'Outre Tombe*, vols. viii.–x. A. G. CANFIELD.

Recanati, rā-kăă-naa'tĕĕ: town; in the province of Macerata, Italy; on a hill about 900 feet above the sea; 15 miles S. of Ancona (see map of Italy, ref. 4–E). The adjoining country is very productive, the grapes and figs being of the finest quality. The town has a Gothic cathedral dating from the fourteenth century. The Palazzo Comunale has on its façade a bronze representation of the translation of the Holy House to LORETO (*q. v.*). Leopardi was born here, and his monument adorns the principal piazza. Recanati was sacked by the French in 1799. Pop. 5,824. Porto Recanati, 6 miles N. E. on the coast, has 3,040 inhabitants.

Recapture: in international law, the recovery of a captured vessel by a cruiser of the same nation or of an ally. If retaken before any sentence of a prize-court of the captor's sovereign has decided upon the validity of the capture, and thus determined the ownership of the captured vessel, it goes to the owner; after such sentence, if retaken, it goes to the captor. The captor in the first of these two cases is entitled to a reward. (See SALVAGE.) This is the usage in the courts of the U. S., but a majority of the maritime states of Europe, including Great Britain, restore a recaptured ship to the original owner, even after she has been condemned by a prize-court and adjudged to the captor. It would seem that a neutral purchaser for value from the captor might thus lose his property. A French privateer is not compelled to restore a recaptured ship if an enemy has held it twenty-four hours, while a man-of-war must do so. Spain restores a recaptured ship to the neutral unless she is loaded with enemy's property. The amount of salvage payable to the recaptor by an owner differs. In Great Britain and the U. S. the usual rate is one-eighth of the value of ship and cargo, though the latter nation observes reciprocity in the matter, levying the same rate that would be applied to its ships by the state to which the recaptured vessel belongs. France charges one-tenth, but if recapture has taken place within a day only a thirtieth. Spain and Portugal charge one-eighth, but more if the recaptor is a privateer. Denmark and Sweden allow one-third and one-half respectively. The rate may be modified by treaty. Revised by T. S. WOOLSEY.

Receipt [from O. Fr. *recete* < Lat. *recep'tum*, liter., something received, neut. perf. partic. of *reci'pere*, receive]: the transaction by which property is delivered by one to another, or a writing acknowledging such a transaction. It is used in the first sense in the Statute of Frauds. (See FRAUDS, STATUTE OF.) A written receipt is to be distinguished from a RELEASE (*q. v.*) in that it does not destroy a subsisting right, but is merely evidence of a fact, and therefore may be explained or refuted. As it is merely evidence of a fact it is not a CONTRACT (*q. v.*), although the written instrument in which it appears may contain a contract also. A familiar example is a BILL OF LADING (*q. v.*), which sets forth a receipt of certain goods by a carrier and a contract to transport them. It is at times difficult to decide whether a particular instrument is a simple receipt or superadds to this a contract obligation. Even in the latter case the receipt is open to explanation, except in cases where the contradiction of the receipt would work a destruction of the contract. (*Basch* vs. *Humboldt Mutual Insurance Company*, 35 N. J. L. 429.) Whether the person delivering property or making payment pursuant to a legal obligation has the right to a simple receipt has not been settled by the courts, but statutes give such a right in certain cases. FRANCIS M. BURDICK.

Receiver: a person appointed by the court to receive rents, issues or profits of land, or other property which is in question between the parties to a litigation, or which belongs to one who is legally incompetent, as an infant. The appointment of receivers was resorted to by equity tribunals for the purpose of doing justice in cases where the jurisdiction and remedies of the common-law courts were inadequate. The general principles upon which a court of equity acts in appointing and controlling receivers are stated briefly by the U. S. Supreme Court as follows: "A receiver is appointed upon a principle of justice for the benefit of all concerned. Every kind of property of such a nature that, if legal, it might be taken in execution, may, if equitable, be put into his possession. Hence the appointment has been said to be an equitable execution. He is virtually a representative of the court, and of all the parties in interest in the litigation wherein he is appointed. He is required to take possession of property as directed, because it is deemed more for the interests of justice that he should do so than that the property should be in the possession of either of the parties in the litigation. He is not appointed for the benefit of either of the parties, but of all concerned. Money or property in his hands is in *custodia legis*. He has only such power and authority as are given him by the court, and must not exceed the prescribed limits. The court will not allow him to be sued touching the property in his charge, nor for any malfeasance as to the parties or others without its consent; nor will it permit his possession to be disturbed by force nor violence to be offered to his person while in the discharge of his official duties. In such cases the court will vindicate its authority, and, if need be, will punish the offender by fine and imprisonment for contempt." *Davis* vs. *Gray*, 16 Wallace 203.

Whether a receiver should be appointed in a given case is a matter of judicial discretion, which is exercised cautiously by the courts, especially in the case of a CORPORATION (*q. v.*). Modern legislation has given to law-courts authority to employ receivers, and has increased their powers and usefulness. The cases in which receivers are appointed fall into four classes: (1) Where there is no legal owner of the property, as in the case of an intestate's estate, or the owner is legally incompetent to manage it, as in the case of infants and lunatics. In the U. S., statutes often provide for a temporary administrator and give to guardians and committees an authority so wide as to render receivers unnecessary. (2) Where the litigants are legally competent to manage the property, but justice demands that neither party should control it, as in the case of winding up partnership affairs by judicial proceedings, or of the partition of property. (3) Where the legal title is held by one in a fiduciary capacity who is abusing his trust, as in the case of a suit against an executor, or a mortgagor, or of creditors' suits. (4) Where the proper enforcement of a judgment requires a receiver.

Receivers' Certificates.—Courts of equity are accustomed, at present, to authorize the receiver of a railroad company to borrow money for the operation of the road, and to issue therefor certificates which are made a first lien upon the property of the corporation. This extraordinary power is exercised because of the quasi-public character of railroads, and has been denied in the case of a private corporation, whose chief business was mining and selling coal. "A railroad corporation . . . is charged with the duty of operating its road as a public highway. If the company becomes embarrassed and unable to perform that duty the courts, pending proceedings for the sale of the road, will operate it by a receiver, and make the expense incident thereto a first lien. . . . Private corporations owe no duty to the public, and their continued operation is not a matter of public concern." (*Farmers' Loan and Trust Company* vs. *Grape Creek Coal Company*, 50 *Federal Reporter* 481.) Such certificates are non-negotiable securities; they do not pledge the general credit of the maker, but are payable out of a particular fund. Their validity depends upon the order of the court, and even a *bona-fide* purchaser will not be able to enforce them if the order has not been strictly followed in their issue. Their payment is not compelled by a suit at law, but by an order of the court. One who assigns or indorses them does not

incur the obligation of an indorser of negotiable paper, and it has been held that he does not impliedly warrant that they are collectible. If issued below par the holder's recovery upon them is limited to the amount he paid, unless the court authorized their issue or sale at a reasonable discount. (*Union Trust Company* vs. *Illinois Midland Railway*, 117 U. S. 434.) See Beach on *Receivers* (New York, 1887); Kerr on *Receivers* (London, 1891). FRANCIS M. BURDICK.

Recent Period: in geology, a portion of time between the Pleistocene period and historic time, though this portion is usually included in the Pleistocene. During this period the aspects of nature, both as regards the organic and inorganic worlds, have remained essentially the same, but minor changes have been constantly going on that serve well to illustrate and explain the manner in which the globe has been revolutionized in past ages. These changes consist in the elevation and depression of coast-lines, the scooping out of valleys, the draining and filling of lakes, the outbursts of volcanic matter, and the extinction of certain kinds of animal and vegetable life. See CHAMPLAIN EPOCH and PLEISTOCENE PERIOD. Revised by G. K. GILBERT.

Rech'abites: descendants of Rechab, the father or ancestor of Jonadab. They were a branch of the Kenites (1 Chr. ii. 55), who entered Palestine with the Israelites. The Rechabites were strict abstainers from wine, and dwelt in tents (Jer. xxxv.). There is a secret society of total-abstinence men and women in the U. S. and Great Britain known as the Independent Order of the Rechabites.

Recife: See PERNAMBUCO.

Reciprocity: in international law, the condition or relation existing by virtue of a species of treaty or convention between two or more nations, whereby each pledges itself to act in the same manner toward the other or others in reference to a given subject or to given subjects.

Strictly speaking, the stipulations of a reciprocity treaty or convention should be perfectly mutual; but a wider license is permitted in the actual practice, and if the stipulations are for the most part both in quality and quantity mutual, the term is used to denote this general mutuality in the agreements. Furthermore, the stipulations of the treaty or convention may be themselves of a general nature—as, for instance, in the use of what is termed "the most-favored-nation clause" in a treaty, whereby a treaty of reciprocity may be constructed without containing any particular specification of the manner in which the parties to the same shall act toward each other upon the given subject or subjects, but only the general pledge that each will deal with the other in reference to the subjects mentioned as it does or shall with that nation which it favors, or shall favor, most upon the same point or points.

The practice of reciprocity is older than European international law itself. In fact, before the period of the French Revolution of the eighteenth century the greater part of the intercourse of all the European nations was based upon reciprocity treaties and conventions. International law, as a system of principles, was at that period just emerging from the great mass of long-observed reciprocal agreements between nations. The Armed Neutrality of 1780—an agreement entered into by most of the nations of continental Europe, declaring and maintaining that the rule of "free ships, free goods," was a principle of international law independent of treaty or convention and based upon natural right—marks the chronologic point when, in practice, the exceeding importance of reciprocity agreements in international intercourse began to decline. The revolutionary idea at the close of the eighteenth century was to place both constitutional and international law upon the firm basis of natural reason or justice and universal principle, and emancipate them both from the arbitrariness and vacillation of conventional agreement. The famous debate in the French Assembly of 1790 in regard to the abolition of the Droit d'Aubaine presented most clearly a new philosophy of international law on the part of governments, which declared that every nation should accord to every human being, alien or subject, the natural rights of man, and protect him in their enjoyment, independent of any reciprocal agreements with the nation to which the alien belonged. Throughout continental Europe the revolutionary demand was made upon every government for the recognition of this principle, and Europe's political history from then to now is largely the record of its realization.

At the outset the British Government showed little disposition to sympathize with this enthusiastic humanitarian outburst of its revolutionary neighbor across the Channel; but thirteen years before the French movement began, the great economist Adam Smith produced his work upon the *Wealth of Nations*, one of the objects of which was to emancipate trade from the thraldom of reciprocal agreements between governments and place it in the category of the natural rights of man. That the British Government came to the adoption of this view, and assisted, at least, in bringing almost every European government to its recognition and practice, is matter of history. It may therefore be said, in general, that the revolutionary movements and changes at the close of the eighteenth century and the beginning of the nineteenth reduced greatly the part played by the rule of reciprocity in international intercourse, by moving out of its reach a large number of subjects, by far the larger number upon which it had thereto been employed —viz., the universal rights of man as a citizen of the world —and placing them under the protection of principle independent of specific treaty.

Numerous trade arrangements have been entered into by the U. S., as well as by European powers, on the basis of reciprocal or equivalent reductions in the duties on certain articles. By the third section of the act of Congress of 1890 commonly known as the McKinley Act, it was provided that, "with a view to secure reciprocal trade," sugars not above 16 Dutch standard, molasses, coffee, and hides should be admitted into the U. S. free of duty, unless the President "should become satisfied that reciprocal favors were not granted to the products of the United States" in the countries producing those articles. Under this provision arrangements were concluded with Brazil, the Dominican Republic, Honduras, Salvador, Guatemala, Austria-Hungary, Spain (as to Cuba and Porto Rico), the German empire, Nicaragua, and Great Britain (as to British Guiana and certain British West India islands) for the admission into those countries, free or at a reduced rate of duty, of certain articles from the U. S., in consideration of the free admission by the latter of the articles above enumerated. These arrangements were superseded by the tariff act of Aug., 1894, by which the conditions of trade were materially liberalized.

The word reciprocity is also sometimes used as a term of constitutional law to denote, in a confederate or federal state system, the mutuality upon certain subjects which the confederated or federated parts are obligated to observe. For example, in the Constitution of the U. S. it is provided that each State shall give full faith and credit to the acts, records, and judicial proceedings of every other, shall surrender to any other, upon proper and legal demand, fugitives from justice, etc. J. W. BURGESS.

Recitative [from Fr. *récitatif*, from Ital. *recitativo*, deriv. of *recita're*, recite]: in oratorios, operas, etc., a kind of musical reading or declamation resembling ordinary speech in time and accent, but differing from it by a strict adherence to the tones of the musical scale. The recitative is usually confined to such words as pertain to narrative, description, passion, and declamation. In ordinary recitative the rate and style of utterance are chiefly dependent on the discretion of the vocalist, sustained by an accompaniment of only a few plain chords; but in recitative with full accompaniment a more strict observance of musical time is required, although the rhetorical or declamatory character is still to be retained. Revised by DUDLEY BUCK.

Recke, rā'ke, ERNST, von der: poet; b. in Copenhagen, Denmark, Aug. 14, 1848. He is one of the few living Danish romantic poets, and his talent is almost wholly lyric-dramatic. His earliest and most popular poem is the three-act drama *Bertran de Born* (1872), with music by P. Heise, which is frequently performed at the Royal theater. His writings on the art of Danish verse, *Principerne for den danske Verskunst efter dens historiske og systematiske Udvikling* (2 parts, Copenhagen, 1881) and *Dansk Verslære i kortfattet Fremstilling* (Copenhagen, 1885) are of hardly less merit than his original works, and he has also engaged in the orthographical struggle in Denmark. Among his other publications may be mentioned *Lyriske Digte* (1876); *Kong Liuvigild og hans Sönner* (a tragedy, 1878); *Archilochos* (1878); *Knud og Magnus* (a tragedy, 1881); *Smaadigte* (1883); *Blandede Digte* (1890); *Fru Jeanna* (a tragic opera, 1891); *Hertuginden af Burgund* (1891). D. K. DODGE.

Recklinghausen, rek-ling-how'zen, FRIEDRICH DANIEL, von, M. D.: pathologist; b. at Gütersloh, in Westphalia, Dec. 2, 1833; studied medicine from 1852–55 at the Universities

of Bonn, Würzburg, and Berlin, graduating M. D. from the last in 1855; was assistant at the Berlin Pathological Institute from 1858 to 1864; in 1865 was appointed Professor of Pathologieal Anatomy at the University of Königsberg; in 1866 oecupied the same chair at Würzburg; and in 1872 went to the Strassburg university. He has contributed many valuable papers to the literature of pathology. S. T. A.

Reclus, *re-klü'*, Élisée: geographer; b. at Ste.-Foy-la-Grande, department of Gironde, France, Mar. 15, 1830; was edueated in Rhenish Prussia, and studied in Berlin under Karl Ritter; traveled from 1852 to 1857 in England and America, and published after his return to Paris a number of valuable geographieal works, partly in the *Revue des Deux Mondes*, partly in book-form, of which the most prominent are *The Earth* (2 vols., 1867) and *The Ocean, Atmosphere, and Life* (1872; translated into English by B. B. Woodward, New York, 1871 and 1872). His *Nouvelle Géographie universelle*, regarded as the most eomplete geographical survey of the world ever written, occupied him for twenty years (1874–94), and consists of nineteen volumes, of from 700 to 1,000 pages each. Among its illustrations are more than 3,500 maps. Holding extreme democratic views, when the revolution of Mar. 18, 1871, broke out he sided with the Commune, and later was sentenced to death, but upon the appeal of leading scientific men his sentence was eommuted to banishment. For several years thereafter he resided in Italy, the U. S., and elsewhere. Having returned to Paris, however, he again became involved in communistie plots and fled to Switzerland. Though absent, he was senteneed in 1894 to transportation for twenty years.

Revised by C. C. Adams.

Reclus, Paul, M. D.: surgeon; b. at Orthez, Basses-Pyrénées, France, Mar. 17, 1847; studied medicine in Paris, graduating M. D. in 1876; in 1878 passed the *concours* for the hospitals; in 1880 was appointed associate and subsequently full professor of surgery. Among his writings are *Clinique et critique chirurgicales* (Paris, 1884); *Cliniques chirurgicales de l'Hôtel-Dieu* (Paris, 1887). S. T. A.

Recluse [from O. Fr. *reclus* < Lat. *reclu'sus*, shut up (in Mediæv. Lat., a recluse)]: in strict language, a monk or nun who from choice retired from communication even with members of the same order. The secluded person sometimes adopted this life by way of penance, sometimes as a means of spiritual progress. No one could be thus secluded without permission. The door was sealed in the presence of a superior officer, and could be unlocked only by the command of a bishop. The name "recluse" was given to the inmates of Port-Royal, the famous Jansenist retreat in Paris.

Recognition: the feeling of familiarity with which an image or object affects us. We say feeling, since the recognition, in itself, accompanies the act of knowledge in which the object or image is again presented; that is, reproduction is assumed in recognition. This feeling of familiarity is vague and often misplaced, and ordinarily goes unanalyzed. The means by which recognition arises vary as the recognition is of an object or of an image. In the case of the second perception of an object its recognition is probably accomplished by means of an image which is already recognized. We have a comparison between the percept and the image, and feel them the same or similar. This is seen to be the case in frequent instances in everyday life. If we are asked whether an object is the same as one seen before, we often say we do not know, for we do not remember how the former object looked; which means that we are unable to call up and recognize any image with which the object present may be compared. In the case of the recognition of an image such a procedure is impossible. It would presuppose another image still, and so on indefinitely. The question, therefore, is narrowed down to the means by which we recognize a reproduced image.

The recognition of an image depends upon the degree in which its apperceptive relations are re-established. The reproduction of an image consists in the reinstatement of the conditions, physical or mental, of the original perception. Such a reinstatement of the conditions suffices to bring an image back into consciousness; but it is not then necessarily recognized. It is only when some of the mental connections—the relations established among the perceptual elements by appereeptive attention—are again more or less consciously presented that the sense of familiarity is felt. It is necessary that there be some accompanying conscious elements to which the recognized elements are related. Often when an image arises in consciousness we do not recognize it till we bring back some association with it. Often, also, we see a face and in so far recognize it as to feel vaguely familiar with it, while we strive to bring up more of its apperceptive connections in order fully to identify it. This first vague recognition is probably due to the felt beginnings of the revival of the spatial proportions of the face. This is further proved by the fact that percepts which are not related in the first presentation—for example, single isolated sensations, as the stroke of a bell—are not generally recognized. We say of such presentations that there is nothing distinguishing or characteristic about them whereby they should be recognized; but this is only to say that there were no specific points of connection between this image and others, or between the parts which are separately apperceived. As soon as some sign is made of a peculiar kind in connection with the image it is recognized. Experiments by Lehmann on the recognition of differences of color strikingly confirm this view. Different shades of gray, which could not be recognized when seen alone, were recognized when they were given names beforehand, or when a number was attached to each in the first perception. Of nine shades without names or numbers only 46 per cent. gave true recognitions; while the same shades, with numbers, gave 75 per cent. of correct identifications. Here the introduction of a simple *local relation* in the perception gave the necessary clew. Further support is derived from the phenomenon of so-called psychic blindness, deafness, etc.—i. e. recognition is absent in animals deprived of the higher co-ordinating brain-centers.

This view of the case also enables us to take account of the subjective element of recognition, which is often overlooked. There is more in recognition than the sense of familiarity with an image. There is the feeling of ourselves as in familiar circumstances. This feeling of self develops largely in connection with active attention. Attention, however, is the organ of the process of apperception. Consequently, when by reinstatement of this process the fact of recognition is experienced, it carries with it essentially the feeling of an emphasized self: the self of the first apperception is again evident in the self of the reapperception, and the sense of sameness of the apperceptive content really arises with the sense of the sameness of the individual who has it. Recognition of the image, therefore, and sense of personal identity, both rest ultimately in differences in the amount, ease, facility, and good adjustment of the attention.

J. Mark Baldwin.

Recognizance [from O. Fr. *recognoissance* (> Fr. *reconnaissance*), recognition, deriv. of *recognoistre* (> Fr. *reconnaître*), recognize < Lat. *recognoscere*, know again, recognize]: in law, an obligation of record which a man enters into before some court of record, or magistrate duly authorized, with condition to do some particular act, as to appear and answer in criminal proceedings, to prosecute a case or an appeal, to keep the peace, etc. (2 Bl. *Com.*, 341.) The recognizance is an acknowledgment (recognizing) of the existence of a debt or obligation appearing upon the record of the court, and need not be, like a bond, sealed and signed by the party. It is proceeded upon by a writ of *scire facias* or a summons, without the necessity of an action as in the case of a common bond. At common law it is a preferred debt, but in many States of the U. S. the preference has been abolished or modified. See Blackstone's *Commentaries*, and the *American and English Encyclopædia of Law* (under *Recognizance*). F. Sturges Allen.

Rec'ollet Friars and Nuns: a name usually applied to one of the congregations of Franciscans of the strict observance, but sometimes designating reformed bodies of other orders. A congregation of Augustinian Recollets dates from 1530. The Franciscans who bear this name are especially those of the French congregation, founded in 1592 by the Duke of Nevers, Louis de Gonzaga (1539–95).

Reconnaissance [= Fr., liter., recognition, examination, deriv. of *reconnaître*, earlier *reconnoître*, recognize, examine, whence Eng. *reconnoiter*]: a preliminary or rough survey of a portion of country. A civil reconnaissance may be undertaken for the purpose of selecting suitable points for trigonometrical stations preparatory to a geodetic survey; for ascertaining the relative advantages and disadvantages of two or more routes preparatory to locating a line of railway, canal, or aqueduct; or for the purpose of acquiring a general idea of the features of an unexplored country. A military reconnaissance may be undertaken to ascertain the military resources of a tract of country; for determining

the best line of march for an army; or for obtaining information in regard to the military character of a defile, of a crossing, or of a position of defense. The information obtained by a reconnaissance is usually embodied in a map and an accompanying memoir. The map is intended to show the general topographical features of the country examined, and the memoir is designed to supply such information as can not be presented by the map. Both the map and the memoir vary in character according to the object to be attained. In reconnoitering for the purpose of opening or extending a geodetic survey, the most important object is to make a judicious selection of points to be used as points of reference, called triangulation points. These points are to be chosen so that the triangles formed by joining them shall have no very acute angles; and for the primary triangulation the triangles should be as large as possible, their sides gradually increasing in length from the base up to the longest admissible line. In reconnoitering for the location of a railroad the objects to be attained are to find the most direct route between the points to be connected, with the most uniform grades and the least curvature. Attention should also be paid to the facilities for construction and the convenience of operating the road. In locating a line of communication between two points due regard should be paid not only to the accommodation of the inhabitants at the extremities of the line, but also to the convenience of the greatest number of people along the general direction of the route. In reconnoitering for the purpose of determining the prominent features of a country but little known two sets of operations are generally carried on by the same party; a system of astronomical observations for fixing the latitudes and longitudes of the principal points of the country, and a running survey, intended to fill in the geographical outlines. To this class belong the numerous surveys that were made prior to 1870 in the Territories of the U. S. west of the Mississippi river. In reconnoitering for military purposes the general object to be aimed at is to acquire a knowledge of the principal lines of communication, the obstacles which they present to military movements, the character of the roads to be traversed and of the streams to be crossed, the nature of the marshes, swamps, defiles, and mountain-passes, the general resources of the country; in fact, to gather all the information that may be of use to the commanding general. Angles are usually measured with a pocket-sextant or a pocket-compass, distances are determined by estimation or by the time required to traverse them, distant points are laid down by intersection of lines whose directions are determined by the compass, and slopes are judged of by the difficulty of ascending them. In the more extended reconnaissances previously alluded to distances are frequently determined or checked by an odometer, an instrument attached to a wagon-wheel, and so constructed as to record the number of times the wheel revolves in passing over a certain line. The information obtained is recorded in the field, and the principal features of the map are plotted down or sketched as the survey progresses. Photographs taken from elevated points are generally found useful in all kinds of reconnaissance work. See COAST AND GEODETIC SURVEY, SURVEYING, and TOPOGRAPHY. Revised by MANSFIELD MERRIMAN.

Reconstruction: See UNITED STATES (*History*).

Recording Apparatus, Psychological: See Appendix.

Recording of Conveyances: the general practice of keeping a public record of deeds, mortgages, and other documents affecting the title to real estate. This and the legal sanction which supports it are modern and for the most part American additions to the common law of land. It is true that there were a few early attempts to engraft the principle of registration of titles upon the law of real property (as in the Statute of Enrollments, 27 Hen. VIII., cap. 16, A. D. 1535, and the various rules relating to the transfer of copyhold lands), but these attempts were either successfully evaded or of very limited application. The persistent and finally successful struggle of the landowners to secure the right of secret conveyancing, free from the notoriety which attended the common-law modes of alienation as well as from the publicity of registration, forms a long and important chapter in the history of English law. Notwithstanding the numerous practical advantages of a system of recording titles—in facilitating and cheapening the transfer of real property, and preventing vexatious litigations respecting titles—the conservative temper of the English people has thus far successfully resisted every attempt to introduce the practice, and it exists there only in a few counties or parts of counties. Accordingly, the familiar rule, that the purchaser of property buys at his peril (*caveat emptor*), applies to the purchaser of real as well as of personal property. The buyer of land, equally with the vendee of chattels, may, notwithstanding the utmost diligence on his part, find that he has expended his money for a defective title. He buys in reliance upon the *indicia* of ownership and the good faith of the vendor.

In the U. S., on the other hand, although the same rule obtains in the case of chattels (see SALES), the purchaser of real property is protected against latent defects in the title by the recording acts of the several States. These acts (which have also been adopted in Canada) vary somewhat in matters of detail, but their general purport and effect are the same. They all provide that no conveyance or other act affecting the title to lands shall be valid as against a subsequent purchaser in good faith and for a valuable consideration, unless it was made a matter of public record prior to such subsequent conveyance, or at least prior to the recording of such subsequent conveyance. Accordingly, a "search," or examination of the public records, is the invariable preliminary to a conveyance of lands, which is as invariably followed by the prompt recording of the instrument of conveyance. Previous conveyances of the property or incumbrances upon it which are unknown to the purchaser, which are not obvious upon an inspection of the premises, and which do not appear in the records, may be ignored by the intending purchaser. He takes his title free from any defects or claims of which he did not have notice, and if "actual notice" is wanting its place must be supplied by the "constructive notice" afforded by a due and proper record of the previous conveyance or incumbrance. By the system of legislation adopted by all the States an officer is appointed in every county whose duty it is to record all conveyances brought to him in books which are open to the public inspection, and which are provided with alphabetical indexes of the grantors and grantees, mortgagors and mortgagees, etc., so as to facilitate the examination thereof by persons interested. All deeds of conveyance, leases for more than a specified term, mortgages of land, assignments of mortgages, and other muniments of title may be recorded at the instance of the parties holding the same. In order that an instrument may be thus recorded, it is generally made a requisite that the same should have been duly acknowledged by the party executing it before some designated officer, and that this certificate of such acknowledgment should have been attached thereto.

It will be understood from what has been said above that a record is by no means an essential part of a conveyance of land. As between the vendor and vendee of the property, as well as affecting their heirs and devisees, the transaction is complete upon the delivery of the deed. The title passes, as at common law, by the conveyance. It is only innocent purchasers for value, who have been misled in consequence of the secret character of the conveyance, who can impeach the transaction.

From a similar policy to that which has dictated the legislation above described, most of the States have also adopted provisions requiring the filing and recording of chattel mortgages in all cases where the property mortgaged remains in the possession of the mortgagor, and in a few States all sales of goods, if not accompanied by delivery, must also be recorded.

The literature of the subject is extensive. The reader should consult especially Bentham on *Land Transfer Reform*; Brickdale, *Registration of Title to Land*; Jones, *On the Torrens System of Transfer of Land*; Olmsted, *Land Transfer Reform*; Report of New York Commissioners on *Land Transfer* (1886); and the statutes of the several States. GEORGE W. KIRCHWEY.

THE GERMAN SYSTEM of recording transfers and mortgages of realty, and the protection given by the law to those who purchase or lend on the faith of the record, are historically derived, to a large extent, from mediæval customs. At the close of the Middle Ages, however, Roman rules began to prevail (for the chief points of difference, see PROPERTY and MORTGAGE), and the re-establishment and development of the German principles have been effected by modern legislation. Prussia took the first step in 1783; the majority of the other states followed her example during the first half of the nineteenth century; and in connection with the civil code proposed for adoption in the German empire a project has been elaborated for a common system of record-

ing titles. This project is modeled on the Prussian law of May 5, 1872, which will therefore be taken as the basis of the following sketch of the modern German system.

The record (*Grundbuch*) is so arranged that all entries affecting a special parcel of land are made in one "folio." A special folio is regularly assigned, in the cities, to each lot, and in the rural districts to each farm or estate (*Gut*). In the latter case the several fields belonging to the estate are enumerated. The tax-number of each lot or field is given, with its area and its assessed rental value. (The tax-rolls and maps give the metes and bounds of the property as determined by governmental survey.) After the property has thus been described, the remainder of the folio is divided into three parts. In the first are noted all changes of ownership; in the second, all permanent charges upon the land, except taxes; all limitations of the owner's right (see SERVITUDES), and all restrictions upon the owner's power of alienation. In the third part are entered all mortgages, with the amount, the rate of interest, the date of their establishment, and the date at which payment is due. In parallel columns are entered assignments and payments, whether partial or in full.

The record is kept by the court of first instance in each judicial district. Entries are made only by order of the court, and on certain legally specified grounds, of which the most important are contract and judgment. In case of conveyance, the law requires a formal declaration from the recorded owner that he transfers the property to the conveyee and a demand from the conveyee that he be recorded as owner. The declaration and demand may be made in person or by attorney or in writing; but if by attorney or in writing the documents presented to the recording officers must be certified. Similar rules govern other entries based on the contract of the parties. If an entry is demanded on the ground of judgment, the judgment must be authenticated.

The recording officers determine the presence or absence of the grounds on which entries may legally be made, but they do not decide controversies. He who impugns the correctness of an entry already made, or protests against an entry which the recording officers are legally bound to make, must bring action in the proper court; but pending the judicial determination of the controversy, he may save his rights by securing the insertion of a "note" (*Vormerkung*). The same course is open to the person who demands an entry which the recording officers can not legally make until his claim is affirmed by a judgment. The "note" has about the same effect as notice of LIS PENDENS (*q. v.*) in the U. S. Where this safeguard seems insufficient, the court before which the controversy is pending may prohibit alienation, and such prohibition is then placed upon the record.

Effect of the Record.—The record enjoys *publica fides*. It is presumed to be accurate and complete. He who purchases from the recorded owner is therefore owner, unless it can be shown that he knew the record to be erroneous. In like manner, he who has taken a mortgage from the recorded owner, or an assignment of mortgage from the recorded mortgagee, has the rights of a mortgagee, unless it can be shown that he knew the record to be erroneous. Against the assignee of a recorded mortgage no defenses are admissible except those which are indicated on the record and those of which he can be proved to have had knowledge.

Mistakes in the record, it is claimed, are rendered extremely improbable by the rules governing entries. When they can be shown to exist, the record may of course be corrected, but no such correction will be permitted to prejudice the vested rights of third parties. The person who has suffered damage from a mistake in the record has therefore the following additional remedies: (1) An action, based on unjust enrichment (see QUASI-CONTRACT), against the person primarily benefited; (2) a subsidiary claim against the recording officers, when they are chargeable with willful wrong or negligence; and (3) if the recording officers are liable but insolvent, a claim against the State.

Modifications of the Law of Mortgage.—The German system of recording has led to important changes in the whole law of real property, some of which have already been indicated. Special innovations in the law of mortgage are as follows:

(1) *Specialty.*—No lien can be imposed upon the entire estate of a debtor, nor even on all his realty. Judgment liens, for example, can be made effective only by having special mortgages recorded against special pieces of property.

(2) *Owner's Mortgage.*—When the owner of property pays off a mortgage he may elect to have the mortgage assigned to himself. In such case no MERGER (*q. v.*) takes place; the mortgage, whether it remains in the name of the owner or is assigned by him to a third person, retains its validity and its priority.

(3) *Land-debt.*—A lien on the land which operates like a mortgage may be created without any accompanying personal obligation upon the part of the mortgagor. Such a lien the Germans call a "land-debt" (*Grundschuld*). No such defenses as are derived, in the case of the ordinary mortgage (*Hypothek*), from the invalidity of the personal claim can be pleaded against the land-debt, for it is not a collateral but an independent claim. On the other hand, the land-debt is not enforceable against the person who created it except while he holds the land.

(4) *Owner's Land-debt.*—The land-debt may be established in favor of the owner himself. This rule enables the owner of realty to give a second mortgage and at the same time to reserve a first.

(5) *A letter of mortgage* (*Hypothekenbrief*) is an authenticated extract from the record, issued by the recording officers, attesting a particular mortgage, and showing all the facts that are of importance to the holder. In the case of the ordinary mortgage such an extract may be issued with the consent of the mortgagor, and its issue is noted on the record. In the case of the land-debt such an extract is always issued (*Grundschuldbrief*). The purpose of the extract is to facilitate assignment by avoiding the necessity of entering each successive assignment upon the record. Any person who presents the extract and shows that it has come into his hands in the manner provided by law (certified transfer) is entitled to receive interest, and, in case of default, to foreclose. The original creditor, of course, can exercise none of these rights unless he is still in possession of the extract. The extract is thus practically a secondary record, separated from the parent record but enjoying the same *publica fides*. The lien on the land is put into circulation after the fashion of a negotiable instrument. In the case of the land-debt, where most of the defenses available against the ordinary mortgage are excluded, the analogy to commercial paper is particularly obvious, and the German jurists describe the "letter of land-debt" as "a bill of exchange on the land."

It is claimed, and with apparent justice, that the German system makes the ascertainment of title simpler and the security of title greater than any other system yet devised; and that it therefore gives a safer basis to credit than any other system.

See Gide, *Le Régime Hypothécaire en Prusse* (1873); and Achilles, *Grundeigenthum und Hypothekenrecht* (1881).

MUNROE SMITH.

Recoupment [from Fr. *recouper*, cut again, cut off]: a species of defense in actions brought to recover damages for the non-performance of a contract, whereby the defendant alleges that he has himself sustained damages by the plaintiff's breach of the same contract, or by the plaintiff's fraud in procuring him to enter into it, which he seeks to cut off or "recoup" from the amount that would otherwise be recovered against him. The doctrine of recoupment has become established by judicial decision both in England and in the several States of the U. S., although there are some slight differences in the extent to which it has been carried by the various courts. Like the defense of set-off, it is confined to actions upon contract, and must itself arise from contract, but here all resemblance ends. A set-off must be for a debt, a certain fixed sum; recoupment is of damages often entirely unliquidated; a set-off is necessarily a demand arising upon a different contract from the one in suit; recoupment is necessarily of damages arising from a breach of the very same contract sued upon; in set-off the defendant may sometimes recover a balance from the plaintiff; in recoupment this can never be done. Recoupment (as is indicated by the etymology) can strictly be used only as a defense, and can do no more at most than defeat the plaintiff's recovery; even if the defendant's damages should exceed those of the plaintiff, he can have no judgment for such excess. In this last-mentioned particular the doctrine of recoupment has been greatly enlarged by the reformed system of procedure prevailing in the U. S. in many of the States, which permits the defendant by means of a counterclaim to recover an affirmative judgment for damages against the plaintiff when the grounds for such recovery have been established by the proofs. See Sedgwick on the *Measure of Damages*. Revised by F. STURGES ALLEN.

Recovery, Common: a species of common assurance or method of conveying lands, also called *feigned recovery*, formerly used in England as a means of evading the statute *De Donis* (see ENTAIL) and conveying an entailed estate free of the entail, or for enlarging the estate of the tenant in tail to a fee simple, by a secret confidence that the person recovering the estate would reconvey to the party in fee simple. The assurance consisted in a fictitious real action founded on the supposition of an adverse claim, which by the collusion of the owner in tail was carried regularly to a judgment against the owner in tail for the recovery of the land by the demandant or plaintiff. The common recovery was invented by the clergy to evade the statute of MORTMAIN (*q. v.*). Common recoveries were abolished in England in 1833 (3 and 4 Will. IV., c. 84), and a statutory mode of barring entails provided. In the U. S. common recoveries were formerly in use in some States; but they have generally become obsolete where they have not been expressly abolished. See Reeves's *History of the English Law*, and the *Commentaries* of Blackstone, Stephen, and Kent.

F. STURGES ALLEN.

Rector: See PARSON.

Rectum, Diseases of [*rectum* is Mod. Lat., liter., the straight intestine (sc. *intesti'num*, intestine), neut. of *rec'tus*, straight]: diseases of the third and last portion of the great intestine, which receives the fæcal matters from the colon, and opens outward by the anus. The rectum in new-born children is in only few cases abnormal. Congenital defects are preternatural narrowness of the anus, imperforate anus, and absence of the anus, with partial or complete non-development of the rectum. In childhood rectal diseases are exceptional; atony and relaxation of its muscular coat may result in obstinate constipation and overloading of the rectum with fæces. Reversely, in strumous and delicate children continued diarrhœa may result in prolapse of the rectum or protrusion, usually of the mucous membrane only, less frequently of the muscular coat. Adults are subject to numerous rectal diseases. Dysentery is not infrequently limited to the rectum. (See DYSENTERY.) Chronic ulcer is a frequent sequel of the destruction of tissues in dysentery; ulcers may also arise from tubercular or syphilitic deposit. Irritable ulcer of the lower end of the rectum, especially just within the sphincter muscle of the anus, is termed a fissure. It causes intense pain when stretched by the passage of fæces, and the dread of suffering causes voluntary inaction of the bowels and habitual constipation. Fissure often can be completely and satisfactorily detected only by use of the rectal speculum, the patient being anæsthetized. Stricture of the rectum is often the result of former dysenteric inflammation, ulceration, sloughing, and the subsequent formation of dense scars of fibrous tissue. It results in obstruction, difficult and small stools, constipation, straining and bearing-down pain in the bowels, loins, and lower region of the back, with general depression of health. Stricture is often the result of cancer of the rectum, when, in addition to the symptoms and signs of stricture, the patient has also the cachectic facial appearance and progressive emaciation of the body indicative of cancer, and intense lancinating pains in the rectum, due to the malignant local growth. Hæmorrhoids or piles (see PILES) are the frequent result of congestions and inflammation of the abundant venous circulation of the rectum and anus. Polypus of the rectum is an attached tumor, originating in a relaxed fold of mucous membrane, or in a hæmorrhoidal mass, or redundant growth following the healing of ulcers; it may grow to such size as to obstruct the bowel, or by the dragging efforts of defecation be protruded from the body. Fistula in ano is the result of abscess adjacent to the lower bowel or verge of the anus, the purulent contents being discharged into the rectum, and leaving an unhealed passage or sinus. There may be an additional sinus opening on the surface without the anus; fistula may also be "blind," or terminating in a *cul-de-sac* adjacent to the bowel, but opening only externally. The origin of fistula is usually piles, constipation, or other disease of the lower rectum. Intense neuralgia of the rectum, though a frequent forerunner of malignant disease, is often present in persons reduced in health or of highly nervous temperament. Pruritus of the anus (obstinate itching) is often associated with constipation, piles, the climacteric period, and old age. Eczema often affects the anus.

Preternatural narrowing of the rectum demands stretching by the fingers, aided by anæsthesia, and the use of rectal sounds. The imperforate anus is to be punctured or incised, and kept open by bougies while healing. Prolapse usually yields to improved diet, tonics, and internal and local use of astringents. Excision of a chronic prolapsed rectum is sometimes demanded. Ulcers may be treated by astringent tonics, but more effectively by local use of suppositories or direct caustic applications through a speculum of considerable size. Fissure may be cured by keeping the bowels habitually open and by local use of anodynes, astringents, and mild caustics. A more certain cure is by rupture of the sphincter ani under anæsthetics, allowing the fissure or ulcer a period of rest. Stricture when not malignant may be relieved by cautious incision and subsequent use of large rectal bougies. The operation endangers peritonitis and portal phlebitis (inflammation of the portal vein), with abscess of the liver. Cancer of the rectum is incurable save by extensive operation, and then only if recognized early and treated in the most radical manner. Much palliation and relief are afforded by operations which are not expected to cure. An artificial anus is often made in the groin, by which, annoying as it is, patients secure much comfort. The intense pain is modified by keeping the bowels open and by local and internal use of anodynes, opium and atropine being most efficacious. For the treatment of fistula in ano and hæmorrhoids, see FISTULA and PILES. Neuralgia, pruritus, and eczema demand local use of anodyne and emollient suppositories and ointments, while the constitution is improved by corrected diet and tonics. It has been recognized that much reflex disturbance in distant parts of the body is caused by irritations arising primarily in the rectum, and the so-called *orificial surgery* is an expression of the fact that the profession is now alive to this possibility.

Revised by R. PARK.

Recurring Decimal: See CIRCULATING DECIMAL.

Recurring Series: a series in which each term is equal to the algebraic sum of the products obtained by multiplying one or more of the preceding terms by certain fixed quantities. These quantities, taken in order, constitute what is called the "scale of the series." The order of a recurring series is determined by the number of terms in its scale. A geometrical progression is a recurring series of the first order. As an illustration of a recurring series of the second order, let us take the equation—

$$\frac{1-x}{1+x+x^2} = 1-2x+x^2+x^3-2x^4+x^5+x^6-2x^7+, \text{ etc.}$$

The second member is a recurring series of the second order, whose scale is $(-x, -x^2)$. Every term after the second may be found by multiplying the preceding term by $-x$, the second preceding one by $-x^2$, and then taking the algebraic sum of the results. Recurring series may be of any order whatever.

Red Bank: town; Monmouth co., N. J.; on the Shrewsbury river, at the head of navigation, and on the Cent. of N. J. and the Penn. railways; 7 miles N. W. of Long Branch, 26 miles S. of New York (for location, see map of New Jersey, ref. 4–E). It has regular steamboat communication with New York, 3 national banks with combined capital of $225,000, a public high school, public library (founded 1884), 2 weekly newspapers, several canning-establishments, and carriage and gold-leaf manufactories. A large trade in oysters and fish is carried on. Pop. (1880) 2,684; (1890) 4,145; (1900) 5,428.

Redbird: See CARDINAL-GROSBEAK.

Red Bluff: city; capital of Tehama co., Cal.; at the head of navigation on the Sacramento river, on the Southern Pac. Railroad; 135 miles N. by W. of Sacramento (for location, see map of California, ref. 4–C). It is in an agricultural, stock-raising, and fruit-growing region; has large lumber and wool interests, and considerable river traffic; and contains a State bank with capital of $300,000, a private bank, and 3 daily and 3 weekly newspapers. Pop. (1880) 2,106; (1890) 2,608; (1900) 2,750.

Redbud: See CERCIS CANADENSIS and JUDAS-TREE.

Red Cedar River: See CEDAR RIVER.

Red Cloud: city; capital of Webster co., Neb.; on the Republican river, and the Chi., Burl. and Quincy Railroad; 28 miles E. of Bloomington, 41 miles S. of Hastings (for location, see map of Nebraska, ref. 11–F). It is in an agricultural and stock-raising region, and contains flour and saw mills, machine-shops, 2 State banks with combined capital of $30,000, and 4 weekly newspapers. Pop. (1880) 677; (1890) 1,839; (1900) 1,554.

Red Cross: the name applied to the international treaty arranged by the Geneva convention of 1864, as well as to the various societies organized to carry out its aims. These center in the cause of humane and merciful treatment of wounded, sick, and dying soldiers in time of war. The Red Cross is the distinctive flag designated in the treaty, by which all hospitals (field or permanent), ambulances, persons, materials, and appliances employed in the relief service are known as such; and whenever the flag is displayed accompanied by the national flag to which the hospital, etc., belongs, it is treated, respected, and protected as neutral. Under the treaty soldiers disabled by wounds or sickness who have fallen into the hands of the enemy may be sent through the lines; if healed in the hands of the enemy and incapable of bearing arms, they must be delivered to the outposts to be sent to their homes, upon request; if capable of further military service, they may be sent to their homes on condition of not again bearing arms during the war. Thus the spirit of the Red Cross treaty makes of a wounded or sick soldier a neutral, a non-combatant. The Red Cross movement is civil in its origin, and the various national committees, societies, or associations organized to carry into effect the objects of the treaty are purely civil. They place themselves in communication with their respective governments, and in time of military activity they co-operate with, and become auxiliaries and aids to, the medical and surgical departments of the armies. In time of peace they variously employ themselves in preparing for emergencies.

At the battle of Solferino, Italy, June 24, 1859, the terrible and needless suffering and loss of life caused by days of neglect to care for the wounded and dying were witnessed by a philanthropic Swiss gentleman, Henri Dunant, of Geneva. He personally aided the insufficient medical forces of the armies, and realizing that such conditions ought not to exist, and need not, if the humanitarian impulse and efforts of the people could prevail, he conceived the idea of pledging the nations of the earth to regard and protect as neutral all sick and wounded combatants, and all persons and means engaged in giving them succor. He elaborated these ideas and feelingly described the scenes on the battlefield in a book which he wrote, *Un Souvenir de Solferino*. The cause was warmly espoused by La Société Genevoise d'Utilité Publique, of which Dunant was a member, and through the co-operation of the Swiss Federal Council an international conference was assembled at Geneva in Oct., 1863. This meeting was attended by delegates from sixteen governments, and continued in session four days. It was followed by a convention, to which all nations were invited to send representatives, and which convened in Geneva, Aug. 8, 1864. Twenty-five delegates representing sixteen governments attended. The session continued until Aug. 22, and culminated in the agreement to nine "articles of the convention for the amelioration of the condition of wounded in armies in the field." These articles were signed by twelve governments before the convention adjourned, and the treaty was left open for the accession of others. The signatory powers have reached forty in number.

The treaty designates "a red cross on a white ground" as the distinctive and uniform flag and arm-badge that shall be adopted for all hospitals, ambulances, and personnel: and provides that it must on all occasions be accompanied by the national flag; also that the delivery thereof (in time of action) shall be left to the military authority. The red cross on a white ground was adopted as a well-merited compliment to the Swiss confederation, whose national flag is the reverse—a white cross on a red ground.

The Geneva conference stipulated that each treaty nation shall have one national committee or society, civil in character and functions, which shall be the medium of communication with its government, and shall alone possess the right to use the red cross, and to authorize its use at its discretion. The national committees are usually composed of the most distinguished philanthropic persons in public and private life, with the chief magistrate or ruler frequently at the head.

To prevent desecration of the insignia by unauthorized use, severe governmental prohibitive measures have very generally been adopted.

A committee at Geneva, Switzerland, of which Gustave Moynier is president, is recognized as the international committee, through which all international communication is had. An international bulletin is published by that committee, and many other national committees publish journals or other literature of their work, which are interchanged. Many of the societies have been permanently endowed with large sums of money. Others receive the direct patronage of their royal heads or members.

Similar articles pertaining to naval warfare were formulated at Paris in 1868, but have not been generally adopted and ratified.

Upon the formation of the American National Red Cross, its president, Miss Clara Barton, perceiving a far wider usefulness for its work by applying it to the relief of great national calamities other than war, such as famine, pestilences, fires, or cyclones, incorporated such a feature into the charter of the association which she formed. The innovation received unanimous sanction by the international and other national committees, and the broader scope thus inaugurated was denominated the "American Amendment." Money, food, clothing, buildings, agricultural implements, seed, and other means aggregating over $1,000,000 in value have been distributed on thirteen fields of relief by the American National Red Cross under the "American Amendment"; notably at Johnstown, Pa., after the flood, in Russia during the famine, and on the South Carolina Sea islands devastated by cyclone and tidal wave. No money estimate can be made of the practical benefits educationally, as particularly exemplified in teaching the colored sufferers on the Carolina islands the advantages of frugality, of concentrated action in reclamation of their ruined lands, and of self-reliance generally. CLARA BARTON.

Redding: city; capital of Shasta co., Cal.; on the Southern Pac. Railroad; 170 miles N. by W. of Sacramento (for location, see map of California, ref. 3–C). It is in an agricultural, lumbering, and mining region, and contains 2 State banks with combined capital of $175,500, and 2 weekly newspapers. Pop. (1880) 600; (1890) 1,821; (1900) 2,946.

Reddle, Raddle, or **Red Chalk**: an argillaceous oxide of iron exported from Germany and England. It is used for carpenter's chalk, for marking sheep, for drawing on paper, and in the case of fine grades for polishing spectacle-lenses.

Redemptionists, called also **Mathurins, Fathers of Mercy**, and **Trinitarians** (*Ordo Sanctissimæ Trinitatis*): a brotherhood of the Roman Catholic Church founded by John de Matha and Felix of Valois at Cerfroi in France for the deliverance of Christian captives in Barbary. It was approved by Innocent III. in 1199.

Redemptorist Fathers, or **Liguorians** (*Congregatio Sanctissimi Redemptoris*): a congregation of missionary priests founded in 1732 by Alfonso de' Liguori at Scala in Italy. They are most numerous in Italy, Austria-Hungary, and the U. S. They devote themselves chiefly to the holding of "missions" for the increase of religious activity among the people. The original rules of the congregation were unusually severe, allowing only sacks of straw for beds, hard bread and soup at table, and imposing long seasons of worship every night, self-flagellations three times a week, and missionary activity among the very poorest classes. In addition to the usual vows of poverty, chastity, and obedience, a fourth vow was enjoined, by which the member was obliged to refuse all honors and benefices outside of the order, except upon the express command of the pope. In course of time, however, the rules have much relaxed. The congregation has twenty houses in the province of Baltimore, and seven in that of St. Louis.

Revised by J. J. KEANE.

Redfield: city; capital of Spink co., S. D.; on the James and Turtle rivers, and the Chi. and N. W. and the Chi., Mil. and St. P. railways; 41 miles S. of Aberdeen, 87 miles N. by W. of Mitchell (for location, see map of South Dakota, ref. 6–F). It is in a wheat and stock-raising region, and contains Redfield College (Congregational, chartered in 1887), a national bank with capital of $50,000, and a monthly and two weekly periodicals. Pop. (1890) 796; (1900) 1,015.

Redfield, WILLIAM C., A. M.: meteorologist; b. at South Farms, near Middletown, Conn., Mar. 26, 1789; was in early life a mechanic; conceived the fundamental idea of his famous "law of storms" as early as 1821; soon afterward established a line of steam towboats on the Hudson; issued many essays and pamphlets in favor of steamboat navigation; was subsequently an active promoter of railways, especially such as would connect the Hudson with the Mississippi; published at different times forty essays upon meteorology; promulgated his *Theory of Storms* in 1831, and his views upon hurricanes in 1833; devoted much attention to

fossil fishes from 1836 onward; was the first president of the American Association for the Advancement of Science 1843. D. in New York, Feb. 12, 1857. See his *Biography*, by Denison Olmsted (1857).

Redgrave, Richard, R. A.: painter; b. in London, England, Apr. 30, 1804; studied at the Royal Academy; became celebrated for his genre-pictures, and subsequently for his landscapes; was head master of the Government school of design; was one of the most efficient promoters of the South Kensington Art Museum, inspector-general of art schools, and surveyor of crown pictures. Author of *An Elementary Manual of Colors* (1863) and (with his brother Samuel) of *A Century of Painters of the English School* (1866). He was one of the art jurors in the Universal Exposition of 1851; was commissioned to superintend the department of English art in the French Universal Exposition of 1855, and selected the English pictures which figured in the British Universal Exposition of 1862. D. Dec. 14, 1888. Among his later pictures are *Sermons in Stones*, *Startled Foresters*, *Tranquil Waters*, *Calling the Sheep to Fold*, and *A Well-spring in the Forest*.

Redia: a trematode embryo produced asexually within a sporocyst. The redia is of worm-like form, and has a mouth, digestive tract, and an aperture for the extrusion of germs formed within it, which may develop into other rediæ or into cercariæ. See Flukeworms and Trematoda.

Redif Pasha: Turkish general; b. 1827. In 1871 he was intrusted with the command of the army sent to Yemen, and afterward employed in the ministry of War at Constantinople. He was actively engaged in the events which brought Murad V. to the throne of the caliphate, and in the Russio-Turkish war of 1877. With the fall of his superior, Abd-ul-Kerīm Pasha, he was banished, first to Lemnos, and then to Rhodes. R. G.

Reding, Aloys, von: patriot; b. in the canton of Schwyz, Switzerland, in 1755; entered the Spanish military service, but returned to Switzerland in 1788 and became captain-general of his native canton. He was a zealous supporter of Swiss independence and the old Federal constitution against the Helvetic republic established through French influence; he repulsed the French republicans at Morgarten Pass in May, 1798, thereby securing an honorable capitulation for his canton. His opposition to the Helvetic government continued, and after the departure of the French he called a meeting of the Federalists at Schwyz, but French interference prevented the re-establishment of the confederation. Reding became chief magistrate of Schwyz in 1803 and again in 1809. D. Feb. 5, 1818.

Red Jacket: village; Houghton co., Mich.; on the Mineral Range Railroad; 12 miles N. of Houghton, the county-seat (for location, see map of Michigan, ref. 1–E). It is in the great Lake Superior mining region, adjoins the celebrated Calumet and Hecla copper mines, and has a weekly newspaper. Pop. (1880) 2,140; (1890) 3,073; (1900) 4,668.

Red Jacket, or **Sagoyewatha**: a chief of the Seneca Indians; b. at Old Castle, near the foot of Seneca Lake, N. Y., in 1751; did not originally rank as a sachem, but obtained that dignity through his activity on the British side in the war of the Revolution, being noted as a swift runner, and especially as an eloquent orator; derived his English name from a richly embroidered scarlet jacket given him by a British officer; opposed the treaty of Fort Stanwix 1784; on the conclusion of the treaty of peace between the U. S. and the Six Nations in 1792, visited President Washington, from whom he received a silver medal; gave in 1810 to an agent of the U. S. Government valuable information upon the hostile plans of the Ohio Indians under Tecumseh; visited Washington on the same subject 1810; was a useful ally of the U. S. during the war on the Niagara frontier 1812–14. His last years were spent on the Seneca reservation near Buffalo, but he lost much of his influence on account of intemperance, and was once degraded from the chieftainship, but soon restored. He was an inveterate opponent of Christianity, of schools, and of missionaries. D. at Seneca Reservation, Jan. 30, 1830. His *Life* was written by William L. Stone (Albany, 1867).

Redlands: town; San Bernardino co., Cal.; on the Southern Cal. and the Southern Pac. railways; 8 miles E. by S. of San Bernardino, the county-seat (for location, see map of California, ref. 12–G). It is in an agricultural, fruit-growing, and mining region, is the center of the orange belt of the State, and contains a national bank with capital of $100,000, 2 State banks with combined capital of $55,000, and a daily and 2 weekly newspapers. Pop. (1890) 1,904; (1900) 4,797. Editors of "Daily Facts."

Red Lead, or **Minium**: See Lead (*Compounds of Lead*).

Red Oak: city (founded in 1857); capital of Montgomery co., Ia.; on the Nishnabatona river, and the Chi., Burl. and Quincy Railroad; 39 miles E. of Plattsmouth, 50 miles S. E. of Council Bluffs (for location, see map of Iowa, ref. 7–E). It is in an agricultural and stock-raising region, and has 12 churches, 5 school-houses, court-house (cost $100,000), 2 national banks, combined capital of $150,000, a State bank, capital of $50,000, and 3 weekly newspapers. Pop. (1880) 3,755; (1890) 3,321; (1900) 4,355. Editor of "Express."

Redoubts: small forts or inclosed works (usually) without flanking defenses, generally auxiliary to some larger work or defensive system. In permanent fortification the term is applied to small works or intrenchments within a larger member—e. g. "redoubt of the demilune," "of the reentrant place of arms," etc. In this latter sense, however, the French more commonly use the word *réduit* (from Fr. *réduire*).

Redpath, James; journalist; b. at Berwick-on-Tweed, England, Aug. 14, 1833; emigrated with his parents to Michigan 1848; became a printer, newspaper correspondent, and editor; was long connected with *The New York Tribune*, for which he reported the border warfare in Kansas 1855–57, and the famine in Ireland 1879–80; visited Haiti; became emigration agent of the Haitian Government in the U. S., and afterward consul at Philadelphia; was a war correspondent during the civil war; became superintendent of education at Charleston, S. C., where he founded schools for negro children and an orphan asylum; established at Boston in 1868 a lyceum bureau; established a newspaper syndicate at Washington, D. C., in 1877; edited for two years a weekly newspaper in New York; assisted Jefferson Davis in preparing his history of the Southern confederacy. He was the author of *The Roving Editor* (1859); *A Handbook to Kansas Territory* (1859); *The Public Life of Capt. John Brown* (1860); *Echoes of Harper's Ferry* (1860); a *Guide to Hayti* (1860); and *Talks about Ireland* (1881). D. in New York, Feb. 10, 1891.
Revised by H. A. Beers.

Red River: the last great tributary of the Mississippi. It derives its name from the color of the sedimentary matter with which it is freighted at all times except during very low water. It takes its rise in the great Staked Plain in the Pan-Handle of Texas, flows eastward, and forms the southern boundary of Oklahoma and Indian Territory. It enters Arkansas, but soon bends abruptly S., and flows through Louisiana to its junction with the Mississippi. Its length, measured roughly from one bend to another, is about 800 miles; including all its windings, the total length is estimated at 1,550 miles. Its source is 2,450 feet above the sea. For about 400 miles it traverses a series of cañons and descends 3·75 feet per mile; thence its grade gradually decreases, and in much of its lower course is scarcely perceptible. Its general grade may be judged from a map showing its windings; where swift, the channel is much straighter than where sluggish.

Area of Basin.—The basin drained by Red river is about 97,000 sq. miles in area. This region is mostly fertile, but presents all degrees of diversity, from the arid and saline plains where the river rises to the rich alluvial lands bordering its lower course.

The navigable channels are as follows: Red river proper in high water, 1,246 miles, and its own tributaries, not including Washita, 700 miles; Washita proper, 600 miles, and its tributaries, 800 miles; the total navigable channels reaching the Mississippi through the mouth of Red river amount to 3,346 miles. Large sums have been expended by the national Government in improving navigation. The appropriations for Red river alone up to 1892 were over $1,500,000.

Timber Rafts.—One of the most interesting features in connection with Red river is its tendency to form immense accumulations of floating timber. The banks of the river, in its middle course, are heavily forested, and during floods vast numbers of trees are swept away and accumulate lower down where the current slackens. These obstructions sometimes increase until rafts many miles long are formed. When undisturbed by man they grow by additions to their up-stream ends, while the logs decay and are washed away at their lower extremities. For this reason the obstructions

slowly move up stream. In 1854 the lower end of such a raft was located at a point 53 miles above Shreveport, La., extended 13 miles up-stream, and was forming at the rate of 1½ to 2 miles a year. It is stated that at an earlier date this raft was 200 miles lower down the river. Vegetation takes root on the older portions of the rafts, and what are termed "floating forests" are formed. In 1873, when a navigable channel was opened in the raft above Shreveport, it was 32 miles long. This great raft, before it was disturbed, formed a dam, which checked the flow of the river, and produced a lake-like expansion from 20 to 30 miles long above it. When a channel was opened through it the water above was lowered 15 feet. In recent years the river has been patrolled by "snag-boats," and thousands of trees, stumps, and other obstructions removed annually.

Owing to the timber-dams formed naturally in Red river, and to the abundant silt deposits left on its immediate banks during high-water stage, natural levees are formed along its borders which deflect tributary streams and frequently cause them to form lakes.

Consult *Physics and Hydraulics of the Mississippi River*, by Humphreys and Abbot (1861), and the Annual Reports of the Chief of Engineers U. S. army. ISRAEL C. RUSSELL.

Red River of the North: a river which rises in Western Minnesota, near the source of the Mississippi, flows northward for 250 miles through the so-called Red river valley, and empties into Lake Winnipeg. Its source is at an elevation of 1,600 feet, where it enters Canada it is 767 feet, and at its mouth 710 feet above the sea. Its drainage area, not including that of the Saskatchewan with which it unites, is between 43,000 and 44,000 sq. miles, of which three-fourths are S. of the U. S.-Canadian boundary. The region it traverses is a nearly level plain, once the bed of Lake Agassiz, and is famed for the abundance and excellence of its wheat harvests. The river has cut a narrow channel from 20 to 50 feet deep through lacustral deposits, and furnishes a typical example of recent drainage on a nearly horizontal, new land area. The river is navigable from its mouth to near its source. During high-water stages it is connected by way of Lakes Traverse and Big Stone with the Mississippi, and steamboats can occasionally pass from the Mississippi to Lake Winnipeg. ISRAEL C. RUSSELL.

Redroot: See CEANOTHUS AMERICANUS.

Red Sea, or **Arabian Gulf**: a long, narrow inlet of the Indian Ocean; between Arabia on the E. and Abyssinia, Nubia, and Egypt on the W.; separated from the Mediterranean by the Isthmus of Suez, which is only 80 miles across, and communicating with the Indian Ocean through the Gulf of Aden and the Strait of Bab-el-Mandeb, which is only 14 miles broad. The entire length of the Red Sea is 1,450 miles; its greatest breadth is 230 miles; its depth varies from 1,054 fathoms in lat. 22° 30′ N. to 3 fathoms in the harbor of Suez. It is called in the Old Testament "the sea of *suph*," a seaweed resembling wool. Why, in later times, it was called the Red Sea, writers are not agreed. Herodotus (*Hist.*, ii., 11) reports "a flow and ebb of the tide every day." Recent scientific surveys have shown a tide of 5 to 7 feet at Suez, but much less to the southward. Much, however, depends upon the strength of the wind, which blows from the S. S. E. from October to May, and is strongest in February; and from the N. W. the rest of the year, and is strongest in June and July. Near its northern extremity the sea forks into two branches—one, the Gulf of Akaba, length 100 miles and breadth 15, occupies a depression which is the continuation southward of the valley of the Jordan and Dead Sea; the other, the Gulf of Suez, length 200, breadth 20 miles. In the Sinaitic isthmus, lying between these arms, is Mt. Sinai. The Israelites (see EXODUS) are supposed to have crossed in April the Gulf of Suez, near the existing town of that name, the sea at that time extending with small depth some 30 miles farther N. On account of the violence of its winds, and the great number of islands, shoals, and coral reefs which lie along its shores, the navigation of the Red Sea has always been considered very difficult; nevertheless, from the very earliest times it has formed one of the commercial highways of the world, being the shortest and most convenient road between Europe and India. After the discovery of the route around the Cape of Good Hope the traffic which first the Egyptians and Phœnicians, and then the Greeks, the Romans, and the Venetians, had carried on with India over the Red Sea, declined greatly, but the construction of the Suez Canal has once more led this commerce back into its old channel.

Red Seaweeds: the *Rhodophyceæ*; a class of aquatic plants (mostly marine) notable for their red or purple color. The many-celled plant-body is of various forms, from a simple flat thallus to a branching, leaf-bearing axis. Sexual reproduction takes place by the fertilization of a carpogone (by non-ciliated antherozoids), this resulting in the growth of carpospores, and sometimes of a pericarp (Fig. 1) also. Asexual reproduction takes place by the germination of tetraspores, which are produced in various places on the plant-body by the subdivision of cells into four parts. The class is equivalent to the *Rhodospermeæ* of many authors, and includes but one order (*Florideæ*).

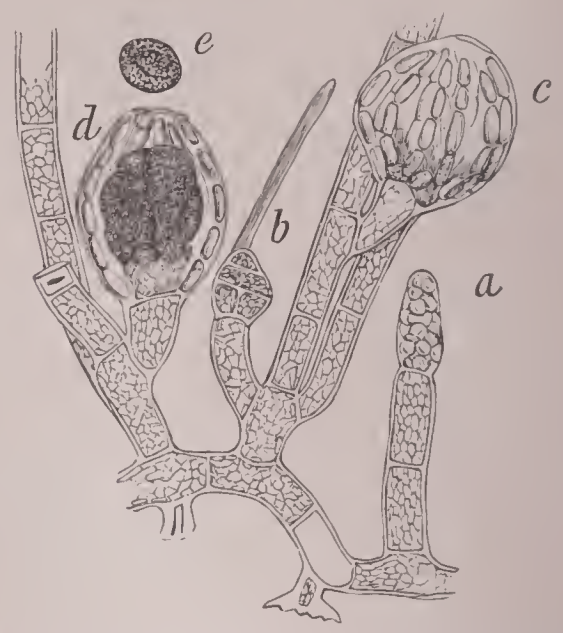


FIG. 1.—A red seaweed (*Lejolisia*): *a*, antherid; *b*, carpogone with slender trichogyne; *c*, sporocarp; *d*, sporocarp in vertical section; *e*, an escaped carpospore. Magnified 150 diameters.

According to Agardh, the known species are between 1,500 and 2,000, widely distributed in all seas, and to a limited extent in fresh water (e. g. species of *Batrachospermum*, *Hildenbrandtia*, *Lemanea*, etc.). The plants are never of large size, rarely attaining a length of more than a few inches, and in some cases they are minute. They are frequently of delicate texture and beautiful outline. The red or purple color is due to the presence in the cells of a soluble substance, phycoerythrin, which hides the chlorophyll. Upon immersion in fresh water the red color of many marine species is discharged, thus disclosing the underlying green.

Agardh has arranged the many families in six groups (which he terms "series") upon characters derived from the structure and development of the spore-fruit (cystocarp). Here only a few general characters will be given, to which there are many exceptions.

Series I. GONGYLOSPERMEÆ. Spore-fruits external or immersed in the substance of the thallus, surrounded by a gelatinous envelope; spores irregularly arranged; plant mostly filamentous, sometimes solid or compressed.

Two families, the *Ceramiaceæ* and the *Cryptonemiaceæ*,

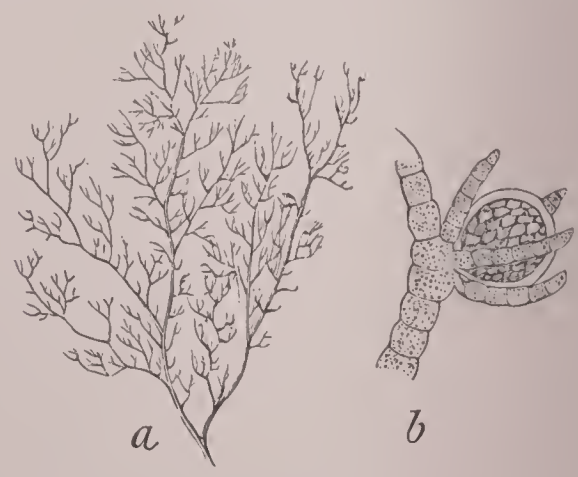


FIG. 2.—*Ceramium rubrum*: *a*, portion of plant; *b*, spore-fruit, magnified.

contain many beautiful species—e. g. *Ceramium rubrum* (Fig. 2), very common along the coasts of the U. S., *Ptilota serrata*, and species of *Griffithsia* and *Callithamnion*, the latter often minute and of great delicacy.

Series II. Cocciospermeæ. Spore-fruits immersed in the swollen thallus forming rounded conceptacles; spores irregularly arranged; plant terete or flattened, fleshy or hardened.

These are usually larger and coarser plants than the preceding, having thick parenchymatous thalli, mostly of a

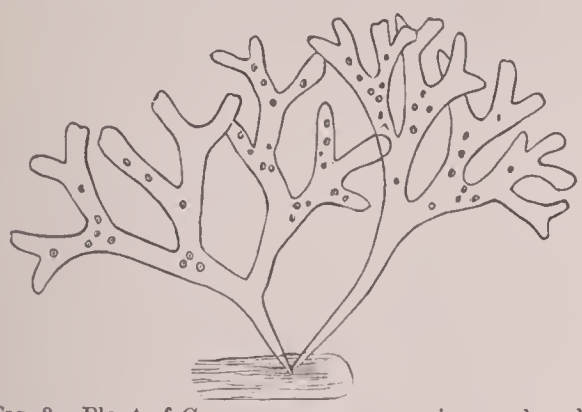


Fig. 3.—Plant of *Gymnogongrus norvegicus*, reduced.

dark-purplish color. *Gymnogongrus norvegicus* (Fig. 3) *Cystoclonium purpurascens*, *Gigartina mamillosa*, and *Chondrus crispus* are common representatives of the principal family *Gigartinaceæ*. The last-named species is the Carrageen (*q. v.*) or Irish moss.

Series III. Nematospermeæ. Spore-fruits external, with a cellular pericarp, or sometimes immersed in the thallus; spores in chains radiating from a central cell; plant filamentous, solid, or membranaceous.

The six families here grouped (*Dudresnayaceæ*, *Dumontiaceæ*, *Spyridiaceæ*, *Areschougiaceæ*, *Champiaceæ*, and

Fig. 4.—*Plocamium coccineum*: *a*, portion of plant; *b*, magnified fragment showing a spore-fruit.

Rhodymeniaceæ) contain many beautiful and interesting species belonging to the genera *Dudresnaya*, *Chylocladia*, *Chrysymenia*, *Rhodymenia*, *Plocamium* (Fig. 4), *Rhodophyllis*, etc. *Rhodymenia palmata* is the Dulse (*q. v.*).

Series IV. Hormospermeæ. Spore-fruits external or immersed, mostly with a pericarp; spores in short chains or single; plant membranaceous. cylindrical, or flattened.

The plants here brought together are apparently but little related. In the *Squamariaceæ* the thallus forms an expanded crust, usually upon other algæ. The *Corallinaceæ* are cylindrical or flattened, mostly jointed, and branching, and like the preceding are covered with a dense layer of lime, which commonly hides their red or purple color. The common coralline, *Corallina officinalis*, is a familiar representative of this family. The *Sphærococcoideæ* include cylindrical or flattened, coarse and cartilaginous plants, while the *Delesseriaceæ* are membranaceous, of delicate texture, and usually rosy-red. One of the prettiest species is *Grinnellia americana* (Fig. 5) of the eastern coast of North America.

Series V. Desmiospermeæ. Spore-fruits external or immersed, mostly with a pericarp; spores borne on central or parietal, simple or branching placentæ; plant filamentous, cylindrical, or compressed.

Five small families are here included (*Helminthocladiaceæ*, *Chætangiaceæ*, *Gelidiaceæ*, *Hypneaceæ*, and *Solieraceæ*). To the first belong the species of *Batrachospermum* (Fig. 6) which are found in fresh-water ponds and streams. *Nemalion multifidum* is a common marine form.

Series VI. Corynospermeæ. Spore-fruits external, with a pericarp; spores borne on a cellular basal placenta; plant filamentous, or solid and cylindrical.

This large group includes five families (*Wrangeliaceæ*, *Spongiocarpeæ*, *Lomentariaceæ*, *Chondriaceæ*, and *Rhodo-*

Fig. 5.—*a*, *Grinnellia americana*, reduced; *b*, spore-fruit, enlarged.

melaceæ). To the first belongs the European *Lejolisia mediterranea* (Fig. 1). The *Spongiocarpeæ* represented by *Polyides rotundus* have cylindrical cartilaginous fronds attached by a disk. The *Lomentariaceæ* have tubular fronds and cystocarps with a basal placenta. The last family (*Rhodomelaceæ*) includes about one-fifth of all the species of red seaweeds. Its important genera are *Dasya* and *Polysiphonia* (Fig. 7). These include many species of great beauty and delicacy.

Fig. 6.—Fragment of *Batrachospermum moniliforme*, enlarged.

Literature.—Agardh, *Species Genera et Ordines Floridearum* (1851–63), *Epicrisis Systematis Floridearum* (1876), *Morphologia Floridearum* (1880); Farlow, *Marine Algæ of New England and Adjacent Coast* (1881); Hauck, *Die Meeresalgen Deutschlands und Oes-*

Fig. 7.—*a*, Portion of plant of *Polysiphonia violacea*, reduced; *b*, enlarged spore-fruits.

terreichs (1885); Harvey, *Phycologia Britannica* (1846–51), *Nereis Boreali-Americana* (1852–58). Charles E. Bessey.

Red Snow: real snow tinted by the presence of *Hæmatococcus lacustris* (or *Protococcus nivalis*), microscopic algæ of the order *Protococcoideæ*. The cells are sub-globose, and about 50 micromillimeters ($\frac{1}{500}$ inch) in diameter. In 1819 Ross found banks of red snow on the eastern shore of Baffin Bay extending for miles, and these were in some parts 12 feet deep. Revised by CHARLES E. BESSEY.

Red Sulphur Springs: magisterial district; Monroe co., W. Va.; on Indian creek and a turnpike 12 miles from Lowell Station on the Ches. and O. Railway; 38 miles S. W. of White Sulphur Springs (for location, see map of West Virginia, ref. 11–G). It is in a beautiful valley of the Alleghany Mountains, is a fashionable watering-place, and is said to contain the only springs of their kind in the country. The water contains phosphorus and a peculiar sulphur compound or gelatinous substance, which is its distinctive feature. The curative properties of the water have been known for more than half a century. Pop. of district (1880) 2,557; (1890) 2,845; (1900) 3,148.

Reductio ad Absurdum: a process of reasoning by which the statement in dispute is made one premise of an argument and an acknowledged truth the other, the conclusion drawn from them being so absurd that the falsity of the premise in dispute must be conceded.

Reduplication: the repetition or doubling of a syllable, a root, or even a complete word, as a method of word-formation. It is a widespread phenomenon of language, and serves a variety of purposes in expression; thus it expresses plurality, reciprocity, repetition, continuousness, intensity, superlative quality, completion, imitation of natural sounds, etc., and is characteristic of nouns as well as verbs. The Indo-European languages abound in traces of an extensive use of this method in the primitive stages of the mother-speech, and cases also occur of its use within the separate history of the languages. (1) The reduplication may consist of the doubling of a root; cf. Lat. *murmur*, a murmuring noise, *querquerus*, shivering cold; Gr. μέρμερος, marvelous, βάρβαρος, unintelligible in speech, ἀλαλά, battle-cry, γάργαρα, muddle. (2) The doubling appears as incomplete, or one syllable of the reduplicated form is weaker than the other; cf. Lat. *quisquiliæ*, scraps, *memor*, mindful, *momordi*, I have bitten; Gr. διδαχή, doctrine, διδάσκω, teach, δέδορκα, I have seen, ὄπωπα, I have seen, πορφύρω, be in movement, γόγγυλος, round, ἀλλήλων, one another, γίγνομαι, become (Lat. *gigno*). (3) A word is doubled; as Lat. *quisquis*, *quidquid*, *quaqua*, *jamjam*, *quamquam*, *quotquot*, *meme*, *sese*; Gr. πάμπαν, πρόπρο, πλέον πλέον, more and more; Sanskr. *áharahar*, day by day, *padé-padē*, step by step. See K. Brugmann's *Compar. Grammar of the Indo-Germanic Languages*, vol. ii., §§ 51–54, 465–476; A. F. Pott, *Doppelung, als eins der wichtigsten Bildungsmittel der Sprachen, beleuchtet aus Sprachen aller Welttheile* (1862). BENJ. IDE WHEELER.

Red Water, or **Black Water**: a disease of cattle, sheep, and goats, characterized by the passage of reddish, brown, or black urine. This disease is most frequently observed among cattle at pasture on low lands, new fields, or soils imperfectly drained. It is thought to be caused by irritating plants which grow in such localities; it may usually be prevented by the amelioration of the soil.

Red Wing: city (founded in 1853); capital of Goodhue co., Minn.; on the Mississippi river at the head of Lake Pepin, and on the Chi., Mil. and St. P., the Duluth, Red Wing and Southern, and the Minneapolis and St. L. railways; 41 miles S. by E. of St. Paul, 63 miles W. N. W. of Winona (for location, see map of Minnesota, ref. 10–F). It is situated on a plain between the river and bluffs that rise to a height of over 300 feet above tide-water, and is one of the most important wheat-shipping points in the U. S. It is substantially built; has water, sewerage, electric-light, and street-railway plants; and contains flour and saw mills, boot and shoe factories, stoneware, sewer-pipe, and lime works, and furniture-factories. There are 14 churches, 4 collegiate institutions, Evangelical Lutheran Seminary (chartered in 1878), State Reform School, Library of the State Board of Health (founded in 1873), a national bank with capital of $100,000, 2 State banks with combined capital of $111,000, a savings-bank, and a daily and 5 weekly newspapers. Pop. (1880) 5,876; (1890) 6,294; (1900) 7,525.
EDITOR OF "REPUBLICAN."

Red-winged Blackbird: See BLACKBIRD.

Redwitz-Schmölz, OSKAR, Freiherr von: poet; b. at Lichtenau, Bavaria, June 28, 1823; studied law at Erlangen and Munich, and later on German philology at Bonn; was for a short time Professor of Literature at the University of Vienna, but resigned his position and devoted himself entirely to literature. He gained a wide reputation by his first work, *Amaranth* (1849), an epic poem written in praise of the Roman Catholic religion, and filled with sentimentality. His later works, *Das Lied vom Neuen Deutschen Reich* (1871), *Odilo* (1878), and his novels *Hermann Stark, deutsches Leben* (1869), *Haus Wartenberg* (1884), and *Hymen* (1887), are the productions of a genuine poet. He died July 16, 1891. JULIUS GOEBEL.

Redwood: the *Sequoia sempervirens*, a noble coniferous timber tree of California, second in size to the *Sequoia gigantea*, or big tree, alone among North American trees. It occurs in great forests upon the coast mountains of California, and often attains a height of 275 feet and a diameter of 15 feet. It is extensively sawn for building purposes. When fresh its wood is of a fine red color, but it slowly fades when exposed to light. (See SEQUOIA.) The redwood sometimes used by dyers is from *Adenanthera pavonina*, a large leguminous East Indian tree.

Redwood City: town (founded in 1849); capital of San Mateo co., Cal.; on Redwood creek, navigable for vessels of light draught to this point, and on the Southern Pac. Railroad; 28 miles S. of San Francisco (for location, see map of California, ref. 8–B). It is in an agricultural, lumbering, and grape-growing region; contains 4 churches, a public school, a State bank with capital of $102,800, and 2 weekly newspapers; and is an important shipping-point for redwood lumber. Pop. (1880) 1,383; (1890) 1,572; (1900) 1,653.
EDITOR OF "TIMES-GAZETTE."

Redwood Falls: city; capital of Redwood co., Minn.; on the Redwood river, and the Chi. and N. W. and the Minneapolis and St. Louis railways; 26 miles N. N. W. of Sleepy Eye Lake, 110 miles S. W. of Minneapolis (for location, see map of Minnesota, ref. 10–C). It is in an agricultural region, and contains Methodist Episcopal, Protestant Episcopal, Presbyterian, Christian, Roman Catholic, and Adventist churches, a handsome graded-school building, county court-house that cost $30,000, 3 State banks with combined capital of $100,000, and 2 weekly newspapers. In the vicinity are mines of coal, gold, and mineral paint. Pop. (1880) 981; (1890) 1,238; (1900) 1,661.
EDITOR OF "GAZETTE."

Reed [O. Eng. *hrēod* : O. H. Germ. *riot* > Mod. Germ. *ried*, reed]: a name proper to certain tall woody grasses smaller than canes and bamboos. The common reed (*Phragmites communis*) of North America, Europe, and Asia is employed on the Eastern continent as thatch, as a material useful in clay walls and floors, etc. The more extensively grown reed of Europe is *Arundo donax*, the woody stems of which are used for a great variety of purposes, especially by the horticulturist and in making musical instruments, fishing-rods, canes, etc. The smaller cane of the U. S. (*Arundinaria tecta*) is often called a reed. Its chief use is in making stems for tobacco-pipes.—REED is also the vibrating tongue or spring, fixed in a narrow slit, which produces musical tones in many wind instruments, such as the melodeon. It was once made of the reed (*Arundo donax*), whence the name. See REED INSTRUMENTS.

Reed, DAVID BOSWELL, M. D.: chemist; b. in Edinburgh, Scotland, in 1805; educated at the High School of Edinburgh, and in medicine at the university of that city, where he was an assistant to Prof. Sir John Leslie; was elected president of the Royal Medical Society and member of the Royal College of Physicians and of the Royal Society of Edinburgh; became instructor in chemistry in the university, teaching that science also to private classes; superintended the improvements in ventilation made in the House of Commons 1836, in the House of Peers 1839, and had charge of the ventilation department in the construction of the new houses of Parliament 1840–45; afterward applied his principles to public buildings in Liverpool and other large cities; visited Russia for a similar purpose; settled in the U. S. 1856; was for some time Professor of Applied Chemistry in the University of Wisconsin; became a resident of St. Paul, Minn.; became medical inspector to the U. S. Sanitary Commission 1863. D. at Washington, D. C., Apr. 5, 1864. He was the author of many books and publications upon chemistry and ventilation.

Reed, Sir EDWARD JAMES, K. C. B.: chief constructor of the British navy; b. at Sheerness, Kent, Sept. 20, 1830;

studied at the School of Mathematics and Naval Construction at Portsmouth; was attached to the dockyard at Sheerness; was afterward editor of *The Mechanics' Magazine*; became secretary of the Institute of Naval Architects. He submitted to the admiralty proposals for reducing the dimensions, cost, and time required for building ironclads, and was soon after appointed chief constructor of the navy. Within three years he designed nearly the whole of the first fleet of ironclads of the British navy. He designed also an ironclad frigate for the Turkish navy, five steam transports of 4,000 tons each for the Indian Government, and numerous smaller vessels. He has also designed armored ships for the German and various other governments. After seven years as chief naval constructor Mr. Reed, who did not approve the construction of rigged seagoing turret ships, found these vessels so much in favor that he resigned his office in June, 1870. In 1874 he was elected to Parliament as a Liberal, and was returned at each election until 1892. He is a member of the council of the Institution of Civil Engineers, having become a member of the institution in 1870. He has been appointed on several Government commissions. In 1878 he was made a Knight Commander of the Bath. He is the author of works on iron ship-building, ironclad ships, and coast defense, and of *Japan, its Histories, Traditions, and Religions* (2 vols., 1880). WILLIAM R. HUTTON.

Reed, HENRY: scholar; grandson of Col. Joseph Reed; b. in Philadelphia, Pa., July 11, 1808; graduated at the University of Pennsylvania 1825; was admitted to the bar 1829; was appointed in 1831 Assistant Professor of English Literature and also of Moral Philosophy in the University of Pennsylvania, and in 1835 Professor of Rhetoric and English Literature; married a granddaughter of Bishop White; wrote the *Life* of his grandfather for Sparks's *American Biography*; edited with valuable prefaces and notes Wordsworth's *Poetical Works* (1837); Arnold's *Lectures on Modern History* (1845); Alexander Reed's *Dictionary of the English Language* (1845); Lord Mahon's *History of England* (1849), and other works, and contributed essays and reviews to several literary periodicals. On his return from a visit to Europe he was lost in the steamer Arctic, Sept. 27, 1854. His brother, William B. Reed, edited his *Lectures on English Literature* (1855), to which he prefixed a biographical sketch, *Lectures on English History as Illustrated by Shakspeare's Chronicle Plays* (1855), and *Lectures on the English Poets* (1857), all republished in England.

Reed, HUGH: See the Appendix.

Reed, JOSEPH: patriot; b. at Trenton, N. J., Aug. 27, 1741; graduated at Princeton 1757; studied law in England 1763–65; became deputy secretary of New Jersey 1767; settled at Philadelphia 1771; was a member of the committee of correspondence 1774; president of the first provincial convention of Pennsylvania Jan., 1775; delegate to the Continental Congress in May; served as a volunteer at the battles of Brandywine, Germantown, and Monmouth; was elected to Congress Sept., 1777; signed the Articles of Confederation in 1778; was elected president of the supreme executive council of Pennsylvania; was an earnest opponent of slavery and of the proprietary system of government; visited England for his health in 1784, but without beneficial result. D. in Philadelphia, Mar. 5, 1785.

Reed, THOMAS BRACKETT: party leader; b. at Portland, Me., Oct. 18, 1839; graduated at Bowdoin College, Maine, in 1860; was acting assistant paymaster in the U. S. navy 1864–65; was admitted to the bar in 1865, and commenced practice at Portland; was member of the Maine House of Representatives 1868–69, and of State Senate in 1870; attorney-general of Maine 1870–72; city solicitor of Portland 1874–77; and Representative from Maine in Congress since that time. He was elected Speaker of the House of Representatives Dec. 2, 1889, and soon entered on a course that provoked bitter opposition, but resulted in revolutionizing the parliamentary procedure of the House. He insisted on counting as present those members who in order to prevent a quorum refused to vote. His rulings were sustained, and the principle was embodied in the new rules adopted Feb. 14, 1890. Dec. 2, 1895, and Mar. 15, 1897, he again became Speaker. F. M. C.

Reedbird: See BOBOLINK.

Reed City: village; Osceola co., Mich.; on Hersey creek, and the Flint and Père Mar. and the Gr. Rapids and Ind. railways; 4 miles N. W. of Hersey and 69 miles N. of Grand Rapids (for location, see map of Michigan, ref. 5–H). It is in an agricultural region; has excellent water-power, several mills, and important manufactories; and contains a national bank with capital of $50,000, and two weekly newspapers. Pop. (1880) 1,091; (1890) 1,776; (1900) 2,051.

Reed Instruments: the generic name of a large class of musical instruments, of which the melodeon, the harmonium, and reed-organs are the most important. The tone of these instruments is produced by means of a thin tongue of wood or metal lying within or over an aperture (technically called a *reed*), and vibrated by means of a current of air. Instruments of this class were found among the Chinese several hundred years ago, but most of them are comparatively modern inventions. The first reed-organs were constructed in the U. S. about 1818; they were improved in 1821, 1825, and 1835, since which time the modifications have been too numerous for separate mention. The accordion was invented in Germany about 1829; the harmonium, first constructed in France soon afterward, was later much improved by the introduction of the exhaust bellows, and the bending and twisting of the tongue of the reed, termed voicing, was developed. These two improvements have been the main features which have wrought such changes in the modern reed-organ.

Reedsburg: city; Sauk co., Wis.; on the Baraboo river, and the Chicago and N. W. Railway; 15 miles W. N. W. of Baraboo, the county-seat; 32 miles W. of Portage (for location, see map of Wisconsin, ref. 6–D). It is an important hop, potato, and hog market; has flour, saw, and woolen mills, machine-shops, and other manufactories; and contains waterworks, two electric-light plants, a State bank with capital of $30,000, a private bank, and two weekly newspapers. Pop. (1880) 1,331; (1890) 1,737; (1900) 2,225.
EDITOR OF "FREE PRESS."

Reefs, Coral: See CORAL ISLANDS AND CORAL REEFS.

Ree Indians: a tribe of CADDOAN INDIANS (*q. v.*).

Rees, JOHN KROM, A. M., E. M.: astronomer; b. in New York, Oct. 27, 1851; graduated from Columbia College 1872, and School of Mines 1875; appointed Professor of Mathematics and Astronomy at Washington University, St. Louis, Mo., 1876; director of the observatory and Adjunct Professor of Practical Astronomy and Geodesy at Columbia College, New York, 1881, and managing editor of *The School of Mines Quarterly* 1884; Professor of Geodesy and Practical Astronomy and director of the observatory, Columbia College, New York, Oct. 1, 1884, and has published *Report on Total Solar Eclipse* (July, 1878); *International Time System* (1882); *Observations of the Transit of Venus, Dec. 6, 1882, made at Columbia College Observatory, Standard Time* (1884), etc.

Reeve, TAPPING, LL. D.: jurist; b. at Brookhaven, L. I., in Oct., 1744; graduated at Princeton 1763; began to practice law at Litchfield, Conn., 1772, and opened there in 1784 a law school, long the only institution of the kind in the U. S., which he conducted alone until 1798, and with Judge James Gould until 1820. He was a stanch Federalist in politics; was judge of the Supreme Court of Connecticut 1788–1814, and originated the movement for more equitable legislation concerning the property of married women. D. at Litchfield, Dec. 13, 1823. Author of *The Law of Baron and Femme, of Parent and Child, of Guardian and Ward, of Master and Servant*, etc. (New Haven, 1816; 4th ed. 1888), and of *A Treatise on the Law of Descents in the Several United States of America* (New York, 1825).
Revised by F. STURGES ALLEN.

Reeves, JOHN: law-writer; b. in London in 1752; studied law and was admitted to the bar; was appointed commissioner in bankruptcy 1783; chief justice of Newfoundland 1790; clerk to the bureau of commerce and of the colonies in 1792, and afterward superintendent of foreign affairs. He was inspired with a bitter hatred of republican institutions, and organized an anti-republican and an anti-French society. He advanced in a brochure the statement that the monarchy had no need of the assembly of the legislative chamber, and was denounced in Parliament for this, and tried before a jury, which acquitted him but denounced his opinions (1795). After the death of Pitt, who was his protector, Reeves retired upon a large pension. D. in London in 1829. He wrote a *History of the English Law from the Time of the Romans to the End of the Reign of Elizabeth* (American ed., 5 vols. 8vo., Philadelphia, 1880), a *History of the Law of Shipping and Navigation* (London, 1792), and a *History of the Government of Newfoundland* (1793), besides minor works. F. STURGES ALLEN.

Reeves, John Sims: singer: b. at Shooter's Hill, in Kent, England, in Oct., 1822; son of the organist of the village church. At eight years of age young Reeves could read any music at sight. At the age of fourteen he himself became the organist and the choir-master of the village church. Under Calcott and Cramer and other masters he became proficient in harmony and counterpoint. Under the name of "Johnson," at Newcastle-on-Tyne, he made his first real public appearance in June, 1839, singing the part of the Gypsy Boy in *Guy Mannering*. His voice at this time was looked upon as barytone, and it was not until 1847 that he sang as a tenor. After studying in Paris and in Milan he made his Italian *début* at La Scala Opera-house, Milan. He appeared, Dec. 6, 1847, at Drury Lane, London, as Edgardo in *Lucia di Lammermoor*, and was enthusiastically received. In 1848 he was engaged with the company at her Majesty's theatre, London, but owing to a dispute with the management appeared but once. He then attempted sacred music, with which his fame and memory must always be associated. Singing in *Judas Maccabæus* at Exeter Hall he astonished the critics, who had not suspected his versatility. He afterward devoted himself entirely to concerts, sacred and secular. In July, 1892, he retired from the stage and accepted a professorship in the Guildhall School of Music, London. D. Oct. 25, 1900. B. B. Vallentine.

Re-exchange: in the usual application of the term, the loss resulting from dishonor of a bill in a country different from that in which it was drawn or indorsed. (Chalmers's *Bills of Exchange*, 4th ed. 193.) A New York merchant wishes to pay a debt in London. He buys a bill on London; it is dishonored at maturity; he is entitled to the amount of money called for by the bill in London; he would not be indemnified by recovering in New York the amount of the bill with interest and protest fees; he has a right to draw in London a re-draft on the drawer or indorser in New York for an amount which will put him at once in possession of the money called for and promised to him by the original bill: this re-draft is called re-exchange. It will include not only the sum promised by the original bill, but the exchange on New York, the interest, and necessary expenses of the transaction. (*Suse* vs. *Pompe*, 8 Common Bench, N. S. 538; *Bank* vs. *U. S.*, 2 Howard 737.) Although this re-exchange bill is seldom drawn, the right to draw it fixes the damages recoverable by the holder in case of the dishonor of the original bill, unless the terms of the bill limit the damages, or a statute prescribes them. (See N. Y. Revised Statutes, 8th ed., p. 2501; Mass. Public Statutes of 1882, ch. 77.) The term re-exchange is used to signify, also, the loss on a particular transaction occasioned by the exchange being adverse, and the course of exchange itself. For further information, see Chalmers's *Bills of Exchange*, 4th ed., p. 194; Daniels, *Negotiable Instruments*, ch. xlv.

Francis M. Burdick.

Referendum [Lat., neut. of *referendus*, gerundive of *referre*, refer]: the practice of submitting legislative measures to the voters for ratification. It is observed in Switzerland, and favored by many political writers in the U. S., Great Britain, and Belgium. See Law-making, Methods of (*Switzerland*).

Reflecting Circle: an astronomical instrument for measuring angles by the reflection of light from two plane mirrors which it carries. It differs from the sextant chiefly in having an entire circle. See Sextant.

Reflection [from Lat. *reflec'tere*, reflect; *re-*, back + *flectere*, bend, turn]: the act of the mind whereby it examines itself or looks upon its own states as its objects. It is one of the most unique activities of the mental life. It is different from simple consciousness, in that in the latter there is no such thing as self-examination, and no act of setting up a conscious relation between the subject, or thinker, and the object, or what he thinks about. Reflection in its full sense seems to characterize man alone in the range of animal life; although wherever there is the beginning of the notion of self, there is also probably the beginning of this function of thinking about self which constitutes reflection.

This mental act is the great resource of self-observation and analysis, upon which the psychologist depends for most of his information. As a method, its use is called "introspection." In philosophy, reflection has always been the function upon which idealistic thought has based itself; for there is in nature nowhere else than in consciousness the fact of one kind of event setting itself over against another and criticising it. The inference is that this relation can not be accounted for in terms of the play of objective forces in nature, and so must be an ultimate kind of activity or reality. The theory of reflection is closely allied to that of Judgment and Knowledge (*qq. v.*). J. Mark Baldwin.

Reflection of Light: that bending which occurs in the path of a light ray when it is turned back from a surface upon which it falls. When a light-ray falls upon an unpolished surface, it is irregularly reflected or scattered in consequence of the different inclinations of the innumerable facets of which such surfaces are composed, as may be seen under the microscope. Non-luminous bodies are made visible by the scattering of light from their surfaces. When a ray falls upon a perfectly smooth surface, it is regularly reflected, and a virtual image of the illuminating body is seen behind the reflecting surface. Most surfaces which reflect regularly also reflect irregularly to some extent. The two portions of a reflected light-ray, before and after bending, are called respectively the incident and reflected ray. If a perpendicular or normal be erected to the reflecting surface at the point of incidence, the angles made with this normal by the incident and reflected ray are called the angles of incidence and reflection. The law of reflection is: *The angles of incidence and reflection are equal, and the incident and reflected rays and the normal lie in one plane.*

From the law of reflection it is evident that all rays diverging from a point and reflected from a plane surface appear to emanate from another point situated at the other side of the surface, and at an equal distance from it. Hence when an object is placed in front of a plane mirror the apparent image is of the same form and magnitude and at an equal distance from the other side of the mirror; but all the parts are reversed, like the negative of a photograph, the right hand of the object appearing on the left in the image and *vice versa*. For parabolic reflection, see Lighthouse (*Lighthouse Illumination*).

The intensity of reflected light varies with the nature and the position of the reflecting surface, the reflecting powers of various substances being greater for small angles of incidence than for large ones, and depending upon the index of refraction between the surface and the medium in which the light is traveling. See Refraction.

The phenomenon of reflection takes place equally with ether vibrations of all kinds, such as those of radiant heat and electro-magnetic undulations, and its laws are the same as in the case of light. Revised by R. A. Roberts.

Reflex Action [*reflex* is from Lat. *reflexus*, perf. partic. of *reflec'tere*, bend or turn back; *re-*, back + *flectere*, turn]: direct response of the nervous system to external stimulation—for example, the winking of the eyes when an object approaches, moving when tickled, etc. These actions are contrasted in physiology and psychology with "voluntary actions," those which owe part of their stimulus at least to central processes. Reflex actions are regular, definite, beyond control, inherited, and presided over by the lower centers of the brain and spinal cord. J. M. B.

Reformation: the name usually given to the religious revolution of the sixteenth century which divided the Western Church into the two sections known as Protestant and Roman Catholic. This movement was not an isolated event, but was closely connected with the intellectual and social changes which marked the transition from the Middle Ages to the modern era of civilization. It was also long in preparation. The disaffection with the hierarchy which disclosed itself in the rise of sects like the Waldenses, and within the Church in the reforming councils of the fifteenth century held at Pisa, Constance, and Basel; the rise of radical reformers, "forerunners" of Protestantism, as Wickliffe and others; the spiritual doctrine of the Mystics; political opposition to the Roman see, dating from the old contests of the empire with the pope; and especially the influence of the revival of learning in promoting general culture, in hastening the downfall of scholastic theology, and in producing a diligent study of the Bible and of Christian antiquity—these are antecedents of Protestantism which deserve special mention. Under this last head the work of Erasmus is very important. Protestantism, as a religious system, had two main principles—viz., the exclusive authority of the Bible as the rule of faith, as opposed to the normative authority of the pope or the Church—a principle that involves the right of private judgment; and the doctrine of justification by faith alone, in contradistinction to salvation

by works or human merit. Protestantism claimed for the individual a direct access to the blessings of the gospel, without the mediatorial intervention of the Church or priesthood. In opposition to the doctrine of a particular priesthood, it asserted the universal priesthood of Christian believers.

I. *The Reformation in Germany.*—The movement began in 1517 by the posting of the theses of Martin Luther, an Augustinian monk and a professor in the University of Wittenberg, who attacked the sale of indulgences, which in the hands of Tetzel and others was a source of flagrant abuses. Universal strife was kindled in consequence. Luther was excommunicated by Pope Leo X. in 1520, but he publicly burned the papal bull, with the book of canon law, which was almost equally obnoxious to him. By preaching and by numerous publications, with the aid of Melanchthon and other coadjutors, he gained numerous supporters among all classes. Political opposition to the encroachments of Rome seconded his efforts. At the Diet of Worms in 1521, however, he was put under the ban of the empire. Among his varied labors which contributed to build up his cause one of the most important was his translation of the Scriptures. His adherents were too powerful to be suppressed. The electors of Saxony were his stanchest friends. At the Diet of Spires in 1529, when a majority declared against the Reformation, the "Protest" which gave rise to the name "Protestants" was signed by the Elector of Saxony, the Margrave of Brandenburg, the Duke of Brunswick-Lüneburg, the Landgrave of Hesse, the Prince of Anhalt, together with fourteen cities, including Nuremberg, Strassburg, and Constance. At the Diet of Augsburg in 1530, in the presence of Charles V., the Protestants presented their famous Confession, but a decree was passed condemning their cause. The menace involved in this decree led to the formation of the Protestant Smalcaldic League. The execution of the Augsburg decree by Charles V. was long prevented by political complications, which often proved helpful to Protestantism. Especially was this true of the rivalship of Charles V. and Francis I. At length, in 1546, after the death of Luther, the Smalcaldic war broke out, which resulted disastrously for the party of reform, but their cause was restored after Maurice, Duke of Saxony, turned against the emperor. The Peace of Augsburg (1555) was a virtual acknowledgment of defeat on the part of the emperor, and secured to Protestantism a legal recognition. After the terrible Thirty Years' war in the seventeenth century the Treaty of Westphalia (1648) once more established the legal privileges of Protestantism as one of the religions of the German empire. The final result was that Northern Germany was mostly Protestant, while Southern Germany, after the Catholic reaction and the labors of the Jesuits, became predominantly Roman Catholic. See GERMAN THEOLOGY.

II. *The Reformation in (German) Switzerland.*—The leader of the Protestant movement here was Ulrich Zwingli, who became pastor at Zurich in 1519. Imbued with the Erasmian culture, but a robust and fervent advocate of the distinctive doctrines of the Reformation, he was chiefly instrumental in inducing the city of Zurich to abolish the old system and become a separate Protestant Church (1524). Public disputations, as well as sermons from the pulpit, and books and pamphlets, were agencies employed in Switzerland, as elsewhere, for the dissemination of the Reformed doctrine. Basel (1529), Berne (1528), St. Gall (1528), and Schaffhausen (1529) followed the example of Zurich. The ecclesiastical revolution was also a political one; the movement for reform in the Church was identified with republican principles and patriotic efforts for the improvement of public morals, and in opposition to the corrupting foreign influence which had drawn the Swiss away from their homes to serve as mercenary soldiers. As the consequence of dissensions between the Protestants and Catholic cantons, war broke out, and Zwingli himself fell in battle in 1531. The cause of Protestantism received a severe blow by its defeat in this struggle, but afterward, in a great degree, recovered its fortunes, especially after Geneva espoused the Reformed faith. The Zwinglians differed from the Lutherans on the doctrine of the Lord's Supper, the former considering it a mnemonic or memorial feast, intended to call vividly to mind the Saviour's death; the latter holding that while transubstantiation is to be denied, Christ is actually received in the sacrament, even by the unbelieving communicant. The division occasioned by this controversy, and by the vehement repugnance of Luther to the Zwinglian opinions, divided and weakened the Protestant power at a critical epoch.

III. *The Reformation in the Scandinavian Kingdoms.*—Protestantism spread northward, largely through the influence of Germans and of preachers sent forth from the great Protestant seminary of Wittenberg. Christian II., King of Denmark, first favored Protestantism, but afterward drew back from its support. Under Frederick I. (1523–33), by whom he was supplanted, the Reformation extended itself, and it acquired a legal establishment in Denmark under Christian III. The Lutheran doctrine and a constitution with bishops or superintendents, which Luther had approved, were accepted. Protestantism was introduced into Norway in 1537 in connection with the subjection of the country to Denmark. The Reformed doctrine was first preached in Sweden in 1519; it was favored by Gustavus Vasa (1523–60), and was formally adopted at the Diet of Westerås in 1527. The ecclesiastical property fell for the most part into the possession of the nobles. Subsequent efforts to restore Roman Catholicism proved abortive.

IV. *The Reformation in Slavonic Countries.*—Lutheranism was favorably viewed by the Hussites of Bohemia. Protestantism was strongly established in that country. The refusal of its adherents to join Ferdinand of Austria in the Smalcaldic war brought upon them, especially after the defeat of the Protestants at Mühlberg, severe persecution. Toleration was continued only to the anti-Lutheran Hussites. Lutheranism early spread into Polish Prussia and Livonia, also into Poland. In this last country dissension broke out between the Lutherans and Calvinists, and further division was occasioned by the introduction of Unitarianism, which gained many adherents among the higher classes. The various evangelical parties formed a union of Sandomir in 1572. Sigismund II., the king, was favorable to the Reformed doctrine.

V. *The Reformation in Hungary.*—Numerous Germans were settled in this country, who brought in the Lutheran faith, and were aided in diffusing it by the Bohemian Brethren and by Waldenses. The new faith made rapid progress, especially in the cities and among the nobles. But the civil wars that arose, coupled with the doctrinal contests between Lutherans (mostly Germans) and Calvinists (mostly Magyars), checked its growth. It remained strong, however, until it was weakened and reduced by the labors of the Jesuits and the measures of the Catholic reaction.

VI. *The Reformation in Geneva.*—The pioneer in the work of introducing Protestantism into Geneva was William Farel, a Frenchman, who preceded Calvin, and by whose influence Calvin was induced to establish himself there (1536). The Bishop of Geneva had been expelled and Protestantism legally accepted in 1535. The intellectual vigor, fine scholarship, and indomitable energy of Calvin, in connection with his systematic organizing genius, caused his name to become familiar and his influence to be powerfully felt, not only within the walls of the city, where his tenets were accepted, and where his will became, after long struggles with adversaries, predominant, but also in other countries, especially in France, his native land. He took the leading part in shaping the civil and ecclesiastical institutions of Geneva. His doctrine upon the Lord's Supper was intermediate between that of Zwingli and the theory of Luther, but it was one which the Zwinglian churches could accept. The two streams of Swiss Protestantism gradually mingled in one. Calvin asserted likewise the divine predestination and election—a doctrine on which the Reformers were at first united—in terms which went beyond the view which the Lutherans were inclined to adopt. His doctrine of the Lord's Supper and of election or divine "sovereignty" became the distinguishing features of Calvinism—a system which was defined with great clearness in Calvin's *Institutes of Theology*. These tenets, associated with the Presbyterian polity, which Calvin also founded at Geneva, were accepted by the Protestants of France, Scotland, Holland, and other countries. Thus Protestants were divided under two great classes—the Lutherans and "the Reformed," this last term being specially applied to the adherents of the Swiss type of the Reformation. Numerous foreigners—most of them exiled from other countries for their faith—resorted to Geneva, many of whom were naturalized, and many others, having been instructed by Calvin, returned as missionaries to their own homes. Geneva became to the Romanic countries and to the lands which received Calvinism what Wittenberg was to the disciples of Luther and Melanchthon. The principal leader there, after Calvin, was his accomplished pupil, Beza.

VII. *The Reformation in France.*—A class of mysties, of whom Lefèvre was the most conspicuous, and among whom were Margaret, sister of Francis I. and Queen of Navarre, and Briçonnet, Bishop of Meaux, sympathized with the doctrine of justification by faith, though they were not averse to the traditional doctrine of the sacraments. Humanism was favorable to reform, and Francis I., who was proud of being styled the "father of letters," encouraged innovation up to a certain degree, when his interests prompted him to lend it assistance. On other occasions he was a cruel persecutor of Protestantism at home, even when, out of hostility to the emperor, he was giving help to Lutheranism in Germany. His vacillation was productive of great mischief. Yet Protestantism, mainly from the influence of Calvin and of Geneva, gained a foothold in France in his reign. His successor, Henry II., was inimical to the Reformed faith, especially after the Treaty of Cateau-Cambrésis with Spain. Nevertheless, Protestantism in his reign made great progress. In 1558 it was estimated that there were 2,000 places of Reformed worship scattered over France, and congregations numbering 400,000 organized after the German pattern. In 1559 they ventured to hold a general synod in Paris. The Huguenots, as they were called, became, by the force of circumstances, a political party. The family of Guise gained such ascendency in the Government during the reign of the young Francis II., and eventually under Charles IX., as to come into inevitable conflict with the great houses of Bourbon and Châtillon, and at the same time the Guises set themselves up as intolerant champions of the old religion. The consequence was that the political and religious elements of opposition coalesced. The Protestants found leaders in Condé and Coligny, who adopted their faith, and the latter of whom honored it by a signally pure and elevated career. Anthony of Navarre first espoused, but finally deserted, the Protestant cause. His heroic wife, Jeanne d'Albret, the mother of Henry IV., was their steadfast defender. The history of the Reformation in France would include a full narrative of the civil wars. The edict of St.-Germain in 1562 granted a measure of toleration to the Huguenots; but the massacre of Vassy shortly after opened the long and bloody struggle which went on, with intervals of peace, down to the accession of Henry IV. and the Edict of Nantes (1598). The massacre of St. Bartholomew in 1572, when Coligny and thousands of his coreligionists were slaughtered, was due to Catherine de Médicis as its main contriver, and sprang out of the mingled motives of political, religious, and personal hostility. The Huguenots were always a minority of the nation, but, besides the nobles who were attached to their side, they comprised a multitude of the sober and intelligent middle classes and of the inhabitants of towns. The Edict of Nantes, following upon the abjuration of Henry IV., reduced them to the condition of a stationary or declining party, but one furnished as a means of defense with political privileges of an extraordinary character, which they continued to hold until the time of Richelieu. There were times in the course of the sixteenth century when the Protestant cause seemed likely to triumph in France. Its failure to achieve the victory in that country was the tragic event of the Reformation.

VIII. *The Reformation in the Netherlands.*—The inhabitants of the Low Countries were highly prosperous and intelligent. The contiguity of the country to Germany and France facilitated the incoming of Protestant opinions. Merchants and emigrants brought them over from England. In 1523 two persons were put to death at Brussels as heretics—an event that called forth a stirring hymn from the pen of Luther. The persecuting edicts of Charles V. led to the destruction of a great number of Protestants in the Netherlands. Grotius makes the whole number who perished in this reign 100,000—probably an exaggerated estimate. Philip II., who was unpopular in this part of his dominions, set about the strict enforcement of the laws against heresy. The cruelties of the Inquisition, in connection with the evident purpose to destroy the liberties of the country and subject it to Spanish absolutism, provoked armed resistance. The hero of the great revolt, which was a struggle for political and religious freedom, was William of Orange. In the course of the protracted conflict a Protestant state grew up in the north under the lead of Orange, while the southern provinces finally submitted to Spain and retained the old form of religion. The Dutch republic confronted the whole power of Spain and achieved its independence. At first, Lutheranism had been introduced into Holland, but the Calvinistic type of doctrine and polity prevailed, and was incorporated in the ecclesiastical institutions of the country. The *Confessio Belgica* was composed in 1561, and was revised and adopted by a synod at Antwerp in 1566.

IX. *The Reformation in England and Scotland.*—The Lollards, a remnant of the followers of Wickliffe, were numerous in England at the beginning of the sixteenth century among the lower classes. The revival of learning prepared the ground for ecclesiastical change. The friends of the "new learning" had a spirited contest with the devotees of scholasticism. More, Colet, and Erasmus during his stay in England, exerted themselves in behalf of letters and against superstition. The writings of Luther found readers, especially among young men at the universities. Tyndale's translation of the Bible was eagerly perused, notwithstanding the efforts of the authorities to suppress it, and the martyrdom of its author. The Reformation in England had two distinct sources, which at times worked in conjunction with one another. The first was the moral and religious feeling, which was enlisted in favor of the Protestant movement. The second was the *quasi* political opposition to the foreign rule of the papacy, which was re-enforced by the difficulties encountered by Henry VIII. in attempting to procure a divorce from Catharine of Aragon. The reluctance of Clement VII. to comply with the king's petition moved Henry to reduce the power of the clergy and to oblige them to declare him the head of the Church of England. Finally, he cut the knot by marrying Anne Boleyn without the papal permission in 1532. This was followed by the Act of Supremacy, which put an end to papal authority in England. In 1536 followed the act for abolishing the monasteries and confiscating their property. The king still professed the Catholic dogmas. There was a Protestant and a Catholic party in the Church, the leader of the former being Cranmer, Archbishop of Canterbury, a man of pure and upright intentions, but of a timid nature. The Protestants were led in the council by Thomas Cromwell, the king's vicegerent in ecclesiastical affairs. The Ten Articles (1536) were, on the whole, favorable to the Protestant side; but the bitter matrimonial experiences of the king, taken in connection with the Catholic rebellion in the North, led to the issuing of the Six Articles (1539), which were more in the Roman Catholic interest; and the same circumstances caused the fall of Cromwell (1540). Cranmer was saved from the vengeance of the opposing faction by the king's personal favor. On the death of Henry VIII. and the accession of young Edward VI. (1547) the Protestant party obtained complete control. In his brief reign, under the auspices of Cranmer and his associates, the Protestant Church of England received its constitution, liturgy, and creed. Evangelical theologians from the Continent filled the chairs of theology in the universities. Under Mary (1553–58), the successor of Edward, the old order of things, the papal supremacy included, was restored. Her matrimonial connection with Philip II. and subservience to Spain, and the popular sympathy excited by the martyrdom of Cranmer, Ridley, Latimer, and others, prepared the nation for the restoration of Protestantism under the auspices of Elizabeth, in 1558. During her long reign the Protestant religion took firm root in English soil. The defeat of the Spanish Armada (1588) rendered it certain that the authority of the papacy could not be reinstated by foreign intervention. The conservatism of Elizabeth in matters of religion provoked into activity the Puritan sentiment, which was anxious to assimilate English Protestantism to that of the Continent, where numerous English exiles had lived during the preceding reign. The Puritans likewise demanded a greater independence for the Church in relation to the state than the Tudor love of power and a widespread feeling of repugnance to ecclesiastical control would allow. The result was the division of the Church of England into two great parties whose contests fill many a page of English history for the century that followed the accession of Elizabeth.

In Scotland, at the outbreaking of the Reformation, the clergy were ignorant and vicious, and the Church was in possession of a great portion of the landed property of the kingdom. The evangelical doctrine, of which John Knox was the most effective apostle, gained a lodgment in the hearts of the people, and the co-operation of the nobles was founded partly in religious conviction and partly in the desire to appropriate to themselves the property of the Church. Protestantism in the Calvinistic and Presbyterian

form was legally established by an act of the Scottish Parliament in 1560. The events of the reign of Mary Stuart proved that the new faith was too deeply rooted in the hearts of the middle class of the Scottish nation to be dislodged. The Presbyterian system was fully established in 1592.

X. *The Reformation in Italy and Spain.*—Protestantism in these countries had several peculiar characteristics. Its disciples were confined to the higher, cultivated classes, and the Reformed faith took no root among the people at large. Protestantism was also a thing of degrees. Many held the doctrine of justification in the sense of the Reformers, but felt little repugnance for the old view of the sacraments and the hierarchical government of the Church. The societies of professed Protestants were secret. In Italy there was a widespread desire of Church reform, in which eminent Catholics—such as Caraffa, Contarini, and other members of the Oratory of Divine Love participated. Some of them were subsequently leaders of the Catholic reaction, which aimed at the purification of morals and discipline, but at the same time crushed dissent and schism with an iron hand. In Naples, Venice, Florence, and other cities there were Protestant churches. Eminent preachers like Ochino and theologians like Peter Martyr privately espoused the Protestant faith. These were driven into exile, and Protestantism was extirpated in Italy by the instrumentality of the Inquisition, the *Index Expurgatorius*, and the other agencies of the strict and ascetic party which gained the ascendency in the Church, and which suppressed also the moderate evangelical Catholics of the school of Contarini. In Spain there were Protestant churches at Seville and Valladolid. The writings of Luther and of other Reformers were secretly introduced into the kingdom, as they were in large numbers into Italy; but in Spain also the Inquisition, with its *autos-da-fé* (1559–60), did its work thoroughly.

Literature.—The history of the Reformation occupies, of course, a large space in the general histories of the Church. Of these we may specify Gieseler's, Schaff's, and (on the Roman Catholic side) Alzog's and Döllinger's works. Of the numerous separate writings on the Reformation as a whole, the author would refer to his own work, *The Reformation*; Häusser's *History of the Period of the Reformation* (in an Eng. trans., 1874), which is instructive upon the general course of events; d'Aubigné's well-known history, written by an ardent Protestant; Beard's *The Reformation of the Sixteenth Century*, etc. (1883); Seebohm's *Era of the Protestant Revolution* (1874), a brief work. In the first rank of authorities is the series of histories of the papacy and of England, France, and Germany in the sixteenth and seventeenth centuries, by Ranke. On the Roman Catholic (Ultramontane) side the most noted recent work is Janssen's *Gesch. d. deutschen Volkes seit dem Ausgang des Mittelalters* (5 vols., 1876–86). The literature relating to the Reformation in each of the several countries is copious. George P. Fisher.

Reformatories: See Prison Discipline.

Reformed Church in the United States: the ecclesiastical body which was formerly known as the German Reformed Church, historically derived from the Reformed Churches of Switzerland and Germany. It may accordingly be regarded as the American representative of the oldest of the series of national churches which spring from the great religious movement in the sixteenth century, of which Zwingli and Calvin were the most prominent leaders. In its early European history its most important centers were Zurich, Geneva, and Heidelberg. The union of the churches of Zurich and Geneva was effected by the adoption of the *Consensus Tigurinus* in 1549. In 1559 the Palatinate of the Rhine passed over from the Lutheran to the Reformed Church, and its example was soon followed by several other German principalities. At the direction of the Elector Frederick III., Zacharias Ursinus and Caspar Olevianus prepared the Heidelberg Catechism, which was published in 1563. This catechism was recognized by the Church in Switzerland, and became a common bond of union for the Reformed churches along the whole course of the Rhine from its source to the ocean. It is Christological in its character, giving full expression to Calvin's doctrine of the spiritual real presence, and teaching the doctrine of election, but omitting all reference to an eternal decree of reprobation. The Heidelberg Catechism is the only confession of faith which is formally recognized as of binding authority by the Reformed Church in the U. S.

The American history of the German branch of the Reformed Church may be regarded as consisting of five plainly marked periods.

1. *The Preliminary Period* (1709–47).—Though there were members of the German Reformed Church in the U. S. at an earlier period, it was not until about 1709 that they emigrated to that country in large numbers. In that year John Frederick Hager was ordained in London for service "among the Palatines, New York." During this period the most eminent man was the Rev. John Philip Boehm, who began to preach in what is now Montgomery co., Pa., at least as early as 1720. George Michael Weiss founded the Reformed Church of Philadelphia in 1727. Churches were founded in isolated settlements from New York to South Carolina, but they were most numerous in Pennsylvania. An attempt was made to unite them by means of an organization known as The Congregation of God in the Spirit, but it proved a failure. The churches were very poor, and appealed for aid to the Church of Holland.

2. *The Period of the Coetus* (1747–93).—Michael Schlatter (1716–90) was a native of Switzerland, but had been sent to America in 1746, with the rank of missionary superintendent, to organize the Reformed churches. In 1747 he succeeded in establishing an ecclesiastical body, which was known as the Coetus. It was in all respects like a synod, except that its decisions were not final until they had been approved by the synods of Holland. His visit to Europe in 1751 resulted in the collection of the sum of £12,000, which was invested for the benefit of the German Reformed churches in Pennsylvania. On his return to America in the following year he was accompanied by six young ministers, of whom Stoy and Otterbein became eminent. From the fund collected in Europe the Reformed ministers in Pennsylvania received an annual stipend. There were many independent ministers, of whom the most eminent was Dr. John Joachim Zubly, of Georgia.

3. *The First Period of the Synod* (1793–1825).—The connection with Holland, which had been at first a blessing, became an intolerable burden, and in 1793 the Coetus resolved itself into a synod. This ended the period of dependence. The Church was thrown on its own resources, and met with many discouragements. In some congregations the change of language from German to English induced protracted conflicts. There was a great lack of ministers, and most of the churches in New York, New Jersey, and South Carolina were gradually alienated. It was in the main a period of disintegration, but in its later years the fruits of a new life began to appear. Sunday-schools were introduced, and the work of missions begun. In 1824 the Classis of Western Pennsylvania resolved itself into the Synod of Ohio. The "mother synod" in 1825 numbered 22 ministers and 23,291 members.

4. *The Founding of Literary and Theological Institutions* (1825–63).—A theological seminary was founded at Carlisle, Pa., in 1825. It was removed to York, Pa., in 1829, and thence to Mercersburg, Pa., in 1837. Marshall College was founded at the latter place in 1835. The two institutions were under the same general management, and the little village of Mercersburg became an important literary center. It gave its name to a system of teaching which was known as Mercersburg theology. The professors in the Theological Seminary at Mercersburg at different times were the Rev. Drs. Lewis Mayer, Frederick A. Rauch, John Williamson Nevin, Philip Schaff, Bernard C. Wolff, Henry Harbaugh, E. E. Higbee, and Emanuel V. Gerhart. It was here that Rauch wrote his *Psychology*, Nevin published his *Mystical Presence*, and Schaff began his series of Church histories. In 1853 Marshall College was removed from Mercersburg to Lancaster, and united with Franklin College, which had been founded at that place as early as 1787. The united institution is known as Franklin and Marshall College. Other literary and theological institutions of the Reformed Church are Heidelberg University, Tiffin, O., founded in 1850; Ursinus College, Collegeville, Pa.; Catawba College, Newton, N. C.; Calvin College, Cleveland, O.; and the German Mission House, near Sheboygan, Wis.

5. *The Period of the General Synod.*—In 1863 the two existing synods united in the organization of a general synod. In the same year the tercentenary of the Heidelberg Catechism was celebrated, and several important volumes were published. For some years there were serious conflicts concerning liturgical worship, but these were concluded by the adoption of a *Directory of Worship*. In 1893 the Church appropriately commemorated the centennial anniversary of the organization of its oldest synod.

The Reformed Church in the U. S. publishes 29 periodicals, of which 23 are English and 6 German. It is actively engaged in the work of missions, and has been especially interested in the evangelization of Japan. In the U. S. it has found an extensive field for missionary labor among immigrants from Germany and Switzerland. Several Hungarian churches have recently been founded. The Church sustains four orphanages and a home for deaconesses.

The following are the statistics for 1900: Ministers, 1,075; congregations, 1,677; communicant members, 240,130; benevolent contributions, $630,454. See PRESBYTERIAN CHURCH.

JOSEPH HENRY DUBBS.

Reformed Church of America: a religious denomination known prior to 1867 as the Reformed Protestant Dutch Church in North America, a name which exactly described it, as *Protestant vs.* Roman; *Reformed*—i. e. Calvinistic in doctrine and non-prelatical in order; *Dutch*, as descended from Holland and inheriting its religious type.

1. *Origin and History.*—The first settlers in New Amsterdam brought with them the schoolmaster and the visitor of the sick, and in 1628 a church organization was formed. The emigration from Holland followed the Raritan, the Hudson, and the Mohawk rivers and their affluents, and at first was considerable, but after the English conquest in 1664 fell off rapidly. Still, the Hollanders held the ground they had taken, and everywhere multiplied ministers and churches. Their subsequent growth was hindered by three great causes—too great tardiness in relinquishing the Dutch language in public worship; a bitter controversy among themselves on the question whether they should act independently of the mother-Church in supplying their pulpits; and the waste of the Revolutionary war, whose chief scenes of conflict in the Middle States lay in the territory occupied by the Dutch; but after the return of peace the denomination consolidated its institutions and set to work repairing the desolations of the past. It increased its funds for educational purposes, enlarged its corps of theological professors, prosecuted in various directions missionary enterprises at home, and also engaged in the same work abroad—at first, in connection with other denominations, afterward independently. It numbers (1900) 643 churches, 715 ministers, and 124,248 communicants, who are organized into 34 classes, 4 particular synods, and 1 general synod. The strength of the denomination lies at the East, but seven classes have been formed among the many thousands of Hollanders who have settled in various Western States from Michigan and Illinois to the Dakotas.

2. *Doctrine and Worship.*—The Church is eminently confessional. It owns five creeds—the Apostles', the Nicene, the (so-called) Athanasian, the Belgic Confession, and the Canons of Dordrecht. It requires the Heidelberg Catechism to be taught in families and schools, and also to be regularly explained from the pulpit on the Lord's Day. A short compendium of this catechism is the standard of doctrine for all who seek full communion; and ministers are required to pledge themselves in writing not to promulgate any change of views they may make without previously consulting the classis to which they belong. There is a Liturgy, which is mostly optional, but the forms for the administration of the sacraments, of ordination, and of church discipline are of imperative obligation. No psalmody may be used unless it has been approved by the General Synod.

3. *Polity.*—The affairs of each congregation are managed by a consistory, consisting of elders and deacons chosen for two years, but in such a way that only half go out of office at once. The elders, with the pastor, receive and dismiss members and exercise discipline; the deacons have charge of the alms. Both together are trustees of the church, hold its property, and call its minister. Ex-members of this body constitute what is called the "great consistory," who may be summoned to give advice when necessary. The minister and one elder from each congregation in a certain district constitute a classis, which supervises spiritual matters in that district. Four ministers and four elders from each classis in a larger district make a particular synod, with similar powers, and representatives from each classis, proportioned in numbers to the size of the classis, constitute the General Synod, which has supervision of the whole, and is a court of the last resort in judicial cases.

Educational and other Institutions.—Rutgers College (1770), New Jersey, Hope College (1865), Michigan, Northwestern Academy, Orange City, Ia. (1883), and Pleasant Prairie College, German Valley, Ill. (1893), are controlled by members of this Church, but are unsectarian in teaching and influence. The chief theological seminary, at New Brunswick, N. J., has five professors and a library of over 40,000 volumes. There are two others—one at Holland, Mich., the other at Palmaner, India—each with three professors and a respectable library. Foreign missions are maintained in Japan, China (Amoy), India (Madura), and Arabia. There are 23 ordained missionaries, 55 churches, 6,226 communicants, and an annual outlay of about $112,000. The board of domestic missions aids in sustaining over 150 churches and expends about $65,000 yearly. The board of education aids over 100 students in preparing for the ministry and expends $30,000 yearly. A board of publication, organized in 1854, besides other good work, issues two monthly journals. The salient characteristics of the Church are zeal for doctrine, order, and a learned ministry, unyielding attachment to its own views and usages, and a large charity for all other Christians.

LITERATURE.—Demarest, *History and Characteristics of the Reformed Dutch Church* (2d ed. 1889); Corwin, *Manual* (3d ed. 1879).

T. W. CHAMBERS.

Reformed Church of Scotland: See SCOTLAND, CHURCH OF.

Reformed Episcopal Church: a religious body founded Dec. 2, 1873, by a few clergymen and laymen who left the Protestant Episcopal Church of the U. S. under the leadership of the Right Rev. George David Cummins, D. D. Unwilling longer to share responsibility for what he believed to be the Romeward tendencies of that church, he resigned his bishopric in it, and and was chosen the first presiding bishop of the new Church under the following resolution: "That we, whose names are appended to the call for this meeting as presented by Bishop Cummins, do here and now, in humble reliance upon Almighty God, organize ourselves into a Church, to be known by the style and title of 'The Reformed Episcopal Church,' in conformity with the following declaration of principles, and with the Right Rev. George David Cummins, D. D., as our presiding bishop:

"I. The Reformed Episcopal Church, holding 'the faith once delivered unto the saints,' declares its belief in the Holy Scriptures of the Old and New Testaments, as the Word of God, and the sole rule of faith and practice; in the creed 'commonly called the Apostles' Creed'; in the divine institution of the sacraments of baptism and the Lord's Supper; and in the doctrines of grace substantially as they are set forth in the Thirty-nine Articles of Religion.

"II. This Church recognizes and adheres to episcopacy, not as of divine right, but as a very ancient and desirable form of Church polity.

"III. This Church, retaining a liturgy which shall not be imperative or repressive of freedom in prayer, accepts the Book of Common Prayer as it was revised, proposed, and recommended for use by the General Convention of the Protestant Episcopal Church, A. D. 1785, reserving full liberty to alter, abridge, enlarge, and amend the same, as may seem most conducive to the edification of the people, 'provided that the substance of the faith be kept entire.'

"IV. This Church condemns and rejects the following erroneous and strange doctrines as contrary to God's Word:

"(1) That the Church of Christ exists only in one order or form of ecclesiastical polity.

"(2) That Christian ministers are 'priests' in another sense than that in which all believers are 'a royal priesthood.'

"(3) That the Lord's Table is an altar on which the oblation of the body and blood of Christ is offered anew to the Father.

"(4) That the presence of Christ in the Lord's Supper is a presence in the elements of bread and wine.

"(5) That regeneration is inseparably connected with baptism."

At its General Council in New York in May, 1874, it revised the Prayer-book of 1785 to meet the needs of the changed times, but without making any variations of principles or doctrines. The use of the Prayer-book was made obligatory at Sunday morning services and optional at other times. At the same time it adopted its first constitution and canons. At its third General Council at Chicago a year later it adopted its Articles of Religion, based substantially upon the Thirty-nine Articles of the Church of England.

The Reformed Episcopal Church is governed by a general council, its president being the presiding bishop for the time being, meeting annually, biennially, or triennially as

ordered at each session. This council has supervision and control of all Reformed Episcopal parishes in America, which are subordinately grouped into the following divisions, named in the order of their organization: The First Synod of Canada; the Missionary Jurisdiction of the Pacific; the Synod of New York and Philadelphia; the Missionary Jurisdiction of the South; the Special Missionary Jurisdiction of the South (consisting of congregations composed of colored persons); the Missionary Jurisdiction of the West and Northwest; and the Synod of Chicago. This Church was also planted in England in 1877, and its churches in Great Britain were under the control of its General Council until May, 1883, when they were, by resolution of the council, given a separate and independent existence under the title of the General Synod of Great Britain and Ireland. This body in 1894 was merged with the "Reformed Church of England" under the name of "The Reformed Episcopal Church in the United Kingdom of Great Britain and Ireland, otherwise called The Reformed Church of England."

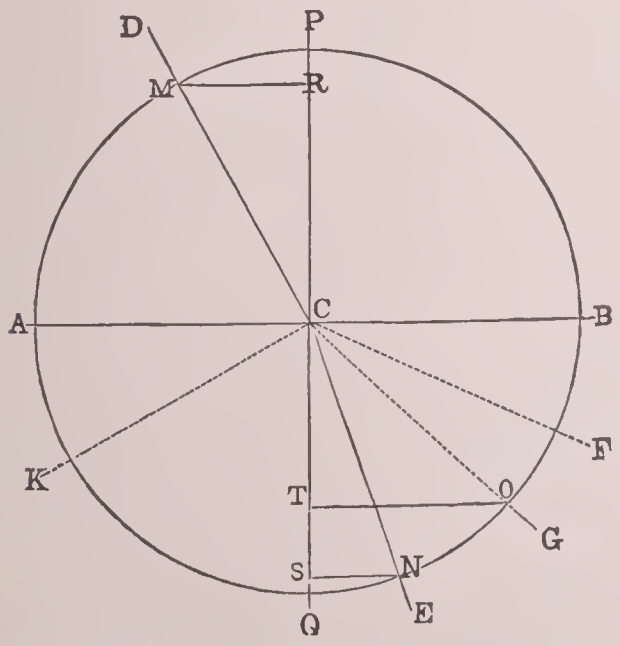
Bishop Cummins was the presiding bishop of this Church until his death June 26, 1876. Since that time the office has been filled by election at each General Council. The young Church had its first five years of life during the unexampled and long-continued financial depression which begun in 1872, but its development was steady and rapid during ten years. Since that time its growth has been more in internal strength and solidity than in extension. As shown by the reports to the General Council at its session in June, 1894, there were in the U. S. 112 churches and missions; 8 bishops: 90 presbyters; 18 deacons; 10,655 communicants; 12,873 Sunday-school scholars, officers, and teachers; $181,150 total annual contributions, of which $123,050 were for current expenses; 102 church buildings and chapels and 11 rectories, all valued at $1,533,017; a theological seminary, value $90,000; a Home for Aged and Disabled Clergymen, value, $8,000; 2 church extension trust funds, $400,000, making a total of $2,031,017. In 1900 there were 104 churches, and 9,743 communicants. CHARLES D. KELLOGG.

Reformed Presbyterians: a religious body in Scotland and the U. S., often called COVENANTERS or CAMERONIANS (*qq. v.*), originating in 1680. They hold that a church member may not take an oath of allegiance to any government that fails to acknowledge the kingly authority of Christ, nor vote for any officer who must take such an oath. A Reformed Presbytery was organized in North America in 1774. In 1782 it united with the Associate Presbyteries of Pennsylvania and New York. Hence arose the bodies of Reformed and Associate Reformed Presbyterians now existing. For an account of these movements in their order, with statistics for 1894, see PRESBYTERIAN CHURCH.

Revised by W. J. BEECHER.

Refraction [from Lat. *refrin'gere*, *refrac'tum*, break up, (in Mod. Lat.) refract; *re-*, again + *fran'gere*, break: Eng. *break*]: the change of direction in light, sound, heat, and similar waves on passing from one medium into another.

REFRACTION OF LIGHT.—The deflection of a light-ray. When a ray of light falls obliquely upon the surface of a transparent medium, a portion of it is reflected (see REFLECTION); the remaining portion enters the medium, is bent aside at its point of entrance, but after that pursues a straight path through the transparent body. In the simplest case of refraction there is only one ray; but in double refraction the intromitted light breaks up into two rays. In simple refraction the deflection of the ray is governed by fixed laws, and the amount of the bending is invariable for each refractive medium. These laws may be best explained through the figure. Let B A be the upper surface of a refractive medium denser than air. At C draw P Q perpendicular to B A, and let the incident ray D C meet B A in C. The medium below C being denser than the air above it, the ray D C is bent toward P Q, making D C E the refracted ray, P C D the angle of incidence, and Q C E the angle of refraction. To determine the amount of the deflection, about C as a center, describe a circumference cutting the incident and refracted rays in M and N, from which points draw M R and N S perpendicular to P Q. M R is the sine of the angle of incidence, and N S the sine of the angle of refraction. The law of refraction, called Snell's law, is that for each refracting medium the sines of these angles bear to each other an invariable ratio, while the incident and refracted rays and the normal lie in one plane. The *index of refraction* is the numerical expression for the ratio of the sines. When a light-ray passes from air into water, for instance, the proportion of the sines is very nearly that of 4 to 3. The refractive index is therefore in this case expressed by the fraction $\frac{4}{3}$, or more exactly by the decimal 1·335. Experiment shows that if the ray passes from the more refractive medium, water, into the less refractive, air, the deflection will be from the normal P Q, and the refractive index will be nearly $\frac{3}{4}$, the reciprocal of the index of the reverse case. The ray on entering the more refractive medium is bent toward the normal, and in entering the less refractive medium is bent from the normal by the same amount; the ray can therefore always return by the path of its arrival, the refractive index being in the one case the reciprocal of what it is in the other.



Looking at the figure, it will be seen that any ray, however oblique, which falls upon A B from the air above will be refracted toward P Q. The reverse is not, however, invariably true. If a ray passes upward through the water, at certain angles refraction is impossible. Let the ray G C, following the law of the sines, just graze the surface of the water B A after being refracted from P Q; then any ray which enters the water between G and B from the direction F, as F C, can not be refracted; for the portion after bending at its proper angle would be within the water, where no change of direction would be possible. The ray which can not be refracted is therefore totally reflected. The critical angle at which total reflection begins is evidently such that its sine equals the reciprocal of the index of refraction. Total reflection at times causes the bottoms of very shallow ponds to be invisible to an eye at a certain angle from them. Every ray of scattered light, by which objects upon the bottom would become visible, reaches the surface of the water at an angle of total reflection, can not emerge, and is turned downward again.

The variation in the refractive indices of different media shows that bodies have different capacities of receiving light through their bounding surfaces. This fact, according to the wave theory, results from the slower propagation of the luminiferous ether-vibrations in the denser medium. Optical density, however, does not necessarily coincide with density of mass. Bisulphide of carbon (CS_2) is lighter than crown glass, but has a greater index of refraction for each kind of light. The velocity of propagation varies inversely as the refractive index, and it is an important mathematical property of the propagation of light that, when a ray passes from one point to another through any number of different media, the time of transmission between the two points is the least possible.

From the law of refraction it is manifest that when a ray passes through a medium with parallel faces, as a pane of window-glass, its course after emergence is parallel to the original direction. All the rays which go to make up the image upon the eye of an object so viewed, therefore, assume their relative positions, and the proportions are perfect, though the whole object is slightly displaced, the amount of displacement being dependent upon the thickness of the glass. An object viewed through imperfect glass, where the faces are not strictly parallel, has its proportions altered, because the emergent rays which go to form it are not parallel, but diverge, or converge, or cross each other, at all sorts of angles. It will be found that the distortion be-

comes more striking as the eye recedes from the glass, the divergencies being more noticeable at a distance. Most optical instruments are dependent upon refraction, and are constructed in accordance with its laws. See ABERRATION, LENS, MICROSCOPE, and TELESCOPE. For the different refrangibilities of each colored ray in the spectrum, see ABERRATION, INTERFERENCE, LENS, LIQUIDS, SPECTRUM. For the history of discovery, see OPTICS. Revised by R. A. ROBERTS.

Double Refraction.—That particular case of refraction in which a ray of light on entering a medium is divided into two rays. One of these, called the ordinary ray, is propagated in accordance with Snell's law. The other, called the extraordinary ray, is propagated in accordance with a much more complex law, which was first shown by Huyghens in 1690 to be a necessary consequence of the assumption that the luminiferous ether in the medium is unequally elastic in two directions, each perpendicular to the other. The phenomena of double refraction are seen to the best advantage in the mineral calcite, a crystalline variety of calcium carbonate. (See OPTICS.) In other double refracting bodies the separation of the two rays is not wide enough to be easily perceptible, but by special contrivances (see POLARIZATION) they may be made to interfere, and many of the most brilliant color effects are thus attained. By such means it has been ascertained that the property of double refraction is exceedingly common in transparent media, being absent only from those homogeneous bodies which are uniform in density, non-crystalline, or isometrically crystallized. (See CRYSTALLOGRAPHY and MINERALOGY.) The two beams are always polarized, the plane of polarization of one being perpendicular to that of the other, except in the case when they coincide in the direction of the principal optical axis of the crystal. In calcite this direction is equally inclined to the three faces whose intersection forms an obtuse triedral angle. The widest separation of beams is in a plane perpendicular to this axial direction. Under this special condition each ray is propagated in accordance with Snell's law, the index of refraction of the ordinary ray being 1·658 for monochromatic yellow light (D line), while that of the extraordinary ray is 1·486. Since the velocity of propagation varies inversely as the index of refraction, the velocity of the ordinary ray is not quite nine-tenths of that of the extraordinary at maximum separation. In the case of quartz under similar conditions the velocity of the ordinary ray slightly exceeds that of the extraordinary. On this basis double refracting crystals are divided into two classes, negative and positive, calcite being a typical example of the negative and quartz of the positive. Calcite and quartz, moreover, have each but a single axis, along which there is no double refraction, while in many other crystals, such as niter, there are two such directions. On this basis, therefore, crystals are still further divided into two classes—uniaxial and biaxial. It was shown by Fresnel that in transmission through biaxial crystals both rays fail to meet the requirements of Snell's law; each therefore may be properly called extraordinary. In certain varieties of mineral, such as mica, some specimens are found to be uniaxial and others biaxial.

For Huyghens's determination of the direction of either ray in a double refracting medium, see POLARIZATION.

Index of Refraction.—The constant ratio of the sine of the angle of incidence to the sine of the angle of refraction when a ray of homogeneous light passes through the bounding surface between two media. Thus if a ray of monochromatic yellow light (D line) at a temperature of 15°C. pass from a vacuum into water at an incident angle of 60°, the angle of refraction will be found to be 40° 29′. The index of refraction, n, under these conditions is

$$n = \frac{\sin 60^\circ\ 00'}{\sin 40^\circ\ 29'} = 1{\cdot}3339.$$

If the first of these media be air instead of a vacuum, since the index of refraction of air is 1·000294, the relative index of refraction of water with respect to air is found by dividing the former result by the latter, giving 1·3335. Since ordinary measurements are made in air rather than in a vacuum the refractive index referred to a vacuum is usually called the absolute index by way of distinction.

The index of refraction affords a convenient means of comparing the refracting powers of different media. For the indices of refraction of different kinds of glass and several liquids, see LENS and LIQUIDS. For a full table of refractive indices for various media, the reader is referred to Landolt and Börnstein's *Physikalisch-Chemische Tabellen* 2d ed., pp. 384 to 447). W. LE CONTE STEVENS.

REFRACTION OF SOUND.—The change in direction of sound-waves on passing from one medium into another. A beam of sound—regarded as any very small segment of an advancing spherical wave-front—moves normally in a radial line, but it is bent from its rectilinear course whenever it undergoes an unequal acceleration or retardation, necessarily turning toward the side of least velocity and from the side of greatest velocity. In other words, the direction of acoustic impulse is always *perpendicular* to the wave-front of sound, whether it continues as an expanding spherical surface, or, by reason of unequal velocity, becomes in any way deformed.

There are four ways in which sound-waves may be subjected to an unequal disturbance of velocity, and the sound-beams become thereby refracted: 1. By variation of *elasticity* in the medium. If the density be unchanged, the velocity of sound varies directly as the square root of the elasticity. 2. By variation of *density* in the medium. If the elasticity remain unchanged, the velocity varies inversely as the square root of the density. 3. By variation of motion, or *current*, in the medium. Sound traveling with the wind is propagated a little more rapidly than against the wind. 4. By variation of *temperature* in the medium. If other elements remain unchanged, the velocity of sound in air varies directly as the square root of the absolute temperature. The effect of heat on a gas is to increase its elasticity if confined, and to diminish its density if unconfined; in either case equally it accelerates the velocity of propagation.

(1) Perhaps the only practical example of acoustic refraction by differences of *elasticity* is furnished by the passage of sound from water into air or from air into water. Sound moves more swiftly through liquids (and still more so through solids), not in consequence of their greater density, but in opposition to their density, and by virtue of their far greater energy of resilience or elasticity, measured in intensity, not in quantity. The concentric sound-waves sent upward by a submarine explosion to the level surface of the water there suffer a large amount of internal reflection, with a reverse curvature, giving the sound-beams the same amount of divergence downward that they previously had upward. A portion of each of the sound-waves, however (with greatly diminished amplitude of vibration), is propagated into the air. These have their convex fronts very much flattened, by reason of being reduced to less than one-fourth of their previous velocity. The radii of these deformed surfaces, representing the directions of the sound-rays, are thus bent or refracted upward (or toward the vertical) at the surface of the air, and have a focus of divergence much more distant than the position of the origin of the sound-waves. In the case of an aërial sound, as the discharge of a gun, the descending sound-waves are largely reflected upward from the surface of the water; but a small portion of the impulse passing this plane, the convex wave-fronts, acquiring suddenly more than four times their previous velocity, are hurried into greatly increased convexity, and the sound-rays are refracted toward the horizon, with a divergence representing a much lower or nearer focus than the origin of the sound. Those sound-rays which by refraction would coincide with the horizontal plane or water-surface would necessarily suffer total reflection.

(2) The refraction of sound resulting from differences of *density* was first demonstrated by Carl Sondhauss in 1852 by means of a convex lens of carbonic-acid gas confined in an envelope of collodion film. The ticking of a watch was heard, with the lens interposed, most distinctly at a focal point where it could not be heard on the removal of the lens. (*Poggendorffs Annalen*, 1852, lxxxv., 381.) In this case the wave-front on entering the convex surface of the lens is so far retarded by the denser gas (commencing at the axis of the lens) as to have a concave form impressed upon it, and on emerging from the second surface of the lens in reversed order becomes still more concave by being accelerated first at the outer annulus. The normals of these concave waves converge to a focal point.

(3) The refraction of sound by inequality of *wind* was first suggested by Prof. Stokes in 1857. Winds, being ordinarily more retarded near the earth than aloft, would act unequally upon the concentric sound-waves advancing against them, by retarding the upper portion of the wave-fronts more than the lower portion. Being thus tilted backward more and more as they advanced against the wind, these wave-fronts would have their lines of impulse, representing the acoustic beams, bent gradually upward from the surface, so as to leave a sound-shadow at no great distance on a plane. On the con-

trary, sound-waves advancing in the direction of the wind would, for the same cause, have their fronts more tipped forward above than below, and the line of acoustic effect would be bent downward, bringing continuously some of the upper sound-beams to the observer's ear at great distances. This explains why sounds are usually heard with so much better effect and to so much greater distance in the direction of the wind than in opposition to it. In those exceptional cases where the upper wind is moving with less velocity than the lower wind, sound will be heard to a greater distance against the wind.

(4) The refraction of sound from differences of *temperature* was first pointed out in 1874 by Prof. Reynolds, who showed that during the heat of a still summer's day, when the lower air had a higher temperature than the upper air, loud sounds could be heard to but short distances, but that in the evening, when the lower air became cooler, the same sounds were heard distinctly several times the former distance. (*Proceed. Roy. Soc.*, 1874.) The difference of sound-velocity due to the temperature is about 1 foot for 1° F. Hence when the lower strata of air are the warmest (as is usually the case), the advancing wave-fronts are accelerated below, causing the sound-beams to curve upward, as in the case of adverse winds. This explains why the sound of waterfalls is heard so much farther and more distinctly at night than during the day, even in the most silent of rural districts. When the lower strata of air are colder than the upper (as more rarely occurs), the advancing sound-waves are tipped forward above, bending downward the sound-beams, and thus greatly favoring audibility at a distance. This explains the facility with which sounds can sometimes be heard to unusual distances in Arctic regions. See Acoustics.

Revised by W. Le Conte Stevens.

Refrigerants [from Lat. *refri'gerans*, *refrigeran'tis*, pres. partic. of *refrigera're*, cool off again, make cool; *re-*, again + *frigera're*, to cool, deriv. of *fri'gus*, coldness, cold]: a term sometimes used in medicine to designate collectively certain medicines given in fever which produce a grateful feeling of relief from the distress of the febrile symptoms. Such are cooling drinks in general—solutions of potassium salts, as the citrate or nitrate; effervescing draughts, acid mixtures, and solutions of purgative salts. The term has no proper scientific signification.

Refrigerating Processes: the means of producing artificial cold by machinery for the purpose of cooling the interior of buildings to a temperature below that of their natural surroundings. Such processes consist in the application of heat through the medium of steam to cause a series of operations with one of the following substances: (1) Air; (2) sulphuric ether; (3) methylic ether; (4) sulphur dioxide; (5) chymogene, a distillate of petroleum; (6) carbonic acid; (7) anhydrous ammonia, the substance most extensively employed in commercial refrigeration; (8) water. The first six of these substances are available for refrigerating purposes only by means of what is termed the compression system, but the last two may be utilized either by a compression system or what is termed the absorption system.

Compression System, Brine Circulation.—Fig. 1 illustrates the essential features of a compression system for a cold-storage warehouse. D is a gas compressing-pump, driven by any form of steam-engine. E is a nest of pipe connecting with the outlet from the compressing-pump, which is kept drenched or surrounded with cold water at about 60° F., constituting the condenser. A is a closed tank connecting with the outlet from the condenser, constituting the liquid ammonia reservoir. C is a nest of pipe immersed in a bath of brine or other fluid, non-congealable at the lowest desired temperature, constituting the cooler. One end of this nest of pipe connects with the reservoir A by means of a valve, B, termed the expansion-cock, and the other end connects with the inlet, or suction end, of the compressing-pump. H represents cold-storage chambers or rooms having insulated walls, within which it is desired to maintain a low temperature by circulating cold brine through the nests of pipe F. This is accomplished by means of the brine-pump P, which draws brine from the bottom of the bath and forces it through the pipes *b*, whence it returns to the top of the bath, or brine-tank.

The operation of the apparatus is then as follows: The expansion-cock being closed, a tank of liquid anhydrous ammonia is connected so as to discharge into the cooler, and the compressing-pump is operated so as to prevent the accumulation of more than the desired pressure—say, 19 lb. above the atmosphere—in the cooler. The tank of liquid anhydrous ammonia in the condition in which it is received from the manufacturing chemists is at the temperature of the atmosphere—say, 70° F. At this temperature the ammonia can exist as a liquid only when it is under a pressure of about 115 lb. per square inch above the atmosphere. The ammonia therefore flows from the tank into the cooler; but in the latter the pressure is only 19 lb., and at this pressure the ammonia can not exist as a liquid unless its temperature is about 5° F., which is the boiling-point corresponding to the pressure. Hence, as its temperature on entering the cooler is about 70°, it is in the condition of a liquid heated above the boiling-point due to its pressure. Vaporization will therefore occur until the latent heat of the portion vaporized equals the heat represented by the difference between 70° and 5°, when the ammonia will have cooled itself to the latter temperature. About 10 per cent. of the weight of ammonia will have vaporized as a consequence of the fall of temperature, or, in technical terms, 10 per cent. of the ammonia is vaporized by free expan-

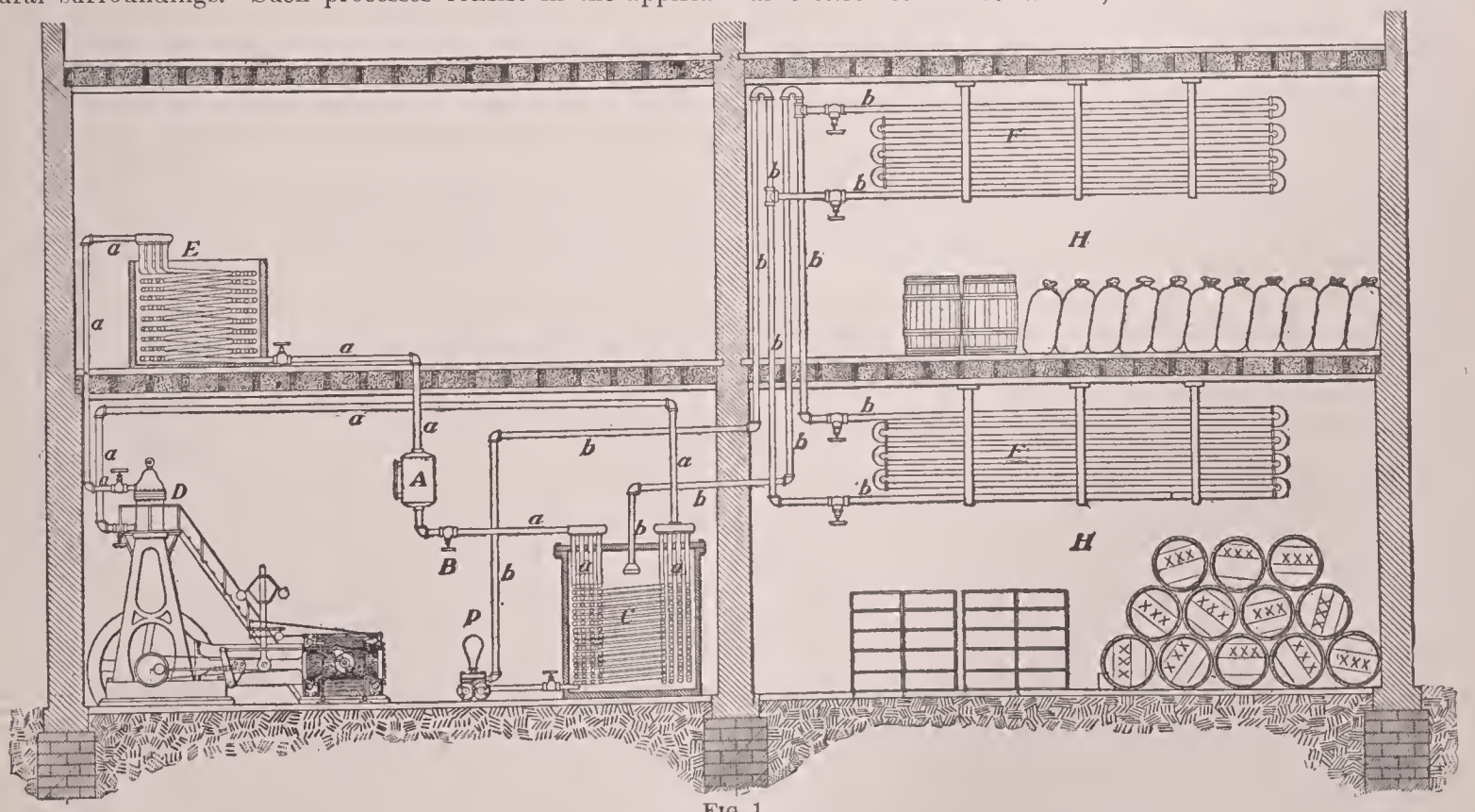


Fig. 1.

sion. Ninety per cent. of the ammonia is therefore in the liquid state when it has attained the temperature of ebullition corresponding to the pressure existing in the cooler, and if no heat could be supplied from surrounding bodies it would remain liquid; but it is practically in direct contact with the brine, whose temperature is so much higher than that of the ammonia that the latter must receive heat from the brine, and, as the compression-pump by its suction prevents the pressure in the cooler from increasing, the effect of the heat received will be to evaporate the liquid ammonia without increasing its temperature. The brine may therefore be cooled by an amount equivalent to the latent heat of 90 per cent. of the total ammonia introduced into the cooler. All of the ammonia is not, however, allowed to vaporize in the cooler in some types of compression-machines, while in other systems particular care is taken to insure its complete vaporization. This difference of treatment gives rise to two classes of apparatus, one known as the wet or cold compression and the other the dry-compression type. In either case all of the ammonia is drawn into the compressing-pump, which forces it into the condenser, where sufficient ammonia is gradually accumulated to cause the pressure to equal that at which it will be liquefied, by means of the cooling water with which the condenser is supplied. When a sufficient amount has liquefied to fill the reservoir A to the desired extent, as shown by a gauge-glass attached to it, the charging of fresh ammonia to the cooler is discontinued, and the expansion-cock B is opened so that liquid ammonia flows into the cooler from the reservoir A at the same rate as the latter receives ammonia from the condenser. This ammonia undergoes free expansion and evaporation in the cooler, and the operations are then continuous, the temperature of the brine gradually approaching that corresponding to the boiling-point of ammonia at the pressure maintained in the cooler by the suction of the pump. When the desired brine temperature is reached its circulation through the cold-storage rooms is commenced. Generally the brine returns to the tank, after passing through the storage-rooms, at about 6° higher temperature than that at which it leaves the tank, and its mean temperature is from 6° to 16° higher than the boiling-point of the ammonia corresponding to the suction-pressure, according to the efficiency and extent of the pipe-surface in the brine-tank. The mean temperature of the brine is about 6° less than that of the storage-space required to be cooled. For the storage of beer a temperature of about 36° F. is required, and this is therefore afforded with a pressure of about 28 lb. above the atmosphere in the cooler. Slaughter-houses require about 25° F. in their storage-rooms, which may be afforded by about 24 lb. suction or cooler pressure; while for the storage of fish, requiring a temperature of about 0° F., a suction-pressure of about 5 lb. above the atmosphere must be used.

Air and Chloride of Calcium Circulating Systems.—Instead of brine chloride of calcium is used as a circulating medium, first, because the corrosion of iron pipes is thought to be less by its use than with brine, and, second, because at temperatures approaching 0° F. brine, unless made from the best qualities of rock-salt, is liable to partly congeal, whereas chloride of calcium is perfectly fluid at temperatures considerably below zero. In cold-storage practice at Boston air from centrifugal fans is blown over the surfaces of the cooler, and by a system of wooden conduits is circulated through storage-chambers. Pipes in the storage-chambers are thus avoided. The expenses of such a system are possibly a little greater than that of a brine system, but by its use a storage-chamber freshly filled with material can be more quickly cooled to a given temperature than by either a brine or a direct-expansion system.

Direct-expansion Compression Systems.—If instead of using cold brine in the pipes in the storage-chambers the liquid ammonia is circulated through them, we have what is called a direct-expansion system. The storage-chamber piping then constitutes the cooler. If it is desired to refrigerate spaces at long distances from the compressor, this system is necessary, as the liquid ammonia from the condenser can be conveyed to an expansion-cock at any point without the expensive insulation necessary on conduits for cold brine. In St. Louis and Denver, for example, areas of half a mile radius are successfully refrigerated by ammonia conveyed in underground pipes. Where, however, the refrigeration is confined to a part of a building near by or containing the compressor, the use of brine is by many regarded as a desirable safeguard against damage of stored material by the accidental escape of ammonia from the circulating pipes, notwithstanding the fact that the cost for piping is less for the direct-expansion system, and that it saves in cost of operation to the extent of most of the power consumed by the brine-circulating pump, and by permitting the suction-pressure to be from 5 to 10 lb. higher to secure a given temperature in a storage-space than is possible with brine as a medium of transmission between the ammonia and the material to be cooled.

"Wet" versus "Dry" Compression System.—In the wet system, which is known also as the Linde system, the presence of some liquid ammonia in the compression-cylinder limits the highest temperature in the latter to about the boiling-point, corresponding to the highest pressure produced by compression, whereas with the dry system the maximum temperature in the compressing-cylinder is upward of 100° F. higher. If the compressing-cylinder was absolutely non-conducting, the wet process should be more economical than the dry method, but the influence of the cylinder-walls appears, by tests, to make the two systems practically equal in economy. See the table near the end of this article.

Ammonia-absorption System.—If instead of being drawn into the compressing-pump the ammonia gas leaving the cooler is led into contact with hydrate of ammonia surrounded by a bath of cooling water, it may be dissolved or absorbed by the hydrate as rapidly as it would enter the cylinder of a compressing-pump. The resulting hydrate of ammonia being then withdrawn by an ordinary pump from the vessel, called the absorber, in which the absorption has occurred, and forced into a still or closed vessel containing a steam-coil, the ammonia absorbed may be distilled from the hydrate as a gas at the same pressure which could be given it by the compressing-pump—that is, the liquefying pressure corresponding to the temperature of the cooling water available for the condenser, the hydrate resulting from the distillation being meanwhile returned to the absorber to react upon more gas from the cooler. The distilled gas being led to a condenser produces liquefied anhydrous ammonia, which can be used through an expansion-cock and cooler like that coming from a condenser of a compression system. Such a series of operations constitutes the ammonia-absorption system. In other words, for the compressing-pump, with its steam-engine in a compression system, there is substituted a vessel called an absorber, a common liquid-pump, and a steam-still. All the other elements, namely, the condenser, liquid-ammonia reservoir, expansion-cock, and cooler, Fig. 1, are identical for the two systems.

A section of a leading absorption refrigerating-machine is given in Fig. 2. G is the still or generator containing the steam-coil *c*, which is supplied with steam by pipe *c* and drained by a steam-trap, I. The distilled gas leaves the generator at J after passing over the baffle, or separating-plates K, to be freed of entrained water. It then passes to the condenser E, which is in two sections, arranged so that water-vapor condensed in the part L can be drained back to the generator. The hydrate or weak liquor resulting from the distillation sinks by its increase of specific gravity to the bottom of the generator, and thence passes by the pipe *a* to the absorber D to reunite with gas entering the latter by the pipe *d* from the cooler C. Simultaneously the recharged hydrate or strong liquor from the absorber is delivered to the generator by the pump P and pipe *e*. In the vessel called the interchanger the weak liquor at about 270° gives up heat to the strong liquor, which leaves the absorber at about 130°. The cooling water which is supplied to the condenser E acts afterward to cool the absorber, the chemical union of the gas and weak liquor being accompanied with generation of heat. A is the liquid-ammonia reservoir, B the expansion-cock, and C the cooler and brine-tank.

All the above remarks regarding the brine, chloride of calcium, air, or the direct-expansion methods of circulation apply as well to the absorption as to the compression system.

Ammonia Compression versus Absorption System.—If a compression system is driven by an ordinary non-condensing Corliss engine affording an indicated horse-power with 3 lb. of fuel, tests of performance show that its economy of fuel is about equal to the best absorption systems when the efficiency of the boiler is equivalent to the evaporation of 11·1 lb. of water per pound of combustible from and at 212° F., and the suction-pressure is about 20 lb. above the atmosphere—that is, when the temperature of the material to be refrigerated is required to be about 20° F. For higher temperatures or higher suction-pressures the compression-machine is superior in economy of fuel, but for lower tempera-

tures theory indicates that the absorption-machine affords the better economy, unless the compression system employs multiple-expansion condensing-engines. Tests indicate that the compression system requires less cooling water than the best absorption systems, apparently because the ammonia leaving the still or generator can not be entirely freed from entrained water or its vapor.

Water, sulphuric ether, sulphur dioxide, carbonic acid, methylic ether, and chymogene can be used in compression systems like those described above for anhydrous ammonia. In the case of water, temperatures in the cooler less than 32° F. require the absolute suction-pressure to be less than ·08 lb. per square inch, or within about ·16 inch of mercury of a perfect vacuum. The fuel required for a given refrigerating effect is about 20 per cent. more than for ammonia, but the dimensions of the compressing-cylinder must be upward of 150 times that required for ammonia. The use of water in a compression system is therefore impracticable, except for making artificial ice very quickly, as explained under Ice-making (*q. v.*). Sulphuric ether was the first substance practically applied to refrigeration by the compressing system. It affords 5° F. in the cooler when the absolute suction-pressure is 1·7 lb. per square inch, and the condenser-pressure, for ordinary temperatures of cooling water, about 8 lb. absolute. The economy of fuel would be nearly equal to that with ammonia, but the volume of the compressing-cylinder must be upward of seventeen times that required for ammonia. The use of ether is therefore obsolete. Sulphur dioxide affords a temperature of 5° F. in the cooler, with about 12 lb. absolute suction-pressure, and about 50 lb. absolute condenser-pressure. Its economy is practically identical with that of ammonia, but the compressing-cylinder must be about three times greater in volume than with the latter substance. Refrigerating-machines using sulphur dioxide are still manufactured to a limited extent in the U. S., where they are known as the Pictet system. The same system in Europe uses a mixture of sulphur dioxide and about 3 per cent. of carbonic acid, which forms what is known as the Pictet fluid. The latter's pressure and density for a given temperature are about 25 per cent. greater than those of sulphur dioxide, but the fuel economy resulting from its use is not sensibly different. Carbonic acid affords 5° F. in the cooler with an absolute suction-pressure of 342 lb. and a condenser-pressure of about 900 lb. per square inch. The fuel required for a given refrigerating effect is about 50 per cent. more than for ammonia, but the volume of the compressing-cylinder is only about one-fourth that required for ammonia. Carbonic acid is as yet in use to a limited extent, but its relatively greater compactness and inoffensive character are leading to its recommendation for service on ships where economy of space is necessary. Nothing very definite is known regarding the application of methylic ether and the petroleum product chymogene in practical refrigerating service. A few machines have been operated with these substances, but they are not now utilized. The physical properties of both of these substances would afford about the same economy of fuel for refrigerating purposes as is available for ammonia. The dimensions of the compressing-

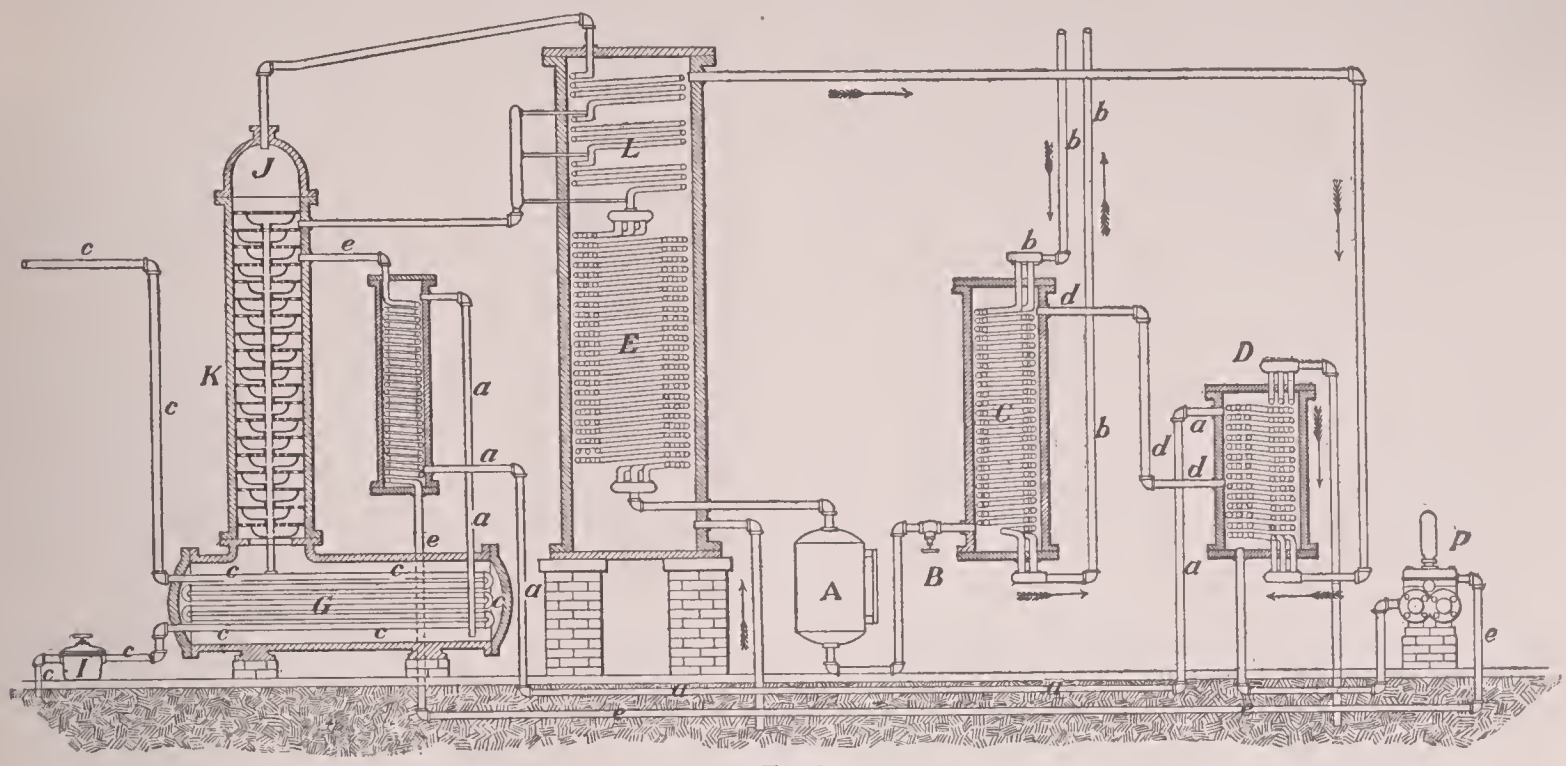


Fig. 2.

pumps would probably be for chymogene intermediate between sulphuric ether and sulphur dioxide, and for methylic ether intermediate between sulphur dioxide and ammonia. Atmospheric air used as a refrigerating substance requires that for the expansion-cock (Fig. 1) there should be substituted a cylinder and piston. If the air at the pressure of the condenser entered the cooler simply by means of an expansion-cock the temperature would not fall, and hence no refrigeration could be effected. In order to lower the temperature the air must be made to perform work against a piston while its pressure falls from that in the condenser to that of the cooler. Hence an expanding as well as a compressing cylinder must be provided. The work done by the air in the expanding cylinder is available to assist in compressing the air, but the losses by friction due to the presence of the extra cylinder considerably reduces the economy. If the air is drawn from and exhausted into the atmosphere at each stroke of the compressor, then in order to secure 5° F. as the minimum temperature a condenser pressure of 22 lb. per square inch absolute would be necessary with perfect action. The fuel for a given refrigerating effect would be about twice that required for ammonia, and the volume of the compressing-cylinder would have to be about sixty times that needed for ammonia. To secure smaller dimensions a condenser-pressure of about 60 lb. per square inch is used, which makes the volume of the compressing-cylinder only about twenty times that needed for the same refrigerating capacity with ammonia; but as the theoretical temperature in the cooler is then nearly 100° F. below zero, the consumption of fuel for a given refrigerating effect is about six times that for ammonia. If instead of drawing air from and discharging it into the atmosphere a closed system is used, so that the lowest air-pressure is about 40 lb., the volume of compressing-cylinder necessary is only about six times that required for ammonia, but the economy is about the same as in the atmospheric system. Air-machines are in extensive use in ships, because the use of air incurs no such risk of destruction of provisions preserved by the artificial cold as exists from danger from leakage when such chemicals as sulphur dioxide or ammonia are used. Many ships are now successfully refrigerated by ammonia compression, brine systems, however.

The table on the next page, abstracted from *Ledoux on Ice-making Machines*, shows the best results of tests of performance of current types of refrigerating-machines. The relative economy is shown by the figures in column seventeen, and the capacity by those in column fourteen. Both the economy and capacity may be observed to vary considerably with the suction-pressure, which is the controlling thermo-dynamical element. See *Transactions of the American Society of Mechanical Engineers*, vol. xii., p. 362.

The absorption principle described above can be applied with water or brine as the refrigerating substance, and sulphuric acid as the absorbent. The water or brine is fed into a chamber or cooler in which a vacuum of about ·16 inch of mercury, or less, is maintained by an air-pump. A portion of the liquid evaporates by free expansion, and temperatures as low as 32° are produced with water, or as low as 14° with brine. The unevaporated liquid is frozen to ice if it is water, or circulated through the spaces to be refrigerated if it is brine. The vapor is drawn into a vessel or acid-chamber, adjoining the cooler, containing anhydrous sulphuric acid, which absorbs it. The resulting mixture, or dilute acid, is pumped into the still or generator, which frees it of water, and it is then returned to the acid-chamber to reabsorb the vapor. Experiments with the apparatus on a small scale indicate that the economy of the process for general refrigerating purposes may be superior to that in which ammonia is used, and that it may afford a means of making ice with considerably less expense and space for plant than by the use of any other of the refrigerating substances. This method is employed in one of the oldest forms of refrigerating-machines, where, by means of a hand-pump, a vacuum is produced in a glass bottle or caraffe filled with water, and ice is formed inside the bottle for table use. One-fourth of the water is vaporized and absorbed by sulphuric acid or other substances having a strong affinity for water, and the remaining three-fourths is converted into ice. D. S. Jacobus.

ACTUAL PERFORMANCE OF ICE-MAKING MACHINES.

CLASS OF MACHINE.	Authority.	Dimensions of compressing-cylinder, in inches.		Absolute pressure, in lb. per square inch.		Temperature corresponding to pressure, in degrees Fahr.		Temperature of brine, in degrees Fahr.		Revolutions per minute.	Horse-power of steam-cylinder.	Per cent. of indicated power of steam-cylinder lost in friction.	Ice-melting capacity, in tons per 24 hours.	Ice-melting capacity in lb. per lb. of coal at 3 lb. per hour per horse-power of steam-cylinder of compressing-machine, and an evaporation of 11·1 lb. of water per lb. of combustible from and at 212° F. in the absorption-machine.		
		Bore.	Stroke.	Condenser.	Suction.	Condenser.	Suction.	Inlet.	Outlet.					Theoretical, no cylinder heating during aspiration.		Actual.
														No friction.	With friction.	
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.
Ammonia wet compressor..	Schröter.	9·9	16·5	135·4	55·3	72·3	26·6	42·8	37·2	44·9	17·9	14·4	26·2	58·67	50·23	40·63
" " " ..	"	9·9	16·5	131·4	41·9	70·5	14·3	28·4	23·0	45·1	18·0	16·7	19·5	45·14	37·59	30·01
" " " ..	"	9·9	16·5	128·0	30·3	69·2	0·5	14·0	8·8	45·1	16·8	16·0	13·3	35·04	29·44	22·03
" " " ..	"	9·9	16·5	126·4	22·2	68·5	−11·8	−0·3	−5·5	44·8	15·5	19·5	9·0	28·29	22·76	16·14
" " " ..	"	9·9	16·5	199·5	41·9	95·5	14·4	28·3	23·0	45·0	24·1	10·5	16·5	29·79	26·68	19·07
" " " ..	"	9·9	16·5	135·8	60·0	72·4	30·2	43·7	37·2	45·2	17·9	10·7	29·8	64·74	57·85	46·29
" " " ..	"	9·9	16·5	131·4	45·1	70·6	17·8	28·3	23·0	45·1	18·0	12·1	21·6	48·40	42·56	33·23
" " " ..	"	9·9	16·5	125·6	23·7	68·2	−9·4	−0·4	−5·8	44·7	15·6	18·0	9·9	29·83	24·46	17·55
" " " ..	"	9·9	16·5	116·9	41·0	64·2	13·1	28·4	23·0	45·0	16·4	13·5	20·0	50·53	43·70	33·77
" " " ..	"	9·9	16·5	130·0	60·3	70·0	30·7	42·8	37·3	31·7	12·0	14·8	19·5	69·40	59·09	45·01
Pictet fluid dry compressor.	"	11·3	24·4	56·7	20·9	77·3	28·5	43·0	37·5	57·0	21·5	22·9	25·6	55·01	42·48	33·07
" " "	"	11·3	24·4	55·6	14·9	76·2	14·4	28·5	23·0	56·8	20·6	22·9	17·9	41·05	31·71	24·11
" " "	"	11·3	24·4	54·6	9·7	75·2	−2·5	14·1	8·8	57·1	18·5	24·0	11·6	30·22	23·36	17·47
" " "	"	11·3	24·4	60·4	6·7	80·6	−15·9	−0·3	−5·7	57·6	15·7	25·7	5·7	22·28	16·50	10·14
" " "	"	11·3	24·4	90·9	14·9	104·4	14·4	28·3	23·0	59·3	27·2	16·9	15·7	25·16	20·88	16·05
" " "	"	11·3	24·4	61·0	22·3	81·2	31·5	43·5	37·5	57·3	21·6	14·0	28·1	54·32	46·67	36·19
" " "	"	11·3	24·4	59·3	15·6	79·6	16·2	28·4	23·0	57·5	20·5	12·8	19·3	40·13	35·01	26·24
" " "	"	11·3	24·4	58·7	6·7	79·1	−15·9	−0·4	−5.6	57·8	15·9	21·1	6·8	22·72	17·90	11·93
" " "	"	11·3	24·4	54·3	22·2	74·9	31·3	42·8	37·5	35·3	12·4	22·3	17·0	62·83	49·17	38·04
" " "	"	11·3	24·4	88·7	15·6	102·9	16·2	28·3	23·1	42·9	19·9	14·7	11·9	26·78	22·86	16·68
" " "	"	11·3	24·4	62·1	6·5	82·2	−16·9	−0·1	−5·3	34·8	9·9	24·3	3·5	21·51	16·30	9·86
Air, atmospheric cycle.....	"	28·0	23·8	58·8	14·7	64·8*	−52·6*	....	....	63·2	83·2	21·9	10·3	12·09	7·94	3·42
Air, closed cycle.....	Renwick. Jacobus.	10·0	18·0	175·0	53·7	81·3*	−40·2*	....	....	93·4	38·1	32·1	4·9	14·8	8·1	3·00
Ammonia dry compressor..	Denton.	12·0	30·0	166·0	42·7	84·2	15·0	36·8	28·9	58·1	85·0	22·7	73·9	35·91	27·36	24·16
" " " ..	"	12·0	30·0	167·0	22·9	84·6	−10·8	6·3	2·0	57·7	72·6	18·6	37·9	23·18	18·78	14·52
" " " ..	"	12·0	30·0	162·0	27·7	82·7	−3·2	14·3	2·3	57·9	73·6	19·3	46·5	26·94	21·56	17·55
" " " ..	"	12·0	30·0	176·0	42·2	87·7	14·5	36·4	28·5	58·9	88·6	19·7	74·4	33·54	26·94	23·31
Ammonia absorption.....	"	....	....	152·3	40·4	79·1	12·6	20·7	15·7	....	....	....	42·2	38·5	.....	20·10

* Temperature of air at entrance and exit of expansion-cylinder.

Refrigeration of the Earth: the gradual cooling of the earth in the course of ages. According to the Nebular Hypothesis (*q. v.*) the earth was originally a mass of fiery liquid, and known geological facts have established that its surface was at one period much hotter than it is now. The fact that the temperature increases from the surface inward implies that there is a continual loss of heat from the interior by gradual conduction through the outer crust and atmosphere to external space. (See Energy, Dissipation of.) This loss is very small, in proportion, compared with that of the sun—owing, doubtless, to the existence of the crust. It has been suggested, however, that the internal heat might be kept up by chemical action—that is, by the transformation of chemical energy of combination into heat, or by the passage of the earth through a hotter region of space, a hypothesis due to Poisson. Lord Kelvin regards these views as improbable, and making use only of Fourier's mathematical theory of heat has arrived at some important results. He assumes that at a certain critical epoch a superficial layer of rocks became solidified, at a temperature of about 7,000° F., and shows that it is probable that the amount of heat of the crust went on diminishing by a quantity proportional to the square root of the time from the epoch. Further, his analysis would lead to the inference that during the last 96,000,000 years the rate of increase of the temperature from the surface inward has diminished from about $\frac{1}{10}$th to about $\frac{1}{50}$th of a degree F. per foot, and that the thickness of the crust through which any degree of stated cooling has been experienced has increased up to its present thickness from a fifth of that thickness. Lord Kelvin believes also that the earth is not, as is commonly supposed, a mass of fiery liquid covered with a crust of from 30 to 100 miles thick, but on the whole more rigid than a solid globe of glass, or even of steel of the same dimensions, and he observes that a decided negative should be given to the suggestion that internal heat exerted any sensible effect on climate. See Earth (*Internal Temperatures*). R. A. Roberts.

Refuge, Cities of: See Cities of Refuge.

Regal'di, Giuseppe: poet; b. at Novara, Italy, in Nov., 1809; began the study of jurisprudence in the University of Turin, but failing in his first examinations, and having heard the improvisatore Giustiniani, he resolved to rival him. From 1833 to 1856 his course was a continual triumph; he improvised in all the principal cities of Italy, in France, in Switzerland, in Germany; visited Greece, Asia Minor, Mt. Lebanon, and Egypt, and there gathered fresh inspirations. In 1860 he was appointed Professor of History in the Lyceum of Parma; then (1862) in the University of Cagliari; and finally, in 1866, in the University of Bologna. D. at Bologna, Feb., 1883. Among his volumes of verse are *La guerra* (1832); *Poesie estemporanee e pensate* (1839); *Canti* (1840); *Canti nazionali* (2 vols., 1841); *La Bibbia* (1852); *Canti e prose* (1861–65); *Poesie scelte* (1874); *L'acqua* (1878). We have also a volume of travels, *Dora* (2d ed. 1867), and a collection of essays, *Storia e letteratura* (1879). See F. Orlando, *Giuseppe Regaldi* (1880). Many illustrious French and Italian poets have written verses in his honor, among others Lamartine. Revised by A. R. Marsh.

Regatta: See Rowing and Yachting.

Regelation [Lat. *re-*, again + *gela'tio*, a freezing, deriv. of *gela're*, freeze]: the freezing together, without the application of outward cold, of contiguous surfaces (of ice or of certain other solids at the melting-point) when subjected to pressure and then released.

This phenomenon, which was discovered by Faraday in 1850, is common to all substances which increase in volume upon freezing. It has been studied chiefly in the case of ice, a material in which the process is of particular interest on account of the part which it plays in the motion of glaciers.

Regelation depends upon a principle stated by James Thompson, viz., that any substance the volume of which is greater in the solid state at the melting-point than when liquefied at the same temperature will have its melting temperature lowered by pressure. The effect, even in the case of water, is very small, amounting to a reduction of 0·0075° per atmosphere. By means of it, however, Mouton in 1858 was able to prevent that liquid from freezing even at −18° C. The pressure necessary to the purpose was 13,000 atmospheres. This minute change in the melting-point is sufficient to enable regelation to take place.

The explanation of the phenomenon is as follows:

When two ice blocks in contact are subjected to pressure, a slight lowering of the melting-point occurs and a certain amount of ice is liquefied. To convert ice into the liquid form, even without rise of temperature, requires, however, a large amount of heat (heat of fusion = 79·9 calories per gramme). This is obtained at the expense of the temperature of the liquid and of the surrounding ice masses, which are thus brought below the normal melting-point. As soon as the pressure is removed, freezing takes place and the adjacent surfaces of the two blocks are united.

Under the conditions of an ordinary laboratory experiment the range of temperature changes is very minute, but when we come to consider glacial action, where immeasurably great pressures are brought to bear, we find in regelation an agency which, taken in connection with ordinary plasticity, is quite sufficient to account for the extraordinary motions of the ice. E. L. Nichols.

Regeneration [from Lat. *re-*, again + *genera're*, beget]: a theological term used to express the initial stage of the change experienced by one who enters upon the Christian life. It is derived from the New Testament, where the "new-birth" (1 Pet. i. 3, 23; Titus iii. 5; John iii. 3 f.) is the beginning of that "renewal" which produces the "new creature." In the history of theology the term has been used with varying latitude of meaning. Among the Jews it was employed in an external sense to express the change of relation which took place when a heathen became a Jew; from them it was adopted in this sense by many of the Fathers, and is still so used by many advocates of "baptismal regeneration." It is used in the Latin Church to express the whole real change which corresponds to this external change of relation. The Reformers separated justification by itself as something wrought on, not in, the sinner, and employed regeneration to express the whole process of inner renovation in all its stages. In the development of Protestant theology the term has been still further narrowed: first, to express the opening stage of this subjective work as distinguished from its continuance in sanctification; and then, since the seventeenth century, to express the initial divine act in this opening stage itself, as distinguished from the broader term conversion, which includes, along with the act of God, revivifying man, also the act of man in turning to God.

The nature of regeneration is of course variously conceived by different schools, according to their various views of the nature of the soul and its relation to God, of original or habitual sin, and of divine grace.

1. *Pelagians*, in accordance with their view of freedom and of sin, necessarily regard regeneration as a self-determined change in the general moral course of man's life, an act of the man himself, without any gracious assistance other than that involved in instruction and favorable providential conditions. This was the teaching of Pelagius in the early part of the fifth century; and although not adopted by an historical Church, it has been reproduced in various combinations by Rationalists and Socinians.

2. The *Semi-Pelagian* doctrine taught by John Cassian (d. 440) admits that divine grace (*assistentia*) is necessary to enable a sinner to return unto God and live, yet holds that, from the nature of the human will, man may first spontaneously, of himself, desire and attempt to choose and obey God. They deny the necessity of *prevenient* but admit the necessity of *co-operative* grace and conceive regeneration as the product of this co-operative grace.

3. The *Mediæval and Papal* doctrine, which is practically that of Thomas Aquinas, and is hence often called "Thomism," admits original sin and the necessity of prevenient grace, but places the efficacy of grace in the non-resistance of the subject. (See the *Council of Trent*, sess. 6, can. 4, chs. v. and vi., and sess. 7, cans. 6 and 8.) But this grace is supposed to be exercised only through the instrumentality of baptism, which acts as an *opus operatum*, *ex vi actionis ipsius*, effecting regeneration and the entire removal of sin, and consequently of guilt, from every infant, and from every adult who does not willfully resist (*non ponentibus obicem*). *Council of Trent*, sess. 7, can. 6; Bellarmin, *De Sacramentis*, 2, 1.

4. The *Arminian* view of regeneration admits total depravity and consequent moral impotency, yet holds that man is not really responsible until there is redemptively bestowed upon him for Christ's sake *sufficient* grace to reendow him with ability (gracious, substituted for natural) to do right, which grace becomes *efficient* when the sinner co-operates with it, and thus effects the end intended.

5. The *Synergistic* view was held by a party among the Lutherans, under the leadership of Melanchthon. At the Leipzig Conference (1548) Melanchthon said: "There concur three causes of a good action—the word of God, the Holy Spirit, and the human will assenting, not resisting the word of God." *Loc. Com.*, p. 90.

6. The *Lutheran* standard, the *Formula Concordiæ*, teaches that: (1) Human nature is spiritually dead; and (2) the Holy Ghost is the sole efficient agent who quickens the dead soul to life, without the least co-operation of the will of the subject; but the non-regeneration of the unbeliever is referred not to the absence nor to any deficiency of grace, but to the positive resistance of the man himself. *Formula Concordiæ*, pp. 662, 666, 582, 677.

7. The *Reformed* doctrine teaches as follows: (1) As to the *nature* of regeneration: (*a*) There are in the soul, besides its several faculties, habits or dispositions, innate or acquired, which lay the foundation for the soul's exercising its faculties in a particular way. (*b*) These dispositions (moral) are anterior to moral action, and determine its character as good or evil. (*c*) In creation God made the dispositions of Adam's heart holy. (*d*) In regeneration God recreates the governing dispositions of the regenerated man's heart holy. Regeneration is therefore essentially the communication of a new spiritual life, and is properly called a "new birth." (2) As to its *efficient cause*: It is effected by divine power acting supernaturally and immediately upon the soul, quickening it to spiritual life, and implanting gracious principles of action. (3) As to man's action: Conversion (*conversio actualis*) instantly follows, as the change of action consequent upon the change of character, and consists in repentance, faith, holy obedience, etc. *Thirty-nine Articles*, art. 10; *Can. of Synod of Dort*, ch. iii., art. 3; *Westminster Confession*, ch. x.

What is called *baptismal regeneration* is held by members of the Church of England and others in various senses. (1) Some hold that the Holy Spirit through the instrumentality of baptism implants a germ of spiritual life in the soul, which may long remain latent, and may be subsequently developed (in conversion) or blasted. (2) Others hold that there are two regenerations—one a change of *state* or *relation*, and the other a change of *nature*; the first is baptismal and the second moral, though both are spiritual, since both are wrought by the Holy Ghost.

Revised by B. B. Warfield.

Regensburg: See Ratisbon.

Regent-bird: a name given to one of the bower-birds (*Sericulus melinus*), in honor of the prince regent, afterward George IV., because the black and golden yellow plumage of the male represented his family colors. It is an inhabitant of New South Wales. F. A. L.

Reggio di Calabria, red'jō-dee-kăă-laab'rĕĕ-ăă (anc. *Rhegium*, *Regium*): city of Italy; in the province of Reggio; on the Strait of Messina (see map of Italy, ref. 9–G). The ancient name, signifying rending, probably refers to some grand natural convulsion, and possibly to that which separated Sicily from the mainland in prehistoric times. Reggio was first colonized by Chalcidians, whom fugitive Messenians joined about 723 B. C. Toward the end of the

fifth century B. C. it lost its republican organization; after an obstinate resistance it was captured by Dionysius the Elder, tyrant of Syracuse (387 B. C.). Under the Romans it became again wealthy and magnificent. The Castor and Pollux with St. Paul on board entered the harbor (63), and, according to tradition, St. Paul landed and founded a church. The ecclesiastical history of Reggio is interesting and somewhat important. The city shared all the vicissitudes of Southern Italy during the Middle Ages. It was burned by Alaric (410), captured by Totila, King of the Goths (549), by the Saracens (918), by the Pisans (1005), by Robert Guiscard (1060), and by the Ottomans (1552 and 1597). Nevertheless, it was flourishing and opulent when in 1783 it was utterly overthrown by earthquake. Though suffering from earthquakes often since, it has been partially rebuilt and presents a modern appearance with handsome and spacious streets. The city now rises in amphitheatrical form upon a gently sloping hill; its suburbs are attractive and it enjoys splendid sunset views over the strait, with Etna and Sicily in the foreground. It has a few manufactories and an inconsiderable maritime trade. Pop., with the suburban villages (1893), 43,000. E. A. GROSVENOR.

Reggio nell' Emilia, red'jō-nel-lā-mee'leĕ-ăă (anc. *Rhegium Lepidi*): city of Italy, in the province of the same name; on the railway between Parma and Modena (see map of Italy, ref. 3–C). It is a walled town, with broad streets, many of which are lined with arcades. Some of the churches are imposing and contain precious objects of art. Over the altar of St. Prospero once stood the *Nativity* of Correggio, known as *La Notte*, now in the Dresden Gallery. Reggio contains a fine cathedral, partly of the twelfth century, a spacious theater, a library with 56,000 volumes, an academy of fine arts, and a museum with the natural historical collection of Spallanzani, born here in 1729. The small house in which Ariosto was born (1474) is still seen. The Asylum for the Insane, outside the town, is one of the best-managed philanthropic establishments in Italy. The origin of the town is uncertain, but it is often mentioned by Latin writers. It was captured by the Goths in 409, was oppressed by the Exarchs of Ravenna, and was rebuilt by Charlemagne in the ninth century. It suffered severely during the Guelph and Ghibelline wars. An independent commonwealth in the twelfth century, during the thirteenth it was prominent in mediæval learning. For several hundred years it was generally ruled by the Este and Austro-Este family, and joined the modern kingdom of Italy in 1859. Now it is the commercial center of a fertile province, carries on a large trade in country products, and has some industries of its own, as manufactures of carriages, brooms, and sailcloth. Pop. 18,634. E. A. GROSVENOR.

Regiment [from O. Fr. *regiment*, government, later a regiment of soldiers < Lat. *regimen'tum*, government, rule, deriv. of *re'gere*, rule]: a military organization made up of one or more battalions of infantry, squadrons of cavalry, or batteries of artillery. The organization being permanent, its history, records, and traditions become matters of regimental pride and a potent factor in preserving its *esprit de corps*. Regiments are generally designated by numbers; but they frequently have special names, derived from the locality of their enlistment or from some marked service rendered by them.

In the U. S. the infantry regiment is made up of ten companies and varies in strength from about 500 men on a peace footing to about 1,000 men on a war footing. In the more modern organization of the European armies it consists of three, or sometimes four, battalions, of about 1,000 men each on a war footing, reduced to about 600 on a peace footing. The cavalry regiment of the U. S. contains 12 troops, or 6 squadrons, and the artillery regiment 12 batteries. In European armies these numbers vary somewhat widely.

The regiment is commanded by a colonel, or in his absence by its lieutenant-colonel. Each battalion is commanded by a major, and each company by a captain. The regimental staff usually consists of an adjutant, quartermaster, commissary, and surgeon. Some regiments have also a chaplain.

The regiment is the *administrative unit* of the army, the battalion the *tactical unit*, and the company the *unit of combat*. See ARMY. JAMES MERCUR.

Regi'na [Lat., Queen]: town of Assiniboia, Canada, and capital of the Northwest Territories; station on the Canadian Pacific Railway, 357 miles W. of Winnipeg (see map of Canada, ref. 9–G). It contains fine public buildings, and is the headquarters of the Northwest mounted police. It is well provided with churches and schools, and has the nucleus of a parliamentary library. Pop. (1895) 1,583.

Regiomonta'nus, JOHANN MÜLLER: astronomer and mathematician; b. at Königsberg in Franconia, June 6, 1436; studied mathematics under Purbach at Vienna, and astronomy at Padua; lived for some time at the court of Matthias Corvinus of Hungary, afterward at Nuremberg, and was invited to Rome in 1474 by Pope Sixtus IV. in order to reform the calendar. D. in Rome, July 6, 1476—some say by the plague, others by assassination at the hands of the sons of George of Trebizond, in whose writings he had pointed out some glaring errors. His *Ephemerides ab Anno 1475–1506* (continued by Bernhard Walther) made him very famous among astronomers. Among his numerous other works are *De Reformatione Calendarii* (1489) and *De Triangulis Omnimodis* (1533). See Alexander Ziegler, *Regiomontanus* (Langensalza, 1874).

Registration of Titles: See the Appendix.

Regnard, rān-yaar', JEAN FRANÇOIS: dramatist; b. in Paris, France, Feb., 1655. Of a wealthy family, he was well educated, and traveled extensively in Italy, Algiers, whither he was taken as captive by pirates in 1678, Scandinavia, Lapland, Germany, Poland, and Hungary. He settled in Paris in 1684, and began first to write for the Théâtre Italien, but after 1696 wrote entirely for the Théâtre Français. He followed Molière, but at a long distance, naturalness and delineation of character being sacrificed to the comic effect, for which his talent was great. *Le Joueur* (1696), *Les Ménechmes* (1705), imitated from Plautus, and *Le Légataire universel* (1708) are his best-known comedies. D. Sept. 4, 1709. He also wrote an account of his *Voyages* and a partly autobiographical story, *La Provençale*. Editions of his works have been given by Michiels (2 vols., Paris, 1854–55) and Moland (Paris, 1875). A. G. CANFIELD.

Regnault, re-nō', ALEXANDRE GEORGES HENRI: historical, genre, and portrait painter; b. in Paris, France, Oct. 30, 1843. Pupil of Montfort, Lamothe, and Cabanel; grand prix de Rome 1866; painted in Italy and Spain 1866–69, and in Africa in 1870. He returned to France and enlisted in the Sixty-ninth Battalion of the National Guard at the outbreak of the war with Germany, and was killed in a skirmish at Buzenval, Jan. 19, 1871. His works are very fine in color and possess qualities of the highest order. Though only twenty-eight years of age at the time of his death, he had already painted a number of important compositions, one of the most famous of which is his equestrian *Portrait of General Prim*, now in the Louvre. In the Louvre also is his *Execution without Judgment—Granada*. In the Museum of Fine Arts, Boston, is a picture entitled *Automedon with the Horses of Achilles*, which, though not one of his most successful works, gives a fair idea of his power as a draughtsman and his ability to handle a large canvas with unity of effect. WILLIAM A. COFFIN.

Regnault, HENRI VICTOR: physicist and chemist; b. at Aix-la-Chapelle, Germany, July 21, 1810; studied at the École Polytechnique of Paris; was appointed Professor of Chemistry at that school in 1840, in Physics at the Collège de France in 1841; chief engineer of mines in 1847, and director of the porcelain-works of Sèvres in 1854. The first work of his which attracted attention was his *Action du Chlore sur l'Éther chlorhydrique* (1840), but his physical researches, especially concerning heat, gained for him his great reputation. In 1848 he received the Rumford medal from the Royal Society of London for his *Experiments to determine the Laws and the Numerical Data which enter into the Calculation of Steam-engines*. His investigations in verification of the law of Mariotte and Boyle were communicated in vols. xxi. and xxvi. of the *Mémoires de l'Académie des Sciences*. His *Premiers Éléments de Chimie* (1850), an abridgment of his *Cours Élémentaire de Chimie* (1847–49), has been translated into several languages. His work on the practical treatment of steam-engines forms vol. xxi. of the *Mémoires de l'Académie des Sciences*. D. Jan. 19, 1878.

Regnault, JEAN BAPTISTE, Baron: painter; b. in Paris, France, Oct. 19, 1754; led for some time a roving life as a sailor, and visited Africa and America; entered in 1771 the studio of the painter Bardin, whom he accompanied to Rome; gained in 1774 the great medal for his *Alexander and Diogenes*; became a member of the Academy in 1782, subsequently professor in the School of Art, and stood by the side of David at the head of the French school of paint-

ing till his death Oct. 29, 1829. Among his most celebrated pictures are *Perseus and Andromeda* (1782); the *Education of Achilles* (1783); and *Cupid and Psyche* (1829).

Regnier, rān'yā', MATHURIN: satirist; b. at Chartres, France, Dec. 21, 1573. He was educated for the Church; accompanied Cardinal de Joyeuse to Rome in 1593, and returned in 1604 with the Duc de Béthune, French ambassador; was appointed canon of the Cathedral of Chartres in 1609. D. at Rouen, Oct. 22, 1613. In spite of his ecclesiastical position he led a dissipated life. His *Satires*, sixteen in number, are coarse, but full of shrewd observation of men, humorous, witty, and striking, and free from all malignity. He was refractory to the refining reforms of Malherbe, and followed rather the tradition of the direct and familiar speech of Villon and Marot. He wrote also some epistles and elegies. Good editions of his works are by Viollet-le-Duc (Paris, 1853), Barthélemy (Paris, 1862), L. Lacour (Paris, 1867), and Courbet (Paris, 1875).

Revised by A. G. CANFIELD.

Regular Clergy [*regular* is from *regula*, a monastic rule]: in the Roman Catholic Church, ordained clergy who live under a monastic rule, as distinguished from the secular clergy or ordinary parish priests, and other clergy free from monastic rules. The regular clergy may, however, be appointed to act as parish priests, and frequently assist the seculars.

Reg'ulus, MARCUS ATILIUS: a soldier belonging to an old plebeian family in Rome; was consul the first time in 267 B. C., and again in 256. In this year, the ninth of the first Punic war, Regulus and his colleague Manlius transferred the war from Sicily to Africa, and even after the return of Manlius with his part of the army Regulus achieved great successes against the Carthaginians. Fortune turned, however, when Xanthippus, a Lacedæmonian general, was put at the head of the Carthaginian army. Regulus was defeated, his army was routed and nearly destroyed, and he himself was taken prisoner. Concerning his death we have no well-authenticated information. The celebrated story, so eloquently told by Horace (*Odes*, iii., 5), of his mission to Rome with Carthaginian envoys to arrange an advantageous peace, of his advice to the senate to reject their propositions, and of his voluntary return to captivity and to a death of ingenious cruelty, is generally believed to be an invention of national and family pride.

Revised by G. L. HENDRICKSON.

Rehan, ADA: actress; b. in Limerick, Ireland, Apr. 22, 1859. She was taken to the U. S. when very young and was educated in the Brooklyn public schools. At the age of fifteen she made a public appearance on the stage, but subsequently resumed her studies for a year. She began a regular professional career in Mrs. Drew's theater, Philadelphia, where she played for two seasons, when she was engaged by Augustin Daly and became leading lady at his theater in New York, and there achieved much success in comedy parts, especially in those of Shakspeare and other old dramatists. She attained an equal reputation in comic *rôles* of a less exacting character. In 1888 Mr. Daly took his company to London, where Miss Rehan's performances were favorably criticised. Subsequent visits in 1889, 1890, 1891, and 1892 confirmed the verdict of approval by the English press. Among the characters which she has personated most successfully are Katherine in *The Taming of the Shrew*, Maid Marian in Lord Tennyson's *Foresters*, and the principal woman *rôles* in *The Railroad of Love*, *A Night Off*, *Needles and Pins*, and *The Squire*.

B. B. VALLENTINE.

Rehobo'am [from Heb. *Rᵉchabᵉ'ām*, liter., he who enlarges the people]: son and successor of Solomon. His mother was Naamah, an Ammonite princess (1 Kgs. xiv. 21, 31). His accession, about 975 B. C. (Usher) or 990 B. C. (Hales), was the signal for the revolt of the ten tribes and the dismemberment of the kingdom (1 Kgs. xii.). He died at the age of fifty-eight, after a reign of seventeen years (1 Kgs. xiv. 21).

Reho'both [from Heb. *Rᵉchōbhōth*, liter., streets, wide spaces]: the name of three biblical sites: (1) In Gen. x. 11, one of the four Assyrian cities founded by Asshur, or, as Schrader understands the passage, one of the four parts of the "great city" Nineveh. (2) In Gen. xxvi. 22, a well dug by Isaac, recently identified with an ancient well, now filled up, 12 feet in diameter, in the Wadi er-Ruhaibeh, about 20 miles S. of Beersheba. Robinson and Smith found the wadi in 1838, but did not see the well. (3) In Gen. xxxvi. 37, the city of an early Edomite king named Saul, described as being "by the river"—i. e. the Euphrates. It has been identified with Rachaba, on the east side of the Euphrates, and 4 miles from it.

Reichenbach, rīch'en-bāȧkh, KARL, Baron: chemist; b. at Stuttgart, Germany, Feb. 12, 1788; educated at the University of Tübingen; after a short political imprisonment at the instigation of the French authorities, devoted himself to the study of natural science, and achieved considerable practical results by his iron-works and beetroot-sugar factory at Blansko, Moravia, and also some scientific triumphs by his discovery of different useful compounds, such as creosote and paraffin, but became most widely known by his half-mystical works on a new natural force which he called *Od*. Among his works are *Physikalisch-physiologische Untersuchungen über die Dynamide des Magnetismus* (3 vols., 1849) and *Odisch-magnetische Briefe* (1852), both translated into English. D. at Leipzig, Jan. 19, 1869. See ODIC FORCE.

Reichenberg, -bārch: town of Bohemia; on the Neisse, 86 miles by rail N. E. of Prague (see map of Austria-Hungary, ref. 2–E). It is one of the most important manufacturing places of the Austrian empire, linen, woolen, and cotton stuffs of various kinds being made extensively, besides leather, shoes, hats, firearms, gold and silver ware, and musical instruments. Pop. (1890) 30,890.

Reichert, EDWARD TYSON, M. D.: physiologist; b. in Philadelphia, Pa., Feb. 5, 1855; studied medicine at the Universities of Pennsylvania, Leipzig, and Geneva, graduating M. D. from the former in 1879; in 1886 was elected Professor of Physiology in the University of Pennsylvania. He is the author of a number of papers on the physiological action of drugs, on comparative physiology, and on experimental and human physiology. His principal work is *A Text-book of Physiology* (Philadelphia, 1894).

S. T. A.

Reichstadt, DUKE OF: See NAPOLEON II.

Reid, ALEXANDER P.: See the Appendix.

Reid, JOHN MORRISON, D. D., LL. D.: b. May 30, 1820, in New York; graduated at the University of the City of New York in 1839, and at Union Theological Seminary; was admitted to the New York conference of the Methodist Episcopal Church in 1844, and preached in Western Connecticut, on Long Island, and in New York; president of Genesee College, New York, 1858–64; editor of *The Western Christian Advocate* 1864–68; editor of *The Northwestern Christian Advocate* 1868–72; corresponding secretary of the Methodist Episcopal Missionary Society 1872–88, and its honorary secretary from that time until his death May 16, 1896. He was author of *Missions and Missionary Society of the Methodist Episcopal Church* (2 vols., 1879); *Doomed Religions* (1884), etc.

Reid, MAYNE: writer of boys' stories; b. in the north of Ireland in 1818; went to the U. S. 1838; ascended the Red and Missouri rivers in quest of adventure; traveled through most of the States; settled in Philadelphia, where he devoted himself to literature; was a volunteer, U. S. service, in the Mexican war, and distinguished at Chapultepec, where he was wounded; about 1849 settled in London; became a voluminous and popular writer, chiefly of romances of American adventure. Among his books are *The Rifle Rangers* (1849); *The Scalp-hunters* (1850); *The White Chief* (1855); *The Quadroon* (1856); *Osceola* (1858); *The Maroon* (1862); *The Castaways: a Story of Adventure in the Wilds of Borneo*; *The Yellow Chief: a Romance of the Rocky Mountains* (1870). A collective edition of his works appeared in New York (15 vols., 1868); other editions in London (1875, 1878). D. near London, England, Oct. 22, 1883.

Reid, SAMUEL CHESTER: naval officer; b. at Norwich, Conn., Aug. 25, 1783; entered the U. S. navy as midshipman at an early age; commanded the privateer brig Gen. Armstrong in a two days' engagement with the boats of three British men-of-war in the port of Fayal, Sept. 26 and 27, 1814, resulting to the British in a loss of 250 killed and wounded, while the privateer was scuttled by Reid with a loss of only 2 killed and 9 wounded. The violation of neutral waters by the British led to a prolonged diplomatic controversy, finally decided by Louis Napoleon, as arbitrator, adversely to the American complaint. Soon after his return to the U. S. Capt. Reid was appointed sailing-master in the navy; became warden of the port of New York, where he regulated the pilot-boat service and erected signal telegraphs at the Battery and the Narrows. He was also the designer of the present U. S. flag. D. in New York, Jan. 28, 1861.

Reid, Thomas: philosopher; b. at Strachan, Kincardineshire, Scotland, Apr. 26, 1710. His father was a minister. He received his first instruction at home and in the parish school of Kincardine. In 1722 he was sent to Marischal College in Aberdeen, where he graduated in 1726, and occupied a position as college librarian and in studying mathematics and philosophy until 1737, when he was appointed minister at New Machar in Aberdeenshire. His parishioners are said to have opposed his appointment very strenuously, and he had so little confidence in his own powers that he never himself composed the sermons which he preached, but used such as were published by English divines, especially Tillotson and Evans. Nevertheless, his life as a minister at New Machar turned out to the satisfaction of all. In 1740 he married, and in 1748 he published his first philosophical essay, *On Quantity*, in the *Transactions* of the Royal Society of London. It was a criticism of the manner in which the mathematical terminology was used at that time in metaphysics and morals, especially by Hutcheson. In 1752 he accepted the position of Professor of Philosophy at King's College, Aberdeen, where he had to teach mathematics, natural philosophy, and moral philosophy; but in 1763 he moved to Glasgow as the successor of Adam Smith in the chair of Moral Philosophy. Here he published his *Inquiry into the Human Mind on the Principle of Common Sense*, in 1764, and read at the meetings of a philosophical society several papers, such as *Examination of Dr. Priestley's Opinion concerning Matter and Mind* and *Physiological Reflections on Muscular Motion*. In 1781, however, he resigned his office in order to devote himself exclusively to philosophical studies, and published *Essays on the Intellectual Powers of Man*, in 1785, and *Essays on the Active Powers of Man*, in 1788. D. Oct. 7, 1796. Originally, he was a disciple of Berkeley, but David Hume's *Treatise upon Human Nature*, published in 1740, showed him at once to what consequences idealism might lead, and roused him to independent speculation. In opposition to Hume's skepticism he tried in his *Inquiry into the Human Mind on the Principle of Common Sense* to establish a series of fundamental truths independent of experience and indisputable as primitive facts of the consciousness. On the Scottish school of philosophy, and more especially on the study of psychology, he exercised a powerful influence. This influence has extended to France (Royer-Collard and Victor Cousin); and to America and the British colonies, nearly all professors of philosophy in colleges for thirty years (1830 to 1860) being followers of Reid in all important respects. See English Literature (*Philosophy*). Revised by W. T. Harris.

Reid, Whitelaw: journalist; b. near Xenia, O., Oct. 27, 1837; graduated at Miami University in 1856; after acting for a year or more as superintendent of the graded schools at South Charleston, O., bought and edited the Xenia *News*; joined the Republican party at its birth and made political speeches in support of Fremont in 1856; advocated in the *News* the nomination of Abraham Lincoln in 1860; became city editor of the Cincinnati *Gazette*; during the civil war served on the staff of Gen. Morris in West Virginia and later on that of Gen. Rosecrans, and was war correspondent of the *Gazette*, writing over the signature of "Agate"; in 1863 was appointed librarian to the House of Representatives; in 1865 accompanied Chief Justice Salmon P. Chase on a tour of the South, undertaken by the latter at the request of President Johnson for the secret purpose of studying the condition and interests of the white and black races, and published *After the War, a Southern Tour* (Cincinnati, 1866); during the next two years engaged in cotton-planting in Louisiana and Alabama, and published *Ohio in the War* (2 vols., Cincinnati, 1868); in 1868 became one of the editors of the Cincinnati *Gazette*; at the invitation of Horace Greeley joined the editorial staff of *The New York Tribune* in 1868, and in 1869 became managing editor. Upon the nomination of Greeley for the presidency in 1872 Mr. Reid became editor-in-chief, and when the former died in the fall of that year he became chief proprietor as well as editor of the *Tribune*. In 1878 President Hayes offered him the U. S. mission to Berlin, which he declined. The offer was renewed under the administration of President Garfield, and again declined. In 1878 he was elected by the New York Legislature regent of the State University, to succeed Gov. Dix. In Mar., 1889, Mr. Reid accepted from President Harrison the appointment of minister to France, and resigned the editorship of the *Tribune*. After securing the repeal of the French decree prohibiting the importation of U. S. meats, and negotiating extradition and reciprocity treaties, he resigned office and returned to the U. S. in Apr., 1892. In June, 1892, he was nominated for the vice-presidency of the U. S. by the Republican national convention, but failed of election. His time since then has been divided between foreign travel and the direction of the *Tribune*. He was a member of the peace commission in 1898. Among his addresses published in book form are *Schools of Journalism* (New York, 1871); *The Scholar in Politics* (1873); *Some Newspaper Tendencies* (1879); *Town-hall Suggestions* (1881).

Reid, William, D. D.: minister and editor; b. in the parish of Kildrummy, Aberdeenshire, Scotland, Dec. 10, 1816; was educated at the University of Aberdeen; went to Canada as missionary of the Established Church of Scotland; was pastor at Graton and Colborne, Upper Canada, 1840–43; was one of the founders of the Presbyterian Church of Canada 1843; was pastor at Picton 1849–53; editor of *The Ecclesiastical and Missionary Record* 1853–75; since 1853 has been clerk of synod and treasurer of the schemes of the Church. Dr. Reid was moderator of the Synod in 1850 and 1873, and of the General Assembly in 1879.

C. K. Hoyt.

Reid, William James, D. D.: clergyman; b. at South Argyle, N. Y., Aug. 17, 1834; was educated at Union College and Allegheny Seminary; corresponding secretary of the United Presbyterian board of home missions 1868–72; principal clerk of the United Presbyterian General Assembly since 1875; and since 1889 pastor of the First United Presbyterian church, Pittsburg, Pa., and editor of *The United Presbyterian*. Dr. Reid has published numerous sermons and pamphlets: *Lectures on the Revelation* (Pittsburg, 1878); and *United Presbyterianism* (1881; 2d ed. 1883).

C. K. Hoyt.

Reidsville: town (founded in 1865); Rockingham co., N. C.; on the Southern Railway; 24 miles N. of Greensboro, and 24 miles S. W. of Danville, Va. (for location, see map of North Carolina, ref. 2–F). It is in the heart of the "bright" tobacco belt, and is a large leaf-tobacco market, selling about 8,000,000 lb. per year. There are 4 large warehouses for the sale of the leaf, tobacco, cigar, and cotton factories, flour and lumber mills, 8 churches, high school for boys, graded public schools, a female seminary, a State bank with capital of $50,000, an incorporated bank with capital of $50,000, and 3 weekly newspapers. Pop. (1880) 1,316; (1890) 2,969; (1900) 3,262.

Editor of "Review."

Reigate: town; in the county of Surrey, England; 21 miles S. of London (see map of England, ref. 13–J). The parish church of St. Mary (mixed Transition Norman and Perpendicular) dates from the reign of Henry VII. It contains a library with MSS. and rare books. Reigate carries on a considerable trade in fuller's earth and sand used in the manufacture of glass. Pop. (1891) 22,646.

Reign of Terror: the name given to that period of the French Revolution which lasted from Jan. 21, 1793, the day of the execution of Louis XVI., till July 27 (9 Thermidor), 1794, when Robespierre was guillotined and the committee of safety broken up. See France, History of.

Reims: a city of France. See Rheims.

Rein, rīn, Johannes Justus: scholar and compiler; b. at Rauenheim, Hesse-Darmstadt, 1835; studied at the University of Giessen, and taught for several years. In 1873 he undertook a mission to Japan on behalf of the Prussian Government for the purpose of studying Japanese industries and commerce, and spent two years in that country. On his return he was appointed Professor of Geography at Marburg, and in 1883 was transferred to a similar post at Bonn, where he succeeded Baron von Richthofen. In 1893 Dr. Rein served as a judge of art industry at the Columbian Exposition in Chicago. The results of his Japanese researches were embodied in his valuable *Japan nach Reisen und Studien dargestellt* (2 vols., Leipzig, 1881, 1886), of which an English translation has appeared under the titles *Japan, Travels and Researches* (London, 1884) and *The Industries of Japan* (London, 1889). A later work treats of Columbus and Spanish subjects—*Geographische und naturwissenschaftliche Abhandlungen* (Leipzig, 1892). J. M. Dixon.

Rein, Wilhelm, Ph. D.: professor of pedagogy; b. at Eisenach, Germany, Aug. 10, 1847; studied at Gymnasium, Eisenach, 1857–66, Jena University 1866–68, Heidelberg 1868–69, Leipzig 1870–71; teacher in Realschule, Barmen,

1871–72; professor in Normal School, Weimar, 1872–76; director of Normal School, Eisenach, 1876–86; professor in Jena University and director of training-school since the autumn of 1886. Rein (a pupil both of Stoy and of Ziller) unites in theory both schools of Herbartianism in Germany, but follows in practice Ziller rather than Stoy. His theories find practical application in the training-school of some forty elementary pupils in three classes, which is supported by the state. His direct influence is confined mainly to the lower schools of Thuringia, but among his hearers are many foreigners, chiefly from the Balkan states. His principal works are *Theorie und Praxis des Volksschul-Unterrichts*, with Pickel and Scheller (8vo, 1878); *Das Leben Dr. Luthers* (1883 Eng. transl.)]; *Pädagogik im Grundriss* (1893, Eng. transl.); *Am Ende der Schulreform?* (1893); *Encyklopädisches Handbuch der Pädagogik* (1894). He has edited several pedagogical works, and is a frequent contributor to educational journals, especially to *Pädagogische Studien*, which he founded, and to *Zeitschrift für Philosophie und Pädagogik*, of which he is coeditor. The annual *Aus dem Pädagogischen Universitäts-Seminar* represents the training-school since 1887.

J. E. Russell.

Reindeer, [from Icel. *hreinn*, reindeer, from Lapp *reino*, pasturage, herding, especially of the reindeer. By popular etymology *reindeer* is now felt as through from *rein* + *deer*; cf. Germ. *rennthier*, apparently running animal]: a large species of deer (*Tarandus rangifer*) occurring in the northern portions of both the Old and New World, and known in North America as the caribou. The animal stands 3½ to 4 feet high at the shoulders, and is more heavily built than the other species of deer. The muzzle is wide, nostrils large, and nose hairy instead of bare and moist. The antlers are large, spreading, somewhat irregular in shape, and the basal snag on one side is widely palmated; small antlers are present in the female. The side hoofs are well developed, and the

The reindeer.

feet are wide-spreading, and well adapted for progress over hard snow. The general color in winter is light gray, lighter on the neck, white beneath: in summer the color is somewhat redder. There is considerable difference in the size of the reindeer, as well as in the size and shape of the antlers, according to locality. Reindeer feed on the shoots and twigs of trees, especially of the birch and willow, and on various lichens and moss. The animal has long been domesticated in Scandinavia and Siberia, where it is kept in herds and used as a beast of burden, besides furnishing food and clothing; but it has never been tamed by the natives of North America. In view of the rapid decrease in the number of wild animals in Alaska the U. S. Government in 1891 began the introduction into that Territory of the Siberian reindeer. See Report U. S. commissioner of education 1890–91, p. 945.

F. A. Lucas.

Reindeer-moss: the *Cladonia rangiferina*, a lichen most abundant in Arctic regions, where it forms the principal winter food of the reindeer. It is of a silvery-white color, even in summer. It is also used as an article of human food after having been boiled in reindeer's milk. It contains the nutritious lichenine, a form of starch. In the U. S. it abounds in damp woods under evergreens in all the Atlantic States down to Florida.

Reinecke, rī′ne-ke, Karl: composer; b. at Altona, Germany, June 23, 1824; studied under his father; in 1834 made a successful concert tour as a pianist. After much wandering he was in 1860 appointed kapellmeister of the Gewandhaus, Leipzig, and a professor in the conservatory there. He has had many famous pupils. His compositions include several operas, some cantatas, two masses, much orchestral music, solo and concerted, chamber music, concertos for piano, violin, and other instruments, much piano music, and many songs and choruses.

D. E. Hervey.

Reinick, Robert: poet; b. at Dantzic, Prussia, Feb. 22, 1805; was educated at the gymnasium of his native city; studied painting under Begas in Berlin and under Schadow at Düsseldorf; went to Italy in 1838; and finally settled in Dresden, where he died Feb. 7, 1852. The influence which the plastic artist in Reinick exerted upon the poet is evident in all of his lyric productions, which rank among the best in modern German literature. Few poets equal him in child-like humor, simplicity of tone, and artistic perfection of form. He published *Liederbuch für deutsche Künstler* (1833); *Liederbuch eines Malers* (1837–44); *Lieder und Fabeln für die Jugend* (1844); *Hebels allemannische Gedichte ins Hochdeutsche übertragen* (1851); *Gesammelte Lieder* (1852); *Märchen-, Lieder- und Geschichtenbuch* (1873).

Julius Goebel.

Reinkens, Joseph Hubert: bishop; b. at Burtscheid, near Aix-la-Chapelle, Germany, Mar. 1, 1821; studied theology at Bonn; took holy orders; was appointed extraordinary professor at Breslau in 1853, and ordinary professor in 1857; but was suspended Nov. 20, 1870, by the Bishop of Breslau because he had made a protest against the infallibility dogma. He became one of the leaders of the Old Catholic movement; was consecrated bishop in 1873 by the Jansenist Bishop of Deventer, and acknowledged by the German Government as bishop of the Old Catholic Church. His official residence was at Bonn, and he died there Jan. 4, 1896. He wrote *Hilarius von Poitiers* (Schaffhausen, 1864); *Martin von Tours* (1866); *Papst und Papstthum*; *Ueber päpstliche Unfehlbarkeit* (Münster, 1870); *Die päpstlichen Dekrete vom 18. Juli, 1870* (1871); *Revolution und Kirche* (Bonn, 1876); *Ueber Einheit der Katholischen Kirche* (Würzburg, 1877); *Melchior von Diepenbrock* (Leipzig, 1881); *Lessing über Toleranz* (1883).

Revised by S. M. Jackson.

Reinmar der Alte: minnesinger; b. about 1160 in Alsace, probably at the town of Hagenau; d. about 1207. He lived principally at the court of Vienna, and probably participated with Duke Leopold VI. in the crusade of 1190. He is the greatest representative of the artistic minnesong as it developed in Germany under the influence of French and Provençal models, his songs evincing great perfection of form, but also the narrow and almost sickly one-sidedness of this mediæval love-poetry. That he was greatly admired by his contemporaries may be judged not only from the praise bestowed on him by Gottfried von Strassburg (Tristan, 4,777), but also from the fact that the greatest lyrist of the Middle Ages, Walther von der Vogelweide, closely imitated him during the first period of his career, and, at the occasion of Reinmar's death, paid his art a glowing tribute in two beautiful poems (Lachmann, 84, 24). See the collection *Des Minnesangs Frühling*, in which Reinmar's songs are published as far as they are extant; Erich Schmidt, *Reinmar von Hagenau und Heinrich von Rugge* (1874); Konrad Burdach, *Reinmar der Alte und Walther v. d. Vogelweide*. See also Minnesingers.

Julius Goebel.

Reis Effendi [Turk., presiding effendi]: originally, chief secretary of the Divān of the Sublime Porte. He was directly under the grand vizier, and was the medium of communication between the Government and the representatives of foreign powers. He was the guardian of the privy seal, and dealt also with the rajahs of subjected nations. The office was abolished by Sultan Mahmūd II. (1808–39), and its place taken by a Minister of Foreign Affairs (Chārijiyyah Nasīrī). According to the constitution of Dec. 11–23, 1876, this minister is to be appointed by an irade of the sultan.

Richard Gottheil.

Reisig, rī′zich, Christian Karl: classical scholar; b. in Weissensee, Thuringia, Nov. 17, 1792. He was the most

highly gifted of the pupils of Gottfried Hermann, and an inspiring teacher of great learning and critical talent. He died, after occupying the chair of Classical Languages at Halle for a few years, at Veniee, Jan. 17, 1829. His principal works, which have not yet lost their value, are *Vorlesungen über Lateinische Sprachwissenschaft* (3d revised and enlarged ed. in 3 vols., 1888); *Coniectanea in Aristophanem*; critieal and exegetical edition of Sophocles's *Œdipus Coloneus* (2 vols., 1823). Cf. Fr. Ritschl, *Opusc.* (v., pp. 95 ff.); O. Ribbeck, *F. W. Ritschl* (i., pp. 34 ff.).

ALFRED GUDEMAN.

Reiske, rīs'ke, JOHANN JACOB: Greek scholar; b. in Zörbig, Saxony, Dec. 25, 1716; matriculated in 1733 at the University of Leipzig, where he devoted himself especially to the study of Arabic. In 1738 he went to Leyden to study the Arabic MSS. in the university library, and eked out a spare living by correcting proof-sheets and by giving private lessons. Amid such hardships he still found time for the study of medicine, graduating in 1746. Soon afterward he returned to Leipzig, and here also he lived in abject poverty for twelve years, when he secured the rectorate of the famous Nicolai Gymnasium. This position he retained till his death Aug. 14, 1774. Reiske is one of the greatest Greek seholars that Germany has produced, and his genius, though depreciated in his lifetime, is now becoming ever more generally recognized. His productivity is astounding; his most celebrated works are editions, commentaries, and translations of Plutarch (12 vols., 1782); Dionysius of Halicarnassus (6 vols., 1777); Oratores Græci (12 vols., 1770–75); Dion Chrysostomos (2 vols.); Libanius (4 vols.); Theocritus (2 vols.); Maximus Tyrius (2 vols.); and many other minor editions. To these must be added a collection of *Animadversiones in Græcos auctores* (5 vols., 1757–66). Many of his works were published posthumously by his wife, ERNESTINE CHRISTINE (1735–98; married 1764). See his *Autobiography*, pp. 818 (1783); M. Haupt, *Opuscula* (iii., pp. 137 ff.); Bursian, *Gesch. der classischen Philologie in Deutschland* (pp. 407–416). ALFRED GUDEMAN.

Reisner-work: See BUHL-WORK.

Reiss, WILHELM: traveler, ethnologist, and naturalist; b. at Mannheim, Germany, in 1838. He graduated at Heidelberg 1864; visited Greece 1866; and from 1868 to 1876 traveled in South America, generally in company with A. Stübel. Their most extended explorations were in Colombia, Ecuador, and Peru, where they ascended and measured many peaks of the Andes, and made valuable archæological and geological studies. Their most important joint publication was *Das Totenfeld von Ancon in Peru* (3 vols. folio, 1880–87), a magnifieently illustrated work on the Indian burial-grounds of Ancon, near Lima. They also published, jointly or separately, many papers in Spanish at Quito; and Reiss is the author of several works in German on South American geology and topography. H. H. SMITH.

Relapsing Fever, also known as **Famine Fever**, and, teehnically, as **Febris Recurrens** [*relapsing* is from Lat. *rela'bi*, *relap'sus*, fall baek, relapse; *re-*, baek, again + *la'bi*, slide, fall]: a specific infeetious and contagious disease due to the action of a micro-organism, the *Spirochæta obermeieri*, which flourishes in the blood. It occurs only at intervals of some years, and generally during seasons of privation and insalubrity, attaeking chiefly the lower classes, ill fed and housed. The idea was formerly held that relapsing fever is a dietetic disease pure and simple. This is not the case, though famine makes large masses of people susceptible to the speeific germ. Its formativc or incubating stage is from four to ten days. Its onset is sudden; the patient, having been perfectly well at the time, is able to fix the exaet time of the attack. It begins with an abrupt and severe rigor, or chill with nervous tremor, and immediate sense of extreme weakness. There is sharp frontal headache, pain in the back and limbs; then follow flushed face, thirst, dry tongue, high pulse, and a steady ascent of body heat. The facial expression and temperature are characteristic. The mind is unaffected, and the face, with the sunken but clear and full eyes, wears a pitiable, helpless, appealing look. The complexion has a bronzed hue, and may be slightly jaundiced. The temperature rapidly ascends and during four or five days remains 105°, 106°, 107°, 108° F.—an unusual fever heat unaccompanied by brain symptoms or danger of death. Physical examination may detect enlargement of the liver and spleen; the urine may contain not only albumin and urea in excess, but blood and casts indicative of acute congestion of the kidneys. The fever and extreme depression last from five to seven days, when, with some critical evacuation, as profuse perspiration, diarrhœa, or urination, a sudden abatement and rapid convalescence set in. Appetite and strength are slowly returning, and the invalid is about, when, on the fourteenth day from the first attack, he is seized by a second or relapse resembling the first. Very rarely, a third, fourth, and even a fifth relapse, occurs. The mortality is not as high as in typhus fever, nor as great as the severe symptoms would indicate. The treatment during the active period is essentially antiphlogistic and expectant—cooling drinks, gentle saline laxatives, sponging, light diet; during eonvalescence, free use of coneentrated liquid diet, tonics, especially liberal use of quinine and brandy. Revised by W. PEPPER.

Relativity: the principle in psychology according to whieh all mental states are influeneed by preceding and accompanying eonditions of conseiousness. The principle was formerly a theoretical doctrine of philosophy, and was discussed in all early English philosophy under the phrase "relativity of knowledge." Aceording to this theory, no knowledge was of an object as it really existed outside of the mind, but was only of an "idea" of this object in consciousness, subject to all the modifying influenees, both of the nervous system and of the come and go of other impressions and ideas. The historieal development of the doctrine is due mainly to Stuart Mill and Sir William Hamilton. The Kantian theory of knowledge, which made the mind's object a construction in certain forms native to the mind, was a further and important development of the doctrine of relativity toward subjeetive idealism. In current thought the law of relativity has become an established psychological doctrine. It gets its first application in the theory of SENSATION (*q. v.*). It is found that none of the attributes of sensation is eonstant, but that they all vary with the condition in which conseiousness already is when the sensation comes to it. Partieular applications are found in the theory of "color-contrast," in the modifying influence of attention on all sensations, in the working of Weber's law (see PSYCHO-PHYSICS) upon the intensities of sensation-states, and in the influence of muscular states and strains at the time that the sensation in question makes its advent in the mind. See the *Psychologies* of James, Höffding, Baldwin, under the heading *Relativity*; Hamilton, *Lectures on Metaphysics*; Mill, *Examination of the Philosophy of Hamilton*; and Lotze, *Metaphysic*.

J. MARK BALDWIN.

Release: in law, the extinguishment of a pre-existing right. It may eonsist in an agreement upon a legal eonsideration, or in a sealed contraet, or it may result from the aets of the parties or from the operation of law. While there is much authority for the statement that an obligation under seal can be released only by a contract under seal, the better modern view is that a release upon a legal consideration is equally effeetive in extinguishing an obligation with the common-law release under seal. The voluntary destruction of an obligation, or its surrender by the obligee to the obligor, with the intention of discharging the latter, will operate as a release. The law often works the discharge of an obligor in cases where the parties intended no such result. A contract for personal services is terminated by the death of either party. At common law the death of a joint eontractor extinguished the obligation so far as he or his estate was concerned. Likewise the release of one joint obligor worked the legal release of his co-obligors, and the release by one joint obligee was binding on his co-obligees. The language of a release is to be dealt with aecording to the general rules of INTERPRETATION (*q. v.*).

The right which is extinguished by a release may be a title to real property; hence a release may be a form of conveyance. Here it is classed as secondary or derivative because it presupposes a preceding conveyance. It passes the releaser's right in land to one who has a former estate in possession therein. It is said to inure by way of enlarging an estate, or by way of passing an estate, or by way of passing a right, or by way of extinguishment, or by way of entry and feoffment. (2 Blackstone's *Commentaries*, 324–325; *Miller* vs. *Emans*, 19 N. Y. 384.) See BARGAIN AND SALE, DOWER, JOINT OWNERSHIP, JOINTURE, and LANDLORD AND TENANT. For Roman law rules, see OBLIGATION.

FRANCIS M. BURDICK.

Relief: in sculpture and some decorative arts, the projection of figures from a background; also a work of sculpture in which the figures stand out from a background, instead of

being free and finished on all sides, as in a statue or statuette. The figures are generally of the same block or mass as the background; that is to say, the wood or the marble is cut into and dug out, so as to leave the figures *in relief*. The background may then be brought to one uniform plane, or it may be sunk deeper in one place than in others, or the subject may even provide its own background in places, as where drapery is spread broadly, or where the representation of a building or a hill serves to relieve some of the figures. But the figures, drapery, etc., of the relief may also be executed in a different piece of material and fastened on to the background. Thus in the frieze of the Erechtheion the background is of dark marble, and the figures of white marble were attached. In many Japanese decorative objects, reliefs in gold, silver, shakudo, shibu-ichi, and other alloys and colored metals are raised upon a background of polished bronze or smooth iron or silver, or even lacquer or polished wood. Carved wooden panels of cabinets and other decorative pieces of furniture are often made by gluing a thin piece of choice wood upon a pine board and carving deeply, so that the more valuable wood is cut away to an openwork pattern, rounded and modeled within itself, but having the pine showing between its parts; the pine being then removed, the sculptured openwork piece is glued firmly to a panel of the same wood as itself, which has previously been highly polished.

Relief may also be produced in other ways than by carving, as by modeling in clay or in softened paper, or by stamping boiled leather or thin plates of metal, or by the *repoussé* process. (See METAL-WORK.) Relief produced in these ways, and generally where thin plates or sheets are pressed or punched, is more often called *embossing*. Relief may also be got by casting, as metal, sulphur, or plaster; but in this instance the relief must exist first, and is only reproduced by the casting, although after the cast is made it may be modified by the chasing-tool or graver.

Relief is of several kinds. *Basso-rilievo*, or bas-relief, is that in which the projection of the figures from the background is not great—certainly less than half of the rounded form, as of the human figure, and generally much less than that. *Alto-rilievo*, or high-relief, is that of which the figures have more projection. In this it often happens that the heads, arms, etc., of some of the figures are wholly detached from the background, and that other parts are much *undercut*—that is, left in apparent separation from the background, but really supported by unseen connecting pieces of the material. As it is impossible to define exactly the limits of low-relief and high-relief, the term *mezzo-rilievo* is sometimes used to denote moderate relief. *Cavo-rilievo* is relief with no sunken background; the solid substance around the figures is left in its original state, the figures being immediately surrounded and outlined merely by a groove. This kind of relief is common in Egyptian sculptures, both on the walls of large buildings and on the sides and top of sarcophagi in very hard stones, like basalt; it is also seen in Japanese carvings in ivory and wood. The very low relief of coins and medals and of some sculptures in marble, especially of the Italian Renaissance, is sometimes called *schiacciato-rilievo* or *stiacciato-rilievo*—that is, crushed or flattened relief.

It is to be observed that the artist in modeling a relief is not limited to the actual curves of the natural surface which he is representing, nor even to a uniform reduction of these curves to a proportionate greater flatness. Very often the curve where the figure quits the background is abrupt, becoming very much more gradual and subtile on the front surface; thus a head will be modeled in almost imperceptible modifications of the surface, convex curves so delicate as to be hardly distinguishable from plane surfaces, but brought out from the flat background by a sudden sharp rising, or even by an undercutting introduced in order to furnish a sharp line of shadow to mark out the profile.

Sculpture in relief is that which is most used for architectural decoration, especially in Assyrian, Egyptian, Greck, Roman, and modern classic architecture. It is much used also in the mediæval styles. RUSSELL STURGIS.

Relief Presbytery, or **Relief Church**: the name of the body of Presbyterians in Scotland which joined with the United Secession Church to form the United Presbyterian Church. See PRESBYTERIAN CHURCH.

Religion, Comparative: the term commonly used either for the comparative study of religions or for the science of religion in general. Here it is taken in the first-named sense, including the comparative study of myths, dogmas, religious ethics, forms of worship, in short, of all the phenomena of religion. Considered as such, it is one of the two principal departments of the science of religion and the indispensable basis of the other—viz., the philosophy of religion.

Rise of the Comparative Study of Religions.—When the sacred writings of the principal civilized nations of the East—the Chinese Classics, the Veda, the Avesta, and a great many of more recent origin, but scarcely less interesting—could be studied in the original; when the key to the Egyptian hieroglyphics and the Babylonian and Assyrian cuneiform writing had been found and afforded a means of regaining a knowledge of the two most ancient civilizations; when the epigraphical studies were pursued after a strictly philological method, and the already known and newly discovered inscriptions of the Aramæans, Phœnicians, and kindred nations could be better understood, a comparative study of religions was not only to be aimed at, but became indispensable for the solution of all the problems due to the new discoveries. The base of comparative religion is the special study of the history of religions as living organisms, of their rise and growth, their spread and decline, till they are superseded by other forms of worship, either the results of internal reforms or of the preaching of a new doctrine by foreign missionaries. Attention must be paid to their relation to philosophy, science, and arts, to the state, to society, and to ethics; and their mutual historical relation and their place in the universal history of religion must be inquired into. To this historical inquiry must be added a comparative study of the constituent elements of religion, myths, dogmas, and sentiments, none of which must be separately regarded as religion itself, since they are rather its necessary manifestations, never wanting where there is a living religion. As a result of those comparative studies of religions and of their elements, there have been several attempts at a twofold classification of religions, one called the genealogical, in which they are grouped after their proved or probable descent and affinity, the other called the morphological, in which they are grouped after the degree of development they have reached, even though they are neither historically related nor contemporary.

The Genealogical Classification.—From the fact that by nearly all the Indo-European or Aryan nations the supreme God of heaven was called by the same name (Dyaus, Zeus, Ju (piter), Zio (Ty); that with nearly all of them also the same general name for "god" was used; that many names of divinities, common to several Aryan nations, though varying in form, are derived from the same root, by which the original unity of their conception is proved—from these and several other facts the conclusion was drawn that all Aryan religions have sprung from one primitive old Aryan religion, and that therefore, however much they may differ as to their standpoint of development, they belong genealogically to the same class, their relationship being like that of cousins, though twice or three times removed. With the religions of the so-called Semitic peoples, the same conclusion was arrived at from the absolutely general use of the name Ilu, El, Ilâh for "god," and the all but general use of other divine titles, as Ba'al, Bêl, Adōn, Malik, etc. It was not so easy to find arguments of the same kind for the common origin of the Polynesian, of the Ural-Altaic, the Mongolic and their relation to the Chinese religions, and it was quite impossible to prove the primitive unity of, let us say, the Nigritian, the American, and other religions of uncivilized and barbarous nations.

Still the philological argumentation was thought positively to hold good for the two most important families of religions, the Aryan and the Semitic, from which have sprung the two universalistic religions Buddhism and Christianity and the widely spread, semi-universalistic Islâm. Some scholars, however, have raised grave objections against the value of this reasoning and of the generally admitted comparative method, on the ground that the use of the same names for the divinity does not prove the common origin of the religions to which it belongs. But, even if we admit that the results of etymological and glottological research have not that great value for the comparative study of myths and religions which has been attributed to them, the science of language can not be dispensed with as an auxiliary for the science of religion, and affords at least one of the standards by which the relationship of myths, dogmas, religious systems, and forms of worship must be determined.

Classification after the Tendency of Development.—We

shall now endeavor to classify the religions of the world first after the line or tendency, then after the degree of their development. To determine the line or tendency of development which a family of religions has followed in the course of history, the principal charaeteristics of such a family must be found out. That which really characterizes a religion or a group of religions is the notion they have formed of the relation between God and the world, God and man, and of the manner in which the Deity chooses to be worshiped. By applying this method to the religions with which we are best acquainted, some distinct families ean be marked out with certainty even now, and by applying it to those which are not so well known, the documents and information from whieh they must be studied being less abundant, less elear, or less accessible, some probable hypotheses about their mutual relationship may be drawn.

Just as there are an Aryan and a Semitic family of speech, there are two corresponding great families of religions, which provisorily and only for convenience' sake may be called the Aryan and the Semitic religions. Studying these two groups we find that each of them develops, with marked and growing onesidedness, one of the fundamental ideas of religion without totally denying the other—viz., the Aryans the kinship between God and man, the Semites the eminence of God above man; the former regarding the Deity as the father of gods and men, the divine protector of the human race and of the same nature with it, though higher and mightier; the latter venerating their gods as lords, masters, and kings, whose obedient servants, nay, whose slaves, they are; the former laying the greatest stress on that which is dogmatically called the immanenee, the latter on that which is dogmatically called the transcendency of the Godhead. The former or Aryan religions may be called theanthropic; the latter or Semitic may be called theocratic.

Theanthropic Religions.—The principal theanthropic religions are—(1) the Vaidie religion in India and its offshoots; (2) the religion of the ancient Iranians, Medes, Persians, and Baetrians, of whieh the Zarathustric Mazdeism was a reform, protected by the Achaemenids and re-established under the latter Arsacids and the Sassanids, though perhaps partly altered under foreign influences. These two are branches of the same stem, as is proved by the many divinities, religious ideas and rites, espeeially the Soma-Haoma worship, which they have in common, but they have developed quite independently, and have really evolved into decided antagonists, the one led by uneontrolled theosophic speculation to the utmost limits of monistic pantheism, and even atheism, the other founding on a rather superficial dualism a practieal system of religious observances and sober morality. Originally not less closely related are the religions of (3) the ancient Greeks and of (4) the Romans; but the Greek or Hellenic religion, under the high pressure of various Eastern creeds and cults, grew into that most attractive, but from a moral standpoint dangerous, humane polytheism, the worship of beauty and genius, while the Roman religion was organized to a cold and formalistic ritualism, till it was totally reformed by a gradual infiltration of Hellenic gods, ideas, and rites. Next come (5) the nearly allied Germanic religions, including the Seandinavian and the Teutonic, which, if the moral dualism of the *Edda* ean be considered as old and original, show a great resemblanee to the Iranian religious system; (6) the rather primitive but vaguely poetical Windic or Slavonic, and (7) the Keltic religions, which are still imperfeetly known, but as far as they are known seem to represent the most ancient form of theanthropic religion, dissimulating its barbarous myths and bloody rites under a veil of magical mysticism.

Theocratic Religions.—The theocratic religions of Western Asia are mueh more closely related than are the theanthropic religions, the former covering a limited area, while the latter are spread from the Ganges to Iceland. The more primitive forms of worship belonging to this family must be sought among the Arabians and among other nomadic tribes of the desert. A marked theocratic charaeter is shown by the Babylonian religious system, of whieh the Assyrian is an offshoot, only slightly differing from it in detail, though grafted on the really heterogeneous religion of the older inhabitants of the eountry, the so-called Sumerians (Accadians), and having borrowed from it not a few gods and rites. The same may be said of the religions of the Aramæans, the Canaanites and Phœnicians, and the Hebrews. In the religion of Israel the same fundamental idea, combined with the conception of God's holiness—by which originally is meant that the heavenly Sovereign is inaccessible—has been developed by the Mosaic reform and the preaching of the prophets into that ethical monotheism which stands unequaled among the religions of antiquity. Even Islâm, the religion founded by Mohammed under the influence of imperfectly understood Judaism and Christianity, though semi-universalistic, must be regarded not only as a theocratic religion but as the one in which the conception of the Deity as an absolute sovereign has been worked out to its utmost consequences. In Christianity, on the contrary, the two currents meet; it is constantly struggling to maintain a kind of balance between the two principles, or even to combine them in a higher unity. It is only fair to say that the younger Judaism, which preceded it, had already prepared the way, as it had weakened the old, onesided theocratic doctrine by its moral dualism and its belief in personal immortality.

The Egyptian Religion.—It might be expected, as the Egyptian language contains so many Semitic elements, that the religion would likewise be theocratic; but, though decidedly theocratic, it is theanthropic as well, and so represents a stage of development at which the two principles were still equally acknowledged. Perhaps the pre-Babylonian religions of Western Asia were more or less closely related to the Egyptian religion; certain it is that some of the oldest Egyptian gods and myths show a great resemblanee to gods and myths probably borrowed by the Babylonians and other Western Asia nations from their predecessors. All this, however, is hypothetieal.

Some other Families of Religions.—It would be impossible to give a complete classification of all religions with the present data. However, mention may be made of the *patriarchal* religions, in which the divine beings, worshiped as "elders, old ones, grandparents," are mutually related in the same way as the heads of different tribes or families, of whom one is superior to the other inasmueh as he is mightier, but eaeh of whom exercises authority independently and in his own sphere. To these belong the religions of the Ural-Altaic peoples (Finns, Lapps, Esthonians, and their relatives, though the first named have borrowed much from the Germans), and perhaps also some religions of North American nations. The Chinese religions that are known are of another kind. They might be called *anthropocentric*, as the human spirits (*shin*) constitute the middle class between the two other classes, viz., the heavenly and the earthly, strictly distinguished from both of them, but just as well venerated by the living. Probably also these have formed a group or family with the religions of some kindred peoples, but of the latter little is known.

As to the remaining religions only the classifieation whieh corresponds to the ethnological and the glottological one can be given.

Classification after the Degree of Development.—To classify the religions aecording to the degree of their development, whieh is usually, but not quite correctly, called the morphological classification, one must observe them at the highest standpoint they have reaehed—not in their growth nor in their decline. It is true that of some religions we must assume that, having had their development checked by adverse causes, they have remained stationary on a lower level than was possible for them to attain, and that of other religions we may suppose that they have fallen into decay through isolation, oppression, general degeneration of a people; but as it is no longer possible to gather information eoneerning their better state otherwise than by guessing from some vague traces, we are compelled to classify them only by what we know of them with certainty. Aeeording to this standard of comparison religions are divided into the two great eategories of nature-religions and ethieal religions.

Nature-religions.—By nature-religions we mean those whose highest divinities, be they spirits, fetishes, or manlike beings, are mighty powers of nature, connected in some way with a definite natural object or phenomenon. From these religions the ethieal element is by no means excluded. On the eontrary, from the remotest times moral qualities have been attributed to the gods or have been deified themselves, and this has been done more and more according as the deities have become more anthropomorphized. The ethieal element, however, remains subjected to the nature-gods, and the latter are by no means bound by it.

Different Degrees of Nature-worship.—Among the nature-religions there is a great difference as to development, though all of them, even the highest, are still dominated by the same principle. On the lowest plane stands what has

been called naturism, a worshiping of natural phenomena, and powers of nature as beings endowed with magical powers, represented for the most part as animals, monsters, portentous mythical beings, such as we still observe in later mythologies. This stage of development may be better named the *Polyzoic.* We are not able to point out any religion that is still standing on this low degree. Polyzoism is known only from survivals in more recent formations, but it is a not improbable hypothesis.

Polydemonistic Magic Religions under the Control of Animism.—As soon as man has become conscious of the superiority of the spirit to the body and of his relative independence, ANIMISM (*q. v.*) arises, a kind of original philosophy, dominating his whole life and also religion. It is a belief in spirits or souls, freely moving in heaven and on earth, and, either of their own free will or under compulsion, embodied, permanently or temporarily, in all sorts of objects, which are living or at least seem to be living (Spiritism and Fetichism). So far as man considers himself dependent on them and stands in awe before them, they become the objects of his religious worship. To these belong, in the first place, the souls of the dead, which continue to live after having left the body and which he tries to appease, and the highest spirits, to whose agency he especially attributes the natural phenomena on which depend his existence and his well-being. In this stage arise the *polydemonistic magic* religions, with their yet unsettled, continually varying mythology, their belief in a magic power, not bound by any laws, which belongs not only to the worshiped spirits, but also to privileged human beings, sorcerers, and fetich priests, and, in accordance with this belief, their magic rites, in which fear constitutes the most powerful motive. All the religions of the so-called savage or uncivilized nations belong to this category, though they no longer offer a complete picture of what religion must have been when animism flourished.

Therianthropic-polytheistic Religions. — The religions which, as to their degree of development, come next to the polydemonistic magic religions, standing under the influence of animism, are the *therianthropic-polytheistic.* From the multitude of demons a number of select ones have detached themselves, superior to the others not only in rank, but also as regards kind: these are called gods. Lower spirits and fetiches are no longer worshiped independently, but only as connected with these gods, as their servants or their embodiments. The gods themselves are mostly represented therianthropically, in shapes partly human and partly animal, though the old tree and stone fetiches are still worshiped (as, indeed, they are even in a more advanced stage of the religion), but as being animated by the gods, as a kind of mystic symbols. Few new myths arise; the old ones are sorted, purified, and part of them are already considered as ancient history. It would be interesting to inquire in what manner the rise of the therianthropic religions is connected with the origin of the apologue and with the so-called totemism.

These religions may still be divided into those of a lower, unorganized sort, as the Anaryan (Dravidian) of Southern India, those of the Finns and Esthonians, the oldest Greek (so-called Pelasgic) and the oldest Italic cults and others, and those of a higher, organized kind, to which belong the religions of the half-civilized peoples of America (Maya, Natchez, Aztecs, Muyscas and Incas), the Egyptian, most probably the oldest Babylonian, and perhaps also the old Chinese religions.

Semi-ethical Anthropomorphic-polytheistic Religions.—Highest among the nature-religions stand the *anthropomorphic-polytheistic.* Man has become conscious of his superiority to the animal. The gods, though superhuman beings, can lay claim only to a human shape. The myths concerning their temporary metamorphoses are but a survival from former periods, and serve only as proofs of their still active magic power and as subject-matter for wanton poets. The animals, formerly their embodiments, have now become their companions and messengers, or, together with the trees and stones, their attributes and symbols. Some therianthropic beings still remain, but only as beings of a lower order or as enemies of the gods. The latter have all the human qualities together with the human shape ascribed to them, and thus the way is paved to the ethical element. Hence we may call these religions *semi-ethical*, but only *semi-ethical*, for the purely ethical standpoint they have not yet reached. The gods, although really vested with all kinds of moral qualities, and although mythology has already been worked up into a great world-drama, are still moved by passions and commit actions which, when viewed as descriptions of the conflict among the powers of nature, can not give offense, but yet are not in keeping with their superhuman though man-like nature. In accordance with their origin, all of them, even the highest, remain nature beings. When the ethical element gets the upper hand, the whole semi-ethical pantheon, together with the religion of which it constituted the basis, is doomed to annihilation.

The religions that belong to this category do not all stand at the same degree of development. Lowest, so far as we know them, are the Celtic and Old-German (with the exception of the Old-Norse, at least so far as can be ascertained by the picture the *Edda* gives of it); superior to these are the Vaidic religion and the religions of Asia Minor (Aramæans, Canaanites, Phœnicians, Sabeans); the highest standpoint was reached, along different ways, by the Babylonians and the Hellenes, in whose wake followed the Assyrians and the Romans.

Ethical Religions.—By *ethical religions* are meant those called by others individualistic or supranaturalistic—those, that is to say, in which the ethical element dominates the naturalistic, although not all the naturistic ideas and customs have been abandoned. The old nature-gods have been preserved as messengers (ἄγγελοι), servants, beings worthy of being worshiped (*yazatas*), and sometimes also as saints. If not all ethical religions are purely monotheistic or even pantheistic, yet they are much more so than the nature-religions, which are mostly polytheistic and can at best get to monolatry. The principal characteristic of the ethical religions is that they are not based on a national tradition, but on a doctrine of salvation, preached either by one prophet, reformer, messenger from God, or by a community of reformers. The ethnic and national elements are not wholly wanting, but they are subordinate. Most of those whose religious community is based on the preaching of such a doctrine ascribe to this doctrine a divine authority, which all have to consider as binding under penalty of being ejected. From the original preaching the divine authority is transferred to the oldest records in which it is contained; all ethical religions have a Holy Writ (which, considered as such, is wanting in nature-religions), however different may be the conceptions formed about it.

The Two Principal Categories of Ethical Religions.—The ethical religions have to be distinguished into at least two principal categories: (1) Those which may be called *nomistical* (nomothetical) or Law-religions (*Rechtsreligionen*), and whose sacred writings, at least part of them, are framed like laws, as the Chinese Confucianism, the religions of the Brahmanical and Jaina-sects, primitive Buddhism, Mazdeism, Mosaism, and Judaism; (2) those which are based upon more or less broadly conceived, universally human principles, and which might be called missionary religions, viz., Islamism, the younger Buddhism, and Christianity. The first-named are, as a rule, confined to a definite nationality, for even if they try to spread among other nations, as the Zarathustric Mazdeism and Judaism have done, the alien proselytes are never regarded as the equals of the native adherents. One can not belong to such a religion without at the same time adapting one's self to the civilization and the customs of the nation with which it has originated. The last named have more or less completely relinquished the principle of nationality, and consider all believers as equals, whatever may be their language or their nationality. Hence the two categories might also be called *particularistic* and *universalistic* ethical religions. The term world-religions, applied to the latter, has been objected to, and, strictly speaking, there can be only one world-religion, though the word may continue to be used for practical purposes, referring to those religions which at least strive after conquering the whole world. Another objection, to the effect that the distinction made here is not a fundamental one, is unreasonable. There is a fundamental difference between law and principle; and moreover, the religions of the first-named category are, as to their development, at a lower standpoint than those of the other. C. P. TIELE.

LITERATURE.—As materials for the study of comparative religion see *The Sacred Books of the East*, a series of translations edited by F. Max Müller (London, 1879, *seq.*, 1st series, 24 vols., 1879–85; 2d series, 24 vols., 1886, *seq.*); also *The Records of the Past*, being English translations of the Assyrian and Egyptian monuments (1st series edited by Samuel Birch, 12 vols., London, 1874–81; 2d series edited by A. H. Sayce, 6 vols., 1889–93). For detailed treatment of several religions, see the following Hibbert Lectures: *The Re-*

ligions of India (F. Max Müller, 1878); *The Religion of Ancient Egypt* (Renouf, 1879); *Indian Buddhism* (Rhys Davids, 1881); *The Native Religions of Mexico and Peru* (Reville, 1884); *Celtic Heathendom* (J. Rhys, 1886); *The Religion of Ancient Assyria and Babylonia* (Sayce, 1887); *The Religion of the Parsis* (Darmesteter, 1890); *The Religion of the Ancient Hebrews* (1892). General works in this department are: C. Hardwick, *Christ and other Masters* (3d ed., London, 1874); A. Kuenen, *National Religions and Universal Religions* (London, 1882); Tiele, *Outlines of the History of Religion* (London, 1884; 2d ed. 1888); A. Reville, *Prolegomena to the History of Religion* (Eng. trans., London, 1885); Chantepie de la Saussaye, *Lehrbuch der Religionsgeschichte* (Freiburg im Breisgau, 2 vols., 1887–89, trans. of vol. i. *Manual of the Science of Religion*, London, 1891). Readable are J. F. Clarke, *The Ten Great Religions* (2 vols., Boston, 1870–83; n. e. 1886); G. T. Bettany, *The World's Religions* (London, 1890); F. F. Ellinwood, *Oriental Religions and Christianity* (New York, 1892); *Religious Systems of the World*, by various authors (London, 1889; 3d ed. 1893).

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Religious Societies: See the Appendix.

Religious Orders: See MONACHISM.

Remainder [from O. Fr. *remaindre*, deriv. of *remaindre*, remain < Lat. *remane're*; *re*, back + *mane're*, stay, remain]: in law, a future estate in land to take effect immediately upon the termination of a prior, limited estate upon which it depends, and with which it was created. As is explained in the articles ESTATE and PROPERTY, the estate in fee simple is conceived of at common law as being susceptible of infinite subdivision. When a tenant in fee simple grants a present, limited estate, as an estate for years, for life, or in tail, the residual interest not thus disposed of is itself an estate capable of being separately dealt with. If by the same conveyance the grantor parts with this residual estate or any part of it to a third person, it is called a *remainder*; if he does not part with it, it "reverts" to him, and is known as a *reversion*. (See LANDLORD AND TENANT.) The present or "particular" estate, as it is called, may be followed by any number of future estates in remainder until the whole fee simple has been taken up. Thus if a tenant in fee simple gives lands, by deed or will, to A for ten years or for life, then to B for life, then to C in fee tail, then to D and his heirs, A is the particular tenant, and B, C, and D are remaindermen. If the last limitation (to D and his heirs) had been omitted the remaining estate in fee simple would have, after the termination of the last remainder (to C), reverted to the grantor and his heirs.

It was a peculiarity of the remainder at common law, which was inflexibly maintained by the courts, that it could be created only as a true remnant of a fee simple to follow a prior estate which was less than the whole estate of the grantor. In other words, a remainder could not take effect in derogation of or in substitution for a preceding estate. Thus if a tenant in fee simple should make a conveyance of his land to A in fee, but with the proviso that if A should die without surviving issue then the estate should go to B in fee, the limitation to B would be void and the estate belong absolutely to A. The whole estate of the grantor had become vested in A, and it could not be divested and transferred to any one else by the creation of a remainder. The result aimed at could, it is true, be secured by the creation of a shifting use (see USES), or by executory devise (see WILL), but it could not be accomplished by any form of limitation known to the common law. By legislation in many of the U. S. remainders have lost this artificial character. In the State of New York, for example, it is expressly provided by statute that any future estate which is dependent on a precedent estate may be called a remainder, and that a remainder may be limited upon a contingency which will operate to abridge or determine the precedent estate. 1 R. S. 723 (sec. 11), 725 (27).

In the remainder proper, as above described, the interest of the remainderman was said to be "vested"—that is, the remainder, although its enjoyment was postponed to a future time, and although it was described as a future estate, was really regarded as a present interest in the lands affected by it, and was accordingly real property, capable of alienation, or, if a remainder in fee, of transmission by will or descent. Like reversions, remainders were regarded as incorporeal interests, and were, like easements and other "incorporeal" rights in land, alienable only by grant. See HEREDITAMENTS (*Incorporeal*).

Originally this "vested" remainder was the only form of future or "expectant" estate which could be created at common law, but in the course of time a gift to take effect in the future in favor of a person not now existing, or not yet ascertained, or upon an event which might or might not happen, acquired recognition under the description of a "contingent" remainder. Such a remainder was not, properly speaking, an estate, inasmuch as it could not be alienated or devised, and would not descend to the heir of the contingent remainderman. It was, moreover, an interest of a most precarious character, as it was liable to destruction by any one of a variety of accidental or intentional circumstances. If the event upon which the contingent estate was limited to depend had not happened at the time when the preceding estate came to an end, the contingent remainder was destroyed. So also a release of the reversion to the particular tenant or the surrender of the estate of the latter to the reversioner, whereby the reversion and the particular estate were merged (see LANDLORD AND TENANT), had the effect of destroying the intervening contingent remainder. This process may be illustrated by supposing A to have a life-estate, with remainder to the (unborn) son of B for his life, with remainder to C in fee. If B's son has not come into being when A's life-estate comes to an end, the contingent remainder of the former is destroyed forever, and the estate vests at once in C. So if, before the birth of B's son, A should convey his life-estate to C, or C his vested remainder to A, the estate would be lost to the contingent remainderman forever. If, however, B's son should be born before any of the events above suggested have happened, his interest would at once become vested, and would from that time on be wholly unaffected by such contingencies. By legislation, whereby contingent remainders are preserved from destruction by the events above enumerated, and whereby they may be alienated or may descend to the heir of the contingent remainderman, these interests have been very generally assimilated to vested remainders both in England and in the U. S., and have thus in a greater or less degree acquired the character of true estates.

For further information, consult Digby, *History of the Law of Real Property*; Fearne on *Remainders*; Leake's *Law of Property in the Land*; the *Commentaries* of Blackstone and Kent, and the statutes of the several States.

GEORGE W. KIRCHWEY.

Remarque Proofs: See ENGRAVING.

Rembang': a Dutch residency of Java, East Indies, comprising 2,600 sq. miles, with (1888) 1,241,093 inhabitants, of whom about 18,000 are Chinese and 700 Europeans. The capital, Rembang, on the flat, hot, northern shore of Java (see map of East Indies, ref. 8–E), has 25,000 inhabitants and some ship-building. Revised by C. C. ADAMS.

Rembrandt (full name, *Rembrandt Harmenszoon Van Rijn*): painter and engraver; b. at Leyden, Holland, July 15, 1606. He first studied painting with Jacob von Swanenburch, and then under Peter Lastman, at Amsterdam. He returned to Leyden in 1623 and gave himself up to studying from nature and painting portraits. About 1629 he settled in Amsterdam, where he remained till his death. His fame was great, his studio crowded with scholars, and his works in great demand, yet in 1656 he became insolvent. It is supposed this may have been owing to the impoverished state of the republic, and to his reckless extravagance in collecting works of art. Sufficient data exist contradicting the oft-repeated tales of his miserly habits. Rembrandt was the greatest genius among Dutch painters, and his influence in the art of his country is paramount. He was married twice, and had in all four children. His son Titus by his first wife became a painter, but did not distinguish himself, and died in his father's lifetime. Among Rembrandt's best-known works are *The Presentation in the Temple*, at The Hague; a portrait of a young man in the royal collection at Windsor; the portrait of Coppenol at St. Petersburg; *The Anatomical Lecture* painted in 1632, at The Hague; *The Night Watch*, at Amsterdam, a prominent example of his maturer work, dated 1642; the portraits of the Syndics, also at Amsterdam, dated 1661, which shows his later manner. He is supposed to have been painting on *The Betrothed Jewess*, now in the Rijks Museum, Amsterdam, the year of his death, 1669. He was buried in the Wester Kirk, Oct. 8 of that year. Of his engravings the most famous are *Jesus Christ Healing the Sick*, six portraits of himself done between 1630 and 1654, *Burgomaster Six*, *Adam and Eve in the Garden of Eden*, *The Flight*

into Egypt, Jesus and the Woman of Samaria, Jesus Healing the Sick, the *Resurrection of Lazarus*, etc., in all 365, of which Bartsch, of Vienna, has made a catalogue. For further information consult Rev. C. H. Middleton, *Descriptive Catalogue of the Etched Work of Rembrandt*, and F. Seymour Haden, *Rembrandt's Etched Work* (1879).

W. J. Stillman.

Remensnyder, Junius B., D.D.: clergyman; b. near Staunton, Va., Feb. 24, 1842. Graduated at Pennsylvania College, and Theological Seminary, Gettysburg, Pa.; pastor, Lewistown, Pa., 1865–67; St. Luke's, Philadelphia, 1867–74; Savannah, Ga., 1874–80; St. James, New York, since 1881. Dr. Remensnyder, while a member of the General Synod South, offered the motion for the preparation of *Common Order of Service*, which has since been adopted by all English-speaking Lutherans. He has published *Heavenward* (Philadelphia, 1874); *Doom Eternal* (New York, 1880); *Six Days of Creation* (Philadelphia, 1886); and *The Lutheran Manual* (New York, 1893).

Rem'enyi, Edward: violinist; b. in 1830 in Hungary (at Herves or Miskole—accounts vary); studied at the Vienna Conservatory 1842–45 under Joseph Böhm, the teacher of Joachim. In 1848 he took part in the insurrection against Austrian rule, and was compelled to fly. He made a concert tour in the U. S. 1849–50, and in European capitals; returned to Hungary in 1860; played in Paris 1865 and again in 1875, in London 1877–78, and in the U. S. in 1878, 1887, and again in 1893. D. in San Francisco, Cal., May 15, 1898. His playing was characterized by great dash, fire, and emotional quality, combined with high technique. D. E. H.

Remig'ius: the name of three eminent French ecclesiastics: (1) St. Remi, the Bishop of Rheims, and the apostle of France, who in 496 baptized Clovis, the founder of the French monarchy. He was born at Laon in 437, became bishop in 459, and died Jan. 13, 533. His literary remains are in Migne, *Pat. Lat.*, lxv. (2) The Archbishop of Lyons, who sided with Gottschalk in the great anthropological controversy of the ninth century. He became archbishop in 853, and died after 875. His life and works are given in Migne, *Pat. Lat.*, cxxi. (3) A Benedictine monk of Auxerre, who was at the head of the bishop's school at Rheims in 882, and died about 908. He wrote commentaries on the Psalms, the last eleven of the Minor Prophets, and the Epistles of St. Paul, and an allegorical explanation of the mass. His works are reprinted in Migne, *Pat. Lat.*, cxxxi.

Revised by S. M. Jackson.

Remington Rifle: See Small-arms.

Remittent Fever [*remittent* is from Lat. *remit'tens*, pres. partic. of *remit'tere*, send back, slacken, relax; *re-*, back + *mit'tere*, send]: a form of malarial fever characterized by an abatement of the temperature occurring at certain intervals, but no return to the normal point while the fever lasts. In this it is unlike intermittent fever, in which there are periods of entire or almost entire apyrexia (absence of excessive heat). The cause of remittent fever is the same as that of any other malarial fever, and is believed to be a specific germ. Several such germs have been described, figured, cultivated, and successfully inoculated. The one which now has most general acceptance is that known as Laveran's. See Miasma.

Remittent fever is usually of a more mild type than active intermittent fever. Its symptoms are less pronounced; the chill is less severe; and in the course of the disease it may appear only once. The alterations of temperature are not unlike those of typhoid fever, and remittent is probably not infrequently taken to be mild typhoid fever. Bronchitis often occurs at the outset of remittent fever, and jaundice frequently follows it. This form of malarial fever is found in all parts of the world, in dry as well as in swampy regions. The diagnosis, made from the symptoms alone, may at times be quite difficult. To obviate this it has been suggested that in all cases the blood should be examined microscopically, and that those cases only should be regarded as malarial in which the specific germ of Laveran is found.

The treatment of remittent fever is that of any form of malarial fever—quinine, as a specific remedy, and tonics, with attention to the general health. See Intermittent Fever.

Charles W. Dulles.

Remmius: See Palæmon.

Remonstrants [from Lat. *remon'strans*, *remonstran'tis*, pres. partic. of *remonstra're*, remonstrate; *re-*, again + *monstra're*, point out, show]: the name by which the adherents of Arminius were designated when in 1610 they addressed a remonstrance (*remonstrantia*) to the states of the province of Holland. Their adversaries, the adherents of Gomarus, answered with a counter-remonstrance, and were called Contra-Remonstrants, but both designations fell subsequently out of use.

Remsen, Ira, M. D., Ph. D., LL. D.: chemist; b. in New York, Feb. 10, 1846; graduated A. B. from the College of the City of New York in 1865, M. D. from the College of Physicians and Surgeons, New York, in 1867, and Ph. D. from the University of Göttingen, Germany, in 1870; was assistant in chemistry in the Universities of Tübingen, Munich, and Göttingen, Germany, from 1870 to 1872; Professor of Chemistry and Physics in Williams College from 1872 to 1876; Professor of Chemistry in Johns Hopkins University, 1876–1901; President Johns Hopkins, 1901. He received LL. D. from Columbia College in 1893. His more important publications are *Theoretical Chemistry* (1st edition, Philadelphia, 1876; 4th edition, 1892, translated into German and Italian); *Organic Chemistry* (Philadelphia, 1886, translated into German, Italian, and Russian); *Introduction to the Study of Chemistry* (New York, 1885, translated into German and Japanese); *A Text-book of Inorganic Chemistry* (Philadelphia, 1889). He is an associate editor of *The Universal Cyclopædia*.

S. T. Armstrong.

Remus: See Romulus.

Rémusat, rā'mü'zaa', Jean Pierre Abel: Orientalist; b. in Paris, Sept. 5, 1788; studied medicine, took his degree, but devoted himself principally to the study of the Asiatic languages, especially Chinese, and was appointed Professor of Chinese at the Collège de France in 1814, a chair which was established specially for him. D. in Paris, June 5, 1832. His principal works are *Recherches sur les Langues tatares* (1820); *Éléments de la Grammaire chinoise* (1822); *Mélanges asiatiques* (2 vols., 1825); *Nouvelles Mélanges asiatiques* (2 vols., 1828); numerous translations from the Chinese and Tibetan languages, besides minor essays in scientific periodicals.

Revised by Benj. Ide Wheeler.

Renaissance, Fr. pron. re-nā'sāăns' [=Fr. *renaissance*, a being born again, deriv. of *renaître* < Lat. *renas'ci*, *rena'tus*, be born again; *re-*, again + *nas'ci*, be born]: a great advance in learning or in the study and pursuit of literature, fine art, etc.; a name applied especially to the revival of learning in the fifteenth century, beginning in Italy, and to the change in most departments of thought which accompanied and followed it. The Renaissance in learning and in literature has been described under Humanism. The term is also used as an adjective, as Renaissance designing, Renaissance sculpture.

Painting and Sculpture.

The Beginning.—The fine art of painting had nearly disappeared from Western Europe during the early Middle Ages, but had been partly restored during the twelfth and subsequent centuries in the north, in vigorous if unskillful wall-pictures and in decorative windows (see Glass); in Italy, in panels painted under Byzantine Greek influence, and in wall-pictures more skillful and better arranged than those of the north; also in the decoration of manuscripts and in the very beautiful miniatures which they contained. (See Illuminated Manuscripts and Miniature.) The fine art of sculpture had been developed in connection with Gothic architecture to great excellence in the thirteenth century; the decorative value of the best works of the time, as part of a building, has never been equaled before or since, and its expressional and purely sculptural value was high. But in Italy in the thirteenth century there began a much closer study of those remains of ancient Roman work which had never been wholly neglected, and also some renewed influence from Constantinople is to be presumed. In 1280 Nicolo Pisano had been dead two years, and had left the remarkable *Descent from the Cross* at Lucca, the *Arca di San Domenico* at Bologna, and the pulpits of Pisa and Siena. His son Giovanni was thirty years old at least, and he and Rossi of Perugia had finished the Perugia fountain. Arnolfo di Cambio had completed the Braye tomb in S. Domenico of Orvieto. A classical feeling was visible in all this sculpture, and a strong effort to treat the figure subjects by and for themselves, apart from the architectural framework. In 1310 Giovanni Pisano had finished the Pistoja pulpit and the monument to Pope Benedict XI. at Perugia; and perhaps the angels and the lunette of the *Porta della Canonica* at Florence, which are of that time even if not by that

sculptor. In the same year Giotto was thirty-four years old, and had painted the Arena chapel at Padua and the chapel of the Florence Bargello, in which works are still to be seen the plain evidences of a combined realism and skill —a desire to think for himself, and a power to express thoughts in painting—which are at the bottom of later progress in painting. These early dates show that the Renaissance in fine art was well under way before any influence from the humanists or the restorers of classical learning had reached the painters and the sculptors. Those artists were thinking out for themselves the great question why the antique sarcophagi and the Græco-Roman engraved gems showed an art so much more learned and complete than theirs. Before Petrarch died, leaving the literary and philosophic Renaissance alive and in progress, if not yet assured, Andrea Pisano had completed the present south doors of the baptistery at Florence, Balduccio had put up his three or four important tombs at Milan, and Orcagna had adorned the Or San Michele at Florence with his marvelous work, ahead of its time and reaching on toward another century, the shrine of the Madonna. Then indeed there seemed to come a pause, and it is hard to understand why so little important art was produced between 1360 and the year 1420 or thereabouts, when Giacomo della Quercia and Lorenzo Ghiberti had come to the front, and Donatello was a promising young sculptor—when, in painting, Fra Angelico and Gentile da Fabriano were gradually leaving missal books and bridal chests for wall-pictures, and the great innovator Masaccio was fairly at work. The year 1425 may be taken as a good date for the triumphant establishment of the new wisdom and power in fine art. Then Masaccio's frescoes in the Brancacci chapel at Florence were well advanced. Then Giacomo della Quercia, who had completed the lovely recumbent figure of Ilaria del Carretto a year or two before, began his sculptured work at San Petronio at Bologna—sculptures associated with a mediæval-seeming doorway, but as far as need be from mediæval in character; indeed modern in conception and in modeling. Then, too, Lorenzo Ghiberti, who had just completed the present north doors of the Florence baptistery, had begun the more elaborate east doors—not necessarily superior to the earlier ones in real merit, but immensely in advance of them and of other previous sculpture in power over material, and in boldness and grasp of subject. And at that time Donatello, whose work is often less easy to date, had certainly completed the noble statues of the exterior of Or San Michele at Florence, the St. Peter and St. Mark, and the admirable St. George. Little had the Renaissance artists learned from the classical scholars up to this time, and yet modern sculpture and modern painting were begun, their possibilities shown, and their future course well indicated.

The Fully developed Renaissance.—The year 1475 is the central point in the century of greatest artistic achievement of the Italian Renaissance, excluding the Venetian painters. The one noticeable effect of the revival of letters upon fine art, the suggestion of subjects from classical antiquity, was then as noticeable as it was to become. This is not of great importance, for the great artists of that time, as of all times, cared little what stories their work was to tell to non-artistic beholders, and painted an allegory of the *Garden of Cupid* as cheerfully as a martyrdom. The important thing is the extraordinary variety of artistic power possessed by the men who were then at the head of the fine-art movement. In Florence Fra Filippo Lippi had been dead seven years, leaving behind him a large number of somewhat prosaic but vigorous and animated pictures. Berozzo Gozzoli was about fifty years old, and had painted his remarkable frescoes in the Pisan Campo Santo. Sandro Botticelli was twenty-eight years old; he had painted those wonderful round Madonna pictures which are now seen in the Louvre and the Uffizi; and either had painted or was on the point of undertaking that *Triumph of Spring* or *Flora*, the famous allegorical picture of the Florence Academy of Arts. The great Ghirlandajo was of about the same age, and had not quite reached his mature power. The two brothers Pollajuolo were at the height of their joint career. Luca della Robbia had done all his best work, both in marble and in glazed terra-cotta, and was an old man. Mino da Fiesole had finished the tomb and the altar of Fiesole cathedral and the noble compositions of the Florence Badia. Verocchio, painter and sculptor, forty years old, was at work upon the *David* of the Florence National Museum. His great pupil, Leonardo da Vinci, was twenty-three years old and at work, but destined to so long a career that he belongs rather to a later epoch than this. In the north, where Leonardo was to labor the most, Mantegna was forty-five years old, and had finished his work at the Eremitani at Padua and the castle at Mantua, besides a host of separate pictures and his principal engravings. Of the Venetian painters even, later to reach greatness and destined to hold it longer, the founder of the school, Giovanni Bellini, was fifty years old. He had painted the splendid altarpiece of the Church of SS. Giovanni e Paolo, Venice, which was burned in 1867, and the gigantic altarpiece at Pesaro, which still remains, and had perhaps reached his greatest strength, though he was to retain it long. These pictures are worthy to rank with those of Central Italy; it is not because the unmatched achievements of the later Venetians surpassed them that they should be depreciated. The Renaissance of fine art in its purest and loveliest form is in the best pictures of Giovanni Bellini. Still more powerful work was to come than any of these mid-Renaissance paintings and sculptures could offer—more powerful, but with not a greater charm.

The Late Renaissance.—Italian writers are extremely careful to mark the close as well as the beginning of their *Rinascimento* or *Risorgimento*. Most of them end this epoch with the early years of the sixteenth century, the *Cinque Cento*, and call the art of that century the *Classicismo*, because it is all, but especially architecture, strongly influenced by the study of ancient Roman remains, or the art of the *Decadenza*, as having lost the charm of spontaneity and unaffected grace, or simply the art of the *Cinque Cento*. The pre-Raphaelites had somewhat the same feeling when they took Raphael's work in Rome (1508 and following years) as the turning-point, with growth before, and decay after. Michelangelo's long career begins with our central year 1475, lasts through the splendid years of highest and purest achievement in Central Italy, and outlasts everything that was precious and hopeful in Italian art anywhere out of Venice.

By 1525 the artists who were great in 1475 were all dead, but this half century was filled with the labors and with the fame of most of the men named under the earlier date, and, besides them, of the following: Filippino Lippi, who died in 1505, Fra Bartolomeo, who died in 1517, and Lorenzo di Credi—all three men of the Florentine Renaissance proper; Andrea del Sarto, modestly keeping up the older traditions except when the overwhelming force of some one of his contemporaries swayed him, capable of anything, but original only in that he gave to his canvases an unwonted glow of color. Among the Umbrians and so-called Roman school, there were Perugino, who had died in 1524, and Francia (Raibolini), who had died in 1517—great workmen, whose art is somewhat lost in the splendor of Raphael's glory; Raphael, who had died in 1520, having made the deepest mark upon the artistic thought of his time, and gained a celebrity and a recognition far beyond what other artists had reached; and Luca Signorelli, of Venice and Central Italy, most powerful and accomplished of all the men who missed supreme greatness; finally (still excepting the great Venetians), Michelangelo in 1525 had painted the Sistine vault and had sculptured the *Moses*, the Florence *Pietà*, the bronze *Pope Julius*, and the *Christ* of Sta. Maria sopra Minerva.

After 1525 decay was rapid. Pontormo and Ridolfo Ghirlandajo, with such mechanicians as Vasari and Venusti, were in the field, and in the north Bernardo Luini was still alive and painting. Andrea Sansovino, best known by the splendid tombs in Sta. Maria del Popolo at Rome, was still alive in 1525, but near his end. Jacopo Sansovino, rather architect than sculptor, had still the divine gift of form in sculpture. Michelangelo was still to complete the Medici tombs at San Lorenzo. Benedetto da Rovezzano had taken his splendid talent to England; and both there and in Florence has left beautiful work behind him.

The Venetian Painters.—In 1525 Giorgione was dead. Titian was nearly fifty years old and in the fullness of his strength. Of the other giants Tintoretto was a boy, and Paolo Veronese unborn; but in Venice the conditions which obtained elsewhere were of no force. Venice was hardly an Italian city, but a little world by itself, poised between the East and the West. Decay did not set in there till much later than in the center. See the notices of the painters named above; also BELLINI and TIEPOLO.

In other Countries.—The descriptive term Renaissance hardly applies to the work of the painters and sculptors elsewhere than in Italy. The art work in France, Spain, Belgium, Germany, Holland, and England is rather a con-

tinuation of the mediæval schools of those countries until long after the Renaissance had run its course in Italy. Some exceptions to this rule exist, in France especially (see below), but in general it is true that the great Spaniards or Dutch or Flemings belong to the seventeenth century, or a later date, and to the history of modern painting and sculpture.

Architecture.

Under this heading it is proposed to consider architecture from the revival of learning to the beginning of the present era. Gothic architecture in Italy had been more or less a foreign style, used by the Cistercian and Franciscan monks in the thirteenth century, and followed, but not closely, by the Venetians, the Florentines, and generally throughout Italy in the fourteenth. Its system of construction, upon which it depends, indeed, and from which it arose, had never been adopted by the Italians with complete unreserve; it is indeed rather as a form given to openings and porches, and a certain freedom allowed to columns and other details than as a complete style that the Italian Gothic appears in the history of architecture. Round arches were never given up altogether, nor low-pitched roofs at all, nor broad, unbroken surfaces of wall, nor the use of surface decoration in large masses, nor marble sheathing and delicately worked sculpture in marble. Therefore when Brunelleschi, a sculptor and—like other sculptors of his time—a planner and designer of buildings, came back from Rome about 1407, and it appeared that he had been studying there the ancient monuments, then much less defaced than they now are, and that he meant to build in the spirit of ancient work, he had a less completely new doctrine to preach than would have been the case in the north. Round arches springing from simple and massive piers had been used with splendid effect by Orcagna and others, as, for instance, in the Loggia dei Lanzi, begun and its character determined probably about 1360. The smooth, large, easy-flowing lines of this noble structure, which yet preserves in its details much of the character of Florentine mediæval work, must have pointed to a gradual transition from Gothic, as the Italians understood it to be a kind of design which should be classical in feeling and made up of classical details, but not without a certain mediæval freedom. The Cathedral of Florence stood with its roof unfinished and the great octagon open to the sky. This great space, larger than that covered by any dome of masonry in Europe except the Pantheon, whose dome is low and hidden in the walls, Brunelleschi, about 1425, covered with the splendid cupola which still crowns Florence; light and high, culminating in a temple-like finial which alone is over 80 feet in vertical dimension, it is a thing as unlike anything Roman as it could well be, and yet a great step toward the Roman largeness of parts and simplicity of construction. So his first church, San Lorenzo, in Florence, begun about 1440, has the un-Roman device of arches springing from isolated columns. There are, indeed, suggestions of a classical entablature crowning each capital, but so reduced in comparative size as to seem a mere doubling of the abacus. The fine interior of Santo Spirito, a later design, preserves the same peculiarities. It is back to the fifth or to the tenth century, to the latest monuments of the dying empire, or else to the Christian basilicas, that Brunelleschi looked, not to the buildings of Augustus or of Hadrian. In like manner the Pitti Palace, begun about 1435, shows not one feature which any Roman building could ever have possessed. If it is so with Brunelleschi, the master, the originator so far as we can judge of the movement toward a classical revival, it is equally so with his great rivals. Michelozzo Michelozzi began the Medicean Palace, which is now called Riccardi, about 1430, and this is as un-Roman as the Pitti. Even Alberti built the exquisite but half mediæval front of Sta. Maria Novella, beginning it probably as late as 1460. In Venice the lovely Church of the Madonna dei Miracoli was built about 1480 by Pietro Lombardo; and the palace called the Casa Dario, on the Grand Canal, and one called Trevisan, or the house of Bianca Capello, behind the Ducal Palace, and the long stretch of the Procuratie Vecchie on the north side of the great square of St. Mark, were all built or begun before 1490; there is nothing Roman in these except a distant reference to antiquity in their details.

There was also, however, a deliberate and conscious attempt to design as the ancients designed, and because they did so. Alberti aided powerfully in this direction, for he was a scholar first of all and an antiquarian by nature. Brunelleschi was content to use classical details, a general classical character and spirit of design, but Alberti deliberately took a Roman triumphal arch as a model for the distribution of a church front. This he did as early as 1446, when the façade of the church at Rimini was begun, and this he repeated as late as 1470 or 1471, when work was begun upon S. Andrea at Mantua. This latter building, indeed, is wholly Roman in the combination of its parts. True, no structure could have been known to Alberti in which pilasters were used throughout as the main feature of the decoration, but it was easy to deduce this use of them from the Colosseum or the baths of Diocletian. True, no Roman building could have given him an example of large windows forming a vital part of the design, but it was his business to provide the large windows which were necessary, and still to keep a Roman look. So it seems that S. Andrea is conceived as an answer to this problem: How would a Roman architect of the second century have designed a building made up of long and narrow halls one story high, with windows, and without the large free columns which the Romans used freely, but which there were neither mechanical nor pecuniary means to provide at Mantua? It may be thought that nothing could have been more unfortunate for the future of art than the eager interest in this problem, taken by Italy at first and then by the rest of Europe; but it is sure that from this time on the study of Roman architecture, not merely for its suggestions but as a whole to be imitated, went on side by side with the fresh and original growth of the Renaissance architecture. Such graceful, simple, unimitative designs as the front of San Zaccharia at Venice, by Antonio di Marco, about 1456, of the Church of the Madonna dei Miracoli at Venice, about 1481, by Pietro Lombardo, and of the Palazzo del Consiglio at Verona, probably by Fra Giocondo (1430 or 1435–1529), and built during the closing years of the century, are the real glory of the Renaissance. Unluckily Fra Giocondo, one of the masters of graceful and original treatment of all kinds of unusual problems, was instrumental in the Roman decadence. He is said to have discovered at Paris a manuscript of Vitruvius more complete than had been known before; at all events, he had to do with editions of that author's work, *De Architectura*, supposed to be more complete and more critical than previous ones, and in this way did what he could to enchain architectural practice by half-understood rules arbitrarily laid down by a single writer of the Augustan age. The *Classicismo*, or classical revival, came in with the new century, or with the second decade of it. At all events, the Italian Renaissance in architecture passed away with all its charm and variety, and may almost be said to have died with the beginning of the new Church of St. Peter on the Vatican Hill.

Meantime in France the late Gothic, a style developed naturally out of the Gothic proper of the thirteenth century, was doing wonders—it is Gothic with Gothic sculpture. Not to mention earlier buildings, the magnificent Church of S. Wulfran of Abbeville was not begun until 1488, a half century after Brunelleschi's beginnings in Florence. The Church of St. Riquier, near Abbeville, is later still; the Hôtel de Cluny, in Paris, was not begun until 1490; the central and finest part of the Palais de Justice, at Rouen, was not begun until the last year of the century; the Church of Brou, at Bourg-en-Bresse, was not begun until 1505. In England fan-vaulting, the finest thing ever done in architecture in the British Isles, was in its glory at this time; the roofs of St. George's chapel at Windsor, Henry VII.'s chapel at Westminster, and, chief of all, King's College chapel at Cambridge, were all under construction in that same year, 1505. But it is also true that when Louis XII. came to the throne of France in 1498 there was already a spirit of longing after the classic splendors of Italy, half seen and half understood by the lords who had followed Charles VIII. in his expedition to Naples. In that year or the next work began upon the new Château of Amboise, and the designs for the lost Château of Gaillon, of which fragments decorate the court of the École des Beaux-Arts in Paris, must have been under consideration as early as 1500. There are sixty years between the beginnings of the architectural Renaissance in Italy and in France. There are perhaps eighty years between the firm establishment of the new style in the two countries, because in France the new style found an old one firmly intrenched, while no such thing is true of Italy, in spite of the charm of some Italian Gothic monuments of late date. The time of the early Renaissance in France, and of its final dawn in Germany and England, is a time of fatigued and self-conscious decay in

Italy, partly because of war and political decline, but partly also because of the substitution of a style of architecture made up of rules and fixed measurements for the fresh inspiration of the earlier time. Thus in the year 1535 the full classical style is embodied in perhaps its loveliest creation, the Library of St. Mark in Venice, and the Renaissance makes its farewell in the front of the Scuola di San Rocco. In that same year Francis I. was surrounded by his Italian and French artists and artisans, and they were still feeling their way with hesitating steps. The Château of Chambord was well advanced but far from completion, and so with Francis's own wing of the Château of Blois, but the new Louvre had not been begun. In Germany and in England the introduction of classical details had hardly begun, and not the least impression had been made upon the general character of the over-picturesque, gabled, and turreted character of the continental art, or of the prosaic Tudor style of England.

The full charm of the Renaissance continued in France through the reigns of Francis I. and Henry II., 1515–59. Then with the religious wars of succeeding reigns comparatively little was done. The style of Henry IV. succeeds, and the French writers are careful not to include that epoch in the Renaissance. If, however, we take the years 1600–10 as the reign, which it is, for our purpose, we find still the most marked difference in the character of the buildings in Italy and in the north. The very "orders," as understood by Henry's architects in Paris, are plastic, modified almost at will; and in Germany, where Ionic or Corinthian columns are seen at all, they are generally small colonnettes, decorating the bold bay windows and stepped gables of a style as picturesque and diversified as that of the Middle Ages. Meantime, in Italy, St. Peter's was being pushed toward completion; in fact, the great colonnade of the front was nearly complete in 1610. Palladio, chief of all classicists, had died in 1580, and all his designs which remain to us had been completed as we have them before 1600. The reign of formality was complete in Italy for nearly a century before it had much hold upon the north.

Buildings in the true classical spirit were built under Louis XIII., such as the wing of Gaston of Orleans at the Château of Blois. It was not, however, until the middle of the seventeenth century that the grandiose and formal style of Louis XIV. finally replaced the French Renaissance. The colonnade of the Louvre was begun in 1664. Before that time the country châteaux and the buildings in provincial cities kept much of the movement and variety of the sixteenth century. The colonnade of the Louvre, the Church of the Invalides, with its noble dome, and the colossal Château of Versailles, in which everything, even the chapel, was of a grandiose, pseudo-Roman type, finished the struggle. From that time the Roman style prevailed, even in Eastern Germany and in England. St. Paul's in London was begun in its present form about 1675.

The architectural style of the seventeenth century toward its close certainly sins on the side of coldness and formality. A singular result of this was the Barocco style which was so soon to follow—perhaps a natural and inevitable reaction. Germany, whose princes had tried to follow Louis XIV. and to build small imitations of Versailles, found the chilly grandeur of that style insupportable, and eagerly took up the novel variety and play of fancy, however insubordinate. The Zwinger Palace at Dresden is one of the earlier instances of this new taste; but that seems to have been thought extravagant. So fantastic a style in cut stone and out-of-doors was too much even for that period of doubtful taste. A better type, and one of the best instances of the developed Barocco style, is the Schloss of Brühl, near Bonn on the Rhine, begun about 1725. Here the exterior is stately and grave, with a "colossal order" of pilasters—that is, an order occupying the whole height of the main wall and including several stories. The smaller details indeed may be rather riotous, and the roof intemperate in curvature, but the full fancy of the designers is kept for the interior, where scroll-work and *rocaille* flourish in their fullest development. The Schloss at Bruchsal, near Heidelberg, is another such building, built about 1741, while the Brühl building was still incomplete. To find in France instances so characteristic of the Barocco style, it seems necessary to examine, for interiors, the Hôtel de Soubise (now the Archives Nationales) and the Hôtel de Toulouse (now the Bank of France). Something of the original exterior remains also in these buildings, but perhaps the great barrack called still the Military School, fronting on the Champ de Mars, and the Château of Compiègne, N. E. of Paris, are the best exteriors of the time. These are both the work of an architect of exceptional ability and good taste, Jaques Ange Gabriel (1699–1782). It is to be noticed that in such an epoch of careful reference to authority and submission to generally admitted rules stately buildings will be erected in the spirit of a previous epoch in spite of a more corrupt taste prevailing in minor arts. Thus in England the Cambridge University senate house, built in 1730, and the Ratcliffe Library at Oxford a little later, each by James Gibbs (1674–1754), are wholly admirable as pieces of design in a style which admits of but little originality. They are worthy to be compared, as to their exterior, with the French buildings of Gabriel, above named. It is in the interior fittings that the style alternates between unrestrained license and cold monotony. In the minor buildings of the time the same bad influence is at work, the only architectural feature recognized as noble being the colonnade or the order of pilasters, with their high plain basement beneath. Buildings which could not have these costly decorations were left with flat walls and square openings evenly spaced. The often complained of monotony of Baker Street and Regent Street in London came, not from the Renaissance proper, but from its unhappy successor, the grandiose Roman revival, begun in Italy in the seventeenth century.

Some attempt at a reaction was made under Louis XVI. Jaques Germain Soufflot (1714 or 1709–80) built the Church of St. Geneviève, or Panthéon, all but the cupola. Pierre Rousseau (b. 1750) built in 1786, for a private residence, the Hôtel of the Legion of Honor on the Quai d'Orsay. In these and in other structures of the time an originality of conception is shown foreign to the previous epoch of a hundred years or more. As under Louis XVI. a new spirit of refined and delicate design is seen in furniture and ornament, so in the most important buildings of the time were the evidences of perhaps a new Renaissance, a return to reason and thought as a substitute for obedience to authority. The great French Revolution put an end to this.

Modern Architecture.—In all the previous sketch it has been possible to speak of the style prevalent at any given time as universally and in all cases the same. At no time does any one builder deviate from the style used by others except as he makes slight modifications, which, at once adopted by others, who in their turn add and alter a little at a time, end in the slow development of the style of the succeeding epoch. In the present era, beginning with the end of the Napoleonic wars in 1815, we face a wholly new condition of things, a condition which had never existed before in all history. From 1815 until 1894 architects have built classical buildings with huge rows of columns, as their fathers or grandfathers had done; Renaissance buildings with delicate details like those of the fifteenth or sixteenth century; Gothic buildings copied from those of the thirteenth or of the fifteenth century; Romanesque buildings studied after models of the eleventh or twelfth century; buildings supposed to be Greek, and copied from the Parthenon; and even Egyptian or Moorish attempts at novelty. It is important to understand how completely this chaos of styles, existing in the absence of any reigning style, differs from all previous experience. Probably no architectural progress can be made under these conditions. Larger and more elegant buildings may be built, and now and then a pleasing result may follow in the way of an archæological study of some ancient structure or group of structures, but that can not be the beginning of a fine art of architecture.

Bibliography.—There are few works on this subject in English. Fergusson's *History of Modern Architecture* is of very little value in this respect. Walter Pater's *The Renaissance* (3d ed. 1888, a series of essays) is very valuable for its truthful insight, and is a suggestive book. J. A. Symonds's *Renaissance in Italy* (vol. iii.) is devoted to the fine arts and gives much general information, but the point of view is that of a literary man having little sense of the true nature of the graphic and plastic arts. The work of Crowe and Cavalcaselle on painting in Italy (9 vols., under different titles), is wholly confined to the period of the Renaissance, although not so announced. This is true also of Charles Perkin's *Tuscan Sculptors* and *Italian Sculptors*, and his smaller and comprehensive work, *Historical Handbook of Italian Sculpture*; but these works do not give the results of late researches, and their statements as to minor matters of fact are not always trustworthy. The same author wrote a sketch of *Sepulchral Monuments in Italy* for a publication of the Arundel Society. Mark Pattison's *The*

Renaissance of Art in France may be consulted, and there are translations of some of the following works, viz.: In the Quantin *Bibliothèque de l'Enseignement des Beaux-Arts* the volumes on *Les Styles Français*, by Lechevallier-Chevignard, and on *L'Architecture de la Renaissance*, by Léon Palustre. By this last-named author, *La Renaissance en France* (3 vols., 1879–89, out of a proposed series of twenty or more). Eugène Müntz, *Les Précurseurs de la Renaissance en Italie*, and *Histoire de l'Art pendant la Renaissance* (vols. i. and ii.); Charles Yriarte, *Un Condottière au Quinzième Siècle: Rimini*; Émile Gebhart, *Origines de la Renaissance en Italie*; Le Comte de Laborde, *La Renaissance des Arts à la Cour de France*. There are also books of plates, such as Fritsch's *Deutsche Renaissance*, and works on the general history of architecture; also monographs of special towns and buildings. RUSSELL STURGIS.

Renal Diseases [*renal* is viâ O. Fr. from Lat. *renalis*, pertaining to the kidneys, from *renes*, kidneys]: diseases of the kidneys. The chief of these are CALCULUS, or stone in the kidney, DIABETES, and BRIGHT'S DISEASE, sometimes called nephritis or inflammation of the kidneys, of which many forms exist. See the separate titles.

Renan, re-năn', JOSEPH ERNEST: philologist and historian; b. at Tréguier, Brittany, Feb. 27, 1823. He was destined for the Church, and at the age of sixteen went to Paris to study. At the Seminary of Saint-Sulpice his taste and talent for languages showed themselves, and his opinions and beliefs were so changed that he felt compelled to renounce the priesthood, and devoted himself to private teaching and study. He became familiar with German, and was much influenced by the methods and results of German historical criticism. In 1848 he received the Volney prize for a monograph on the Semitic languages, and was again honored by the Institute soon after for his essay *Étude de la langue grecque au moyen âge*. In 1849 he was sent on a literary mission to Italy, and collected the materials for his doctor's thesis, *Averroès et l'averroïsme* (1852). In 1851 he was appointed to the MS. department of the Bibliothèque Nationale, and in 1856 succeeded Augustin Thierry in the Académie des Inscriptions. In 1860 he was sent on a scientific mission to Syria, and in 1862 was appointed to the chair of Hebrew of the Collège de France, but the demonstration made at his opening lecture was so violent that he did not continue his course, and was removed the following year, after the appearance of his most famous work, *La vie de Jésus*, which drew upon him the attacks of the orthodox churchmen. He was reappointed to his chair in 1870. In 1872 he revisited Italy. He was chosen to the Academy in 1878, and his speech at his reception caused such highly excited comment in Germany by its political allusions that he thought it worth while to explain his meaning in a *Lettre à un ami d'Allemagne*. In 1880 he delivered in London the Hibbert lectures upon *The Influence of Rome on Christianity*. His attempts to enter the political field in 1869 and 1876 were unsuccessful. In 1873 he was chosen administrator of the Collège de France, and continued to be re-elected till his death, in Paris, Oct. 2, 1892. His chief subjects of study were the Semitic languages and the antecedents and beginnings of Christianity, and in reaching his results the methods of severe historical criticism are supplemented by a vivid and sympathetic imagination. He touched also many other fields, and his influence upon the world of ideas of his time was immense, especially with the younger generation, partly in virtue of the subtle charm of his style. His works include *Histoire générale des langues sémitiques* (1856); the translations **Job* (1859), **Cantique des Cantiques* (1860), *Ecclésiaste* (1881); **L'Histoire des origines du Christianisme*, comprising the *Vie de Jésus* (1863), *Les Apôtres* (1866), *Saint-Paul* (1867), *L'Antechrist* (1873), *Les Évangiles* (1877), *L'Église chrétienne* (1879), *Marc-Aurèle* (1881); **L'Histoire du peuple d'Israël* (3 vols., 1887–89; vol. iv., posthumous, 1893); the collected essays **Études d'histoire religieuse* (1857), *Essais de morale et de critique* (1859), *Questions contemporaines* (1868), *Mélanges d'histoire et voyages* (1878), **Nouvelles études d'histoire religieuse* (1884), *Discours et conférences* (1887); the philosophical dramas, *Caliban*, *L'Eau de Jouvence*, *Le Prêtre de Némi*, *Dialogue des morts*, *L'Abbesse de Jouarre*, and *Le Jour de l'an 1886*; the personal recollections, **Souvenirs d'enfance et de jeunesse* (1883) and *Feuilles détachées* (1892). Consult G. Monod, *Les Maîtres de l'histoire* (Paris, 1894); P. Bourget, *Essais de psychologie contemporaine* (Paris, 1883). A. G. CANFIELD.

* These works have been translated into English.

Rendel, Sir ALEXANDER MEADOWS, K. C. I. E., M. I. C. E.: civil engineer; b. in England, 1829; educated at King's School, Canterbury, and Trinity College, Cambridge; studied engineering with his father, at whose death, in 1856, he took his place as engineer to the London Dock Company, the Leith Harbor and Dock Company, and the East Indian Railway Company; has built numerous docks, etc., in England, bridges, railways, etc., in India, and is consulting engineer to the Secretary of State for India, and for various Indian railways operating 9,000 miles of road. W. R. HUTTON.

Rendel, GEORGE WHITWICK: civil engineer; b. in England, 1832; educated at Harrow and in the office of his father, James M. Rendel; assistant on the construction of the Ganges and Jumna bridges in India; in 1858 joined the Armstrong firm, was manager of the ordnance department; designed and constructed hydraulic machinery for heavy guns; designed the Chilian cruiser Esmeralda; member of committee to decide the types of British ships of war, and others. From 1882 to 1885 he was a civil lord of the Admiralty. He has received both the Watt and the Telford medals from the Institution of Civil Engineers, of which he has been a member since 1863. W. R. HUTTON.

René, re-nā', (or **Renatus**) **I.**, Count of Provence, Duke of Anjou: titular King of Naples; b. at Angers, Jan. 16, 1409; the second son of Louis of Anjou and Yolande of Aragon. Having married Isabelle of Lorraine, he laid claim to this country after the death of her father, Duke Charles, in 1431, but was opposed by a nephew of Charles, the Count of Vaudemont; was captured and imprisoned for several years. In 1434 his elder brother, Louis III., who had been in actual possession of the throne of Naples, died and left to him Provence, Anjou, Naples, Sicily, and Jerusalem. In 1437 René succeeded in buying his liberty and the acknowledgment of his right to Lorraine for 400,000 pieces of gold, and he led an army to Naples, where his claims were disputed by the King of Aragon. He was unsuccessful, and in 1442 returned to Provence, gave up all his ambitious schemes, and confined himself to the improvement of his family estates. He encouraged agriculture, manufactures, literature, and art. His subjects gave him the surname *The Good*, poets and artists gathered at his court, and he was himself a successful cultivator of literature. There is an edition of his writings (*Œuvres du Roi René*) by Quatrebarbes (4 vols., Paris, 1845). The crown of Aragon was offered him, but he refused it for himself, and accepted it only for his son, who, however, died shortly after entering the country. At René's death (at Aix, July 10, 1480) most of his possessions fell to the French crown—Anjou, Bar, Maine, and Provence—his sons having all died before him. See de Lecoy de la Marche, *Le Roi René, sa Vie et ses Travaux* (Paris, 1875).

Renfrew: county of Scotland; bordering N. and W. on the Clyde. Area, 245 sq. miles; pop. (1901) 268,418. The western part is hilly and moorland; the eastern, level and very fertile. Coal and other useful minerals abound; manufactures are important. Renfrew (a royal burgh), 50 miles W. of Edinburgh, pop. (1891) 6,764, is the county-town. The chief towns are Paisley, Greenock, and Port Glasgow. The county sends two members to Parliament.

Reni, GUIDO: See GUIDO RENI.

Ren'nell, JAMES: geographer; b. near Chudleigh, Devonshire, England, Dec. 3, 1742; early entered the British navy, from which he passed to the service of the East India Company; was distinguished in the campaigns of Lord Clive: was for thirteen years employed in the surveys of Bengal, and the results of his work were included in the first approximately correct map of India; returned to England 1786, and devoted many years with his pen to laborious elucidation of geography, giving special attention to India, Africa, ocean currents, and ancient geography. The offshoot of the Gulf Stream turning N. in the Bay of Biscay bears his name. He published an atlas of Bengal (1781); a map of Hindustan with an elaborate *Memoir* (1783); *Elucidations of African Geography* (1793–98); *The Geographical System of Herodotus examined and explained* (1800); *Observations on the Topography of the Plain of Troy* (1814); *Illustrations of the Expedition of the Younger Cyrus* (1816); *Comparative Geography of Western Asia* (1831); and *Investigation of the Currents of the Atlantic Ocean* (1832). D. in London, Mar. 29, 1830. Revised by C. C. ADAMS.

Rennes, ren (the *Condate* of the *Redones*): formerly the capital of Brittany, now the capital of the department of

Ille-et-Vilaine, France; at the confluence of the Ille and Vilaine, 234 miles W. S. W. of Paris (see map of France, ref. 4–C). It consists of two parts—an upper or new town of an elegant and modern appearance, and a lower or old part, mostly built of wood, with narrow and winding streets; these are connected by four bridges. Among the public buildings are the cathedral (Italian), completed in 1844; Notre Dame, with a dome surmounted by an image of the Virgin; the university (1855), with a picture gallery; the hôtel de ville, with a public library; and the Palace of Justice (1618–54). It has manufactures of sailcloth, linen, lace, and embroideries, and an active trade in honey, wax, butter, and poultry. Pop. (1896) 69,937.

Rennet: See CHEESE (*Coagulating the Curd*).

Rennie, Sir JOHN, F. R. S.: engineer; b. in London, Aug. 30, 1794. His father, a distinguished civil engineer (1761–1821), early introduced him to that profession as assistant in the construction of Southwark and Waterloo bridges. In 1821 he succeeded his father as engineer to the admiralty. The new London bridge was completed by him, from designs of his father, in 1831, when he was knighted. The important works of Sheerness dockyard, Ramsgate harbor, and Plymouth breakwater, commenced by his father, were completed by him, as well as the great system of drainage and land reclamation in Lincolnshire. Of the more important works designed and executed by himself are the Whitehaven and the Cardiff docks. With his brother George (1791–1866) the machinery for the mints of Bombay, Calcutta, and Mexico was designed and erected; also the Royal Clarence victualing-yard at Plymouth. Sir John was considered the highest authority on all subjects connected with hydraulic engineering, harbors, canals, irrigation, storage of water, and the management of rivers. He was president of the Institution of Civil Engineers 1845–49; author of *The Theory, Formation, and Construction of British and Foreign Harbors*, and many valuable professional papers. D. Sept. 3, 1874.

Reno: city; capital of Washoe co., Nev.; on the Truckee river, and the Nev., Cal. and Or., the S. Pac., and the Virginia and Truckee railways; 11 miles E. of the base of the Sierra Nevada Mountains, and 51 miles N. W. of Virginia City (for location, see map of Nevada, ref. 5–E). It is in an agricultural and mining region, and has large trade interests. The city contains the State University of Nevada, the State prison, the Bishop Whitaker School for Girls (Protestant Episcopal, opened in 1876), a high school, 2 libraries (State University and Whitaker Hall), a national bank with capital of $200,000, a State bank with capital of $150,000, and 2 daily, a semi-monthly, and 2 weekly newspapers. Pop. (1880) 1,302; (1890) 3,563; (1900) 4,500.

Reno, JESSE LEE: soldier; b. at Wheeling, West Va., June 20, 1823; graduated from the U. S. Military Academy, and entered the army as brevet second lieutenant of ordnance July, 1846; captain 1860. In the war with Mexico he was engaged in the siege of Vera Cruz and in the battles of Cerro Gordo, Contreras, Churubusco, and Chapultepec, and breveted first lieutenant and captain for gallantry; subsequently served on duty with his corps, being in command of Mt. Vernon Arsenal, Alabama, at the time of its capture Jan., 1861; appointed brigadier-general of volunteers in Nov., 1861, he accompanied Burnside's expedition to North Carolina; was promoted to be major-general of volunteers July, 1862, and in August assigned to the command of the Ninth Army-corps, which he led in the second battle of Bull Run and at Chantilly, Aug. 29–Sept. 1. At the battle of South Mountain, while at the head of his command, he was killed Sept. 14, 1862. Revised by JAMES MERCUR.

Renouf, *re-noof'*, ÉMILE: genre, marine, and landscape painter; b. in Paris, June 23, 1845; pupil of Carolus Duran, of Boulanger, and of Lefebvre; second-class medal, Salon, 1880; first-class, Paris Exposition, 1889; first-class, Munich Exhibition, 1883; Legion of Honor 1889. He spent several years in the U. S., and had a studio in New York for the greater part of the time. A large picture by him of the East river bridge, taken from the Brooklyn side at sunset, was painted in New York in 1887–88, and attracted much attention when exhibited there. His *Helping Hand*, a representative work, is in the Corcoran Gallery, Washington. D. at Havre, May 6, 1894. W. A. C.

Renouf, PETER LE PAGE: Egyptologist and Orientalist; b. in the island of Guernsey in 1824; studied at Pembroke College, Oxford; became a member of the Roman Catholic Church in 1842, and in 1855 was appointed Professor of Ancient History and Oriental Languages in the Catholic University of Ireland at its first opening. While professor he was one of the editors of *Atlantis* and of *The Home and Foreign Review*. He was an inspector of schools 1864–85; Keeper of the Egyptian and Assyrian antiquities in the British Museum 1885–92. In 1887 he became president of the Society of Biblical Archæology. D. in London, Oct. 14, 1897. Besides some early works on questions concerning the Roman Church in England he wrote *The Condemnation of Pope Honorius* (1868), and *The Case of Pope Honorius Reconsidered with Reference to Recent Apologies* (1869). The former work met with strong ultramontane criticism, and was placed on the *Index*. His principal Egyptological works are as follows: *Notes on some Negative Particles of the Egyptian Language* (1862); *A Prayer from the Egyptian Ritual, Translated from the Hieroglyphic Text* (1862); *Sir G. C. Lewis on the Decipherment and Interpretation of Dead Languages* (1863), occasioned by an attack upon Champollion and others; *Miscellaneous Notes on Egyptian Philology* (1866); *Note on Egyptian Prepositions* (1874); *An Elementary Manual of the Egyptian Language* (1875); *Lectures on the Origin and Growth of Religion, as Illustrated by the Religion of Ancient Egypt* (Hibbert lectures, 1879); and *The Egyptian Book of the Dead: Translation and Commentary*, first printed in the *Proceedings* of the Society of Biblical Archæology (Mar., 1892, ff.), and afterward separately (London, 1893, ff.). He edited for the trustees of the British Museum *Ancient Egyptian Texts from the Coffin of Amamu* (1886), and *Facsimile of the Papyrus of Ani*, with an introduction to the contents of the Book of the Dead (1890). He also contributed to the *Chronicle*, *The North British Review*, *The Academy*, and the *Aegyptische Zeitschrift*. CHARLES R. GILLETT.

Reno'vo: borough (founded in 1862, incorporated in 1866); Clinton co., Pa.; on the west branch of the Susquehanna river, and on the Phila. and Erie division of the Penn. Railroad; 28 miles N. W. of Lock Haven, the county-seat (for location, see map of Pennsylvania, ref. 3–E). It was founded by the Philadelphia and Erie Railroad Company, which established here a large foundry and extensive boiler-works and car and repair shops. It is in an oval-shaped valley with mountain-sides over 1,000 feet high, and is the center of a great tract of pine forest. The principal industries are coal-mining and lumbering. The borough contains 7 churches, 14 public and 5 parochial schools, a railway Y. M. C. A., national bank with capital of $50,000, private bank, and a daily and 2 weekly newspapers, and is a popular summer and autumn resort for tourists and sportsmen. Pop. (1880) 3,708; (1890) 4,154; (1900) 4,082. EDITOR OF "EVENING NEWS."

Rensselaer, *ren'se-ler*: town; capital of Jasper co., Ind.; on the Iroquois river, and the Louis., New Albany and Chi. Railway; 72 miles S. E. of Chicago (for location, see map of Indiana, ref. 3–C). It is in an agricultural, dairying, and stock-raising region; contains a public high school, St. Joseph's Indian Normal School (Roman Catholic), a State bank, 3 private banks, and 3 weekly newspapers, and has manufactories of flour and cigars. Pop. (1880) 968; (1890) 1,455; (1900) 2,255.

Rensselaer Polytechnic Institute: See the Appendix.

Rent [from O. Fr. *rente*: Ital. *rendita*: Span. *renta* < Lat. **rendita*, re-formed on analogy of *vendita* (*vendere*) from *red'dita* (sc. *pecu'nia*), money paid, perf. partic. of *red'dere*, pay back]: a payment for the use of land. In feudal times this payment was made in labor. Toward the close of the Middle Ages labor rents were generally commuted, either for a share of the produce (see METAYER) or for a fixed sum of money per year. For some centuries these money rents were chiefly fixed by custom; in modern times they are usually fixed by competition. Rent, as ordinarily reckoned, involves compensation for the improvements as well as for the land. If we deduct interest on these improvements, we have the amount of rent in its economic sense. Thus if a man invests $10,000 in improving a piece of land, and then rents the property for $1,200 a year, part of this $1,200 is due not to the land, but to the capital invested; and we must deduct something like $500 in order to find the economic rent. Rent is partly due to productiveness, especially in the case of mines and water-power, but chiefly to advantages of location. Improved means of transportation, by lessening the effect of differences in location, tend to reduce rent—witness the fall in agricultural rents in Great Britain, due to the fact that the lower transportation rates enable the farmers of other countries to compete on more

and more even terms in supplying the British consumers with food. For an analysis of the causes which give rise to rent, see Political Economy. See also Single Tax.

A. T. Hadley.

Rent: in law, as defined by Blackstone, "a certain profit issuing yearly out of lands and tenements corporeal." In its original meaning in English law the term involved no notion of a money payment, but signified a right vested in the feudal lord to exact of his tenant certain military or other services as the price and condition of his tenure. These services were, in process of time, commuted into money values, and were discharged by the payment of stipulated sums of money, or of other property. In this sense of the term, rent, or the right to exact services, or the money value of services, from another, is itself a species of property. It is treated by the common law as belonging to the class of incorporeal interests in land akin to easements and profits. See Hereditaments (*Incorporeal hereditaments.*)

As such it may be created and granted in fee simple, in fee tail, for life or for years. When in fee it may be devised or transmitted by descent in the same manner as an estate of inheritance in the land itself. In England it is not uncommon for landed proprietors, by deed or will, to create such interests in their lands in favor of their minor children, the lands themselves, upon which the rents are charged, going to the eldest son; but in the U. S. rent, as a right of property vested in one not the owner of the soil, is almost unknown. In the U. S. the term is commonly used to denote the sum paid by a tenant for years, or at will, to his landlord as compensation for the possession and use of the leased premises. See Landlord and Tenant.

The older common law distinguished three classes of rent —rent-service, rent-charge, and rent-seck. *Rent-service* existed where the tenant, for the land held of his lord, owed the latter some corporeal service, at least that of fealty, as, for example, a holding by fealty and ten shillings annually, or a holding by plowing the lord's land and five shillings annually, the personal service, however slight, affecting the entire rent. The lord could always distrain for arrears "of common right," without reserving any special power of distress. Originally, where every conveyance of land might by subinfeudation create a relation of tenure between the vendor and vendee, any rent reserved by the former was a rent-service, and might be enforced by distress; but after the statute *Quia Emptores*, which abolished subinfeudation, no rent could have the character of a rent-service unless it was attendant upon the reversion of the lands out of which the rent issued. (See Landlord and Tenant.) At present the rent payable on an ordinary lease for years is a rent-service, the necessity for an actual personal service having long since been done away with. A *rent-charge* was one where the owner of the rent had no future interest or reversion in the land, but had the right to distrain for arrears expressly reserved or granted to him by the deed. A *rent-seek*, or barren rent, arose like a rent-charge, by grant or reservation in favor of one who had no future interest or reversion in the land; but in this case, the right to distrain not being expressly conferred, the owner of the rent had no means of enforcing his claim. These distinctions have lost most of their importance in England, in consequence of modern legislation giving the remedy of distress in all cases to enforce the payment of rent. In the U. S., on the other hand, distress has been very generally abolished by statute.

In Pennsylvania a variety of rent-charge is still preserved in constant use under the name of ground-rent—that is, when the grantor of land in fee reserves a perpetual pecuniary rent to himself and his heirs. It was an attempt to enforce rents of this sort which had been long deemed obsolete that brought about the "anti-rent" disturbance in Eastern New York 1839–47. In other States a ground-rent is simply the rent reserved by the lessor in a building lease, or one wherein the lessee covenants to erect a building upon the land, and which is therefore given in most instances for a considerable term of years.

Read also, on the general subject, Blackstone's *Commentaries* (book ii., chap. iii., 41–43); Taylor, *Landlord and Tenant*; Williams on *Real Property*. For the origin and early history of distress, see Maine's *Early History of Institutions*, chaps. ix. and x. George W. Kirchwey.

Repeating Circle: an astronomical instrument of observation. It involves the principle of repeating an angle several times continuously along its graduated limb, which consists of an entire circle. See Sextant.

Reph'aim [from Heb. *Rĕfrā'īm*]: a people whom biblical tradition supposes to have inhabited parts of Palestine prior to the invasion of the Hebrews (Gen. xv. 20; Josh. xvii. 15). They are represented as living around Bashan (Deut. iii. 11, 13) and in the country of the Ammonites (Deut. ii. 19, 20). A valley of the Rephaim is mentioned (Josh. xv. 8) which has been identified with the valley Bak'a, S. of Jerusalem (cf. Josephus, *Antiq.*, vii., 4, 1). In Deut. ii. 11 the Emīm are said to belong to Rephaim. The Rephaim are probably identical with the children of Rāphā (a supposititious ancestor), mentioned 2 Sam. xxi. and 1 Chron. xx., who with the children of Anak were regarded as giants by the popular fancy. Cf. Ed. Meyer, *Kritik der Berichte über die Eroberung Palästinas* in *Zeitschr. f. Alttest. Wissensch.*, 1881, p. 117; *Gesch. d. Alterthums*, i., § 179.

The same name is given to the shades of the nether world (Ps. lxxxviii. 11; Is. xxvi. 14), who dwell in Sheol (Prov. ix. 18; xxi. 16) and under the waters of the sea (Job xxvi. 5). At the last judgment the earth will give them forth again (Is. xxvi. 19). A similar belief seems to have prevailed among the Phœnicians, as we see from a mention of the Rephaim in the inscriptions of Tabnit and Eshmunazar. Cf. *Corpus. Inscript. Semit.*, vol. i., No. 2, 8; *Rev. Archéologique*, vol. x., p. 3. Richard Gottheil.

Reph'idim [from Heb. *Rephīdhīm*, liter., props, supports]: a locality in the Sinaitic peninsula, where the Israelites under Moses and Joshua gained a great victory over the Amalekites (Ex. xvii. 8, *seq.*). Its identification depends upon that of Sinai, in whose immediate neighborhood it was. If Serbal was the mountain of law, Rephidim must have been in the wady Feiran. If Sufsafeh was the mountain—which can hardly be questioned—Rephidim must have been in the wady es-Sheikh, at the pass called el-Watiyeh.

Replenisher: an instrument required in connection with the quadrant Electrometer (*q. v.*) in order to give a definite value to the potential. In the replenisher, as used in the case of Thomson's electrometer, there are two metal shields insulated with regard to each other by a piece of ebonite. One of these connects with the guard plate and the other with the case of the instrument, and so with the outer coating of the Leyden jar used. A vertical shaft which can be turned round by means of a milled head carries two metal flies at the extremities of a horizontal arm of vulcanite, and these flies, when about to pass out from under the shields, are touched by two platinum springs electrically connected and mounted on ebonite. Now suppose the flies to be in contact with the springs and one shield to be positively electrified, then by induction one fly will be electrified negatively and the other positively. Next let the vertical shaft be revolved; then the first fly carries off its negative charge and comes in contact with a spring connected with a shield, and yields up its charge by transfer to the outside of the shield. At the same time the other fly gives up its positive charge to the other shield. The result of a revolution of the shaft is therefore to increase the positive and negative charges on the shields respectively, or, in other words, increase the difference of potentials of the shields. Thus by giving a sufficient number of revolutions in the proper direction the potential can be raised or lowered. For further particulars, see the books mentioned in the article Electrometer.

Replevin [from O. Fr. *replevin*, deriv. of *replevir*, to warrant; pledge, give bail; *re-*, back + *plevir*, pledge, warrant]: an ancient common-law form of action brought to recover the possession of specific goods unlawfully taken by the defendant and belonging to the plaintiff, or to which the latter has present right of possession. Originally, as still in England (where the action is mostly used to recover goods unlawfully distrained for rent), replevin could be brought only to recover goods unlawfully taken and detained, Detinue (*q. v.*) being the proper action for unlawful detention of goods lawfully taken; but in most of the States of the U. S. the scope of the action has been enlarged so that it lies to recover all specific goods unlawfully detained, regardless of the manner of taking. In some States this action as such has been abolished, and a suit similar in its features, its objects, and its relief has been provided for by statute.

The plaintiff at the beginning of the suit, by furnishing to the proper officer (in England formerly the sheriff, now the registrar of the county; in the U. S. generally the sheriff) security that he will prosecute the suit and that he will restore the goods upon failure to recover judgment, has the right to procure the immediate seizure of the goods by the officer

and their delivery into his own possession. The plaintiff when successful, if the goods have remained in the defendant's custody, recovers their possession, or in default thereof their value (assessed by the jury), together with damages for the unlawful detention or taking. If he has taken them into his own custody his title is confirmed, and he recovers the damages alone, while a judgment in such case for the defendant restores the possession, or the value, and lays the foundation for a suit for damages by him against the plaintiff. The title to the goods is not tried unless it is necessary to the decision of the question as to who has the right of possession, nor can the title to the land be directly brought into question. Sir Henry Maine, in his *Early History of Institutions*, traces the origin of this remedy to the right of a tenant to recover goods unlawfully distrained by his landlord —a right that can be traced among the Saxons prior to the Conquest, and in some of the primitive Germanic codes. See Wells's *Law of Replevin as administered in the Courts of the United States and England*, and Sedgwick on the *Measure of Damages*. F. STURGES ALLEN.

Reports, Law: See LAW REPORTS.

Reposia'nus: a Latin poet, perhaps of the early fifth century, although commonly assigned to the reign of Diocletian. (See Eskuche, *Rheinisches Museum*, 45, 256.) His hexameter poem *De concubitu Martis et Veneris* may be found in Baehrens's *Poet. Lat. Minores*, vol. iv., p. 348. M. W.

Repoussé, re-pōō'sā' [Fr., liter., thrust back, perf. partic. of *repousser*; *re-*, back + *pousser*, push < Lat. *pulsare*]: a French term for the art of producing reliefs, and even rounded forms, in metal by beating thin plates from behind (Germ. *das treiben*; Eng. *embossing*). The metals employed are those that by their malleability lend themselves most easily to the work—gold and silver, brass, copper, tin, and lead. This is a very ancient art; the Egyptians, Cypriotes, and Etruscans practiced it, and specimens of their skill in the art are preserved. In the Middle Ages it was widely employed both in Europe and in the East, and it has continued in use down to our own times. Some splendid pieces of repoussé work were produced in Italy in the fifteenth century. These were chiefly for the decoration of altars and shrines and for use in the ceremonies of the Church. The art was in a flourishing state in Europe in the seventeenth and eighteenth centuries, but the design was artistically inferior to that of an earlier time. The art then fell into disuse for a time, but it has shared in the general revival of the arts, and is much in fashion. In Italy, France, Great Britain, and the U. S. much repoussé work is now produced, and, so far as mechanical excellence is concerned, American smiths are not behind the rest of the world. The results produced by this process are superficially similar to those attained by casting, but the effects are more artistic and free, and in the best work, whether of semi-barbarous or of civilized peoples, there is more individuality expressed than any casting could give. In the old repoussé work, the coarse as well as the fine, the relief is distinguished by softness of outline and the design has a look of spontaneity. The workman has used his tools as if they were the pencils of a painter or the dab-sticks of a modeler in clay. In the Castellani collection of antique jewelry exhibited at Philadelphia in 1876 were specimens of Etruscan repoussé work which, though small in size and minute in execution, had all the largeness of antique sculpture. These were extraordinary pieces, but much of the Japanese, Indian, Arabic, Persian, and Moorish work of modern times has the same quality, though more rudely manifested. The repoussé work of modern French, British, and American smiths is chiefly applied to gold and silver, and is distinguished by great sharpness and decision of line, so that the work is scarcely to be told from casting. See METAL-WORK.

Representation: in the political sense of the term, the method of transmitting the will of the people into law or action by means of a few persons chosen by the people.

In the ancient city democracies the people made their own laws. When different states took part in government, as in the Achæan League, any citizen had, as a general rule, the right to appear, and representatives in the modern sense were not chosen, though of course the persons present from any state had authority to bind their constituents.

There seem to have been, however, certain instances of real representation in ancient times, as in provincial councils summoned by Augustus and in city leagues in Asia Minor. From very early times the Church employed the principle, and probably this had influence in determining its use among western nations. It first came into general political use among the Germanic nations, and has had its fullest development in Great Britain and the U. S. Representative democracy, the system of government that relies solely upon representation, as Bluntschli says, developed in the North American colonies and the U. S., where the causes of its development are to be found especially in the character of the people and in the extent of the territory that necessitated representation if free government were to exist. The representative system, however, is found fully developed in nearly all civilized modern states, whether republics, as France and Switzerland, or monarchies, as Germany, Austria, Italy. In the monarchies usually some check is placed upon the representative body by an hereditary or appointed upper house, as in Great Britain and Germany, and sometimes the monarch even is able to exert much power in this direction. See LEGISLATURES and LAW-MAKING, METHODS OF.

Nature of Constituencies.—Generally speaking, in the U. S., in France, in the German empire, and in some other countries, the constituencies are divided territorially, each representative being voted for by all classes of voters resident in his district. A system of class constituencies is in vogue, however, in some countries; for the classification of electors in Prussia, see LEGISLATURES (*Composition*). In local representative bodies in Austria members are elected by the great landed estates, by the most highly taxed industries and trades, by the towns and markets, by the rural communes, by boards of commerce, or trade-guilds. Somewhat similar constituencies are found in rural local government in Prussia. Even in England constituencies have been so divided as to separate cities from the rural districts, and economic conditions have divided constituencies in practice even more accurately than that.

Relation of the Representative to his Constituency.—Of grave import, both theoretically and practically, is the question whether a representative is to act merely as the mouthpiece of his constituency, blindly preferring its interest as its members see that interest, or whether he is to act with independent judgment, preferring the interests of the whole country to that of his constituency in case of conflict. Most writers adopt the latter theory as the right one from the standpoint of political science. In practice, however, representatives as a rule wish a re-election; and in consequence the expressed or understood wishes of their constituencies are likely to determine their votes. Indeed, some representatives have openly confessed that they were voting contrary to their own opinion of what was best for the country in deference to the wishes of their constituencies. This is apt to be oftener the case when the member represents a certain economic or social class than when his constituency includes all voters within a certain geographical district. If in general, however, the constituency determines the vote, the special advantage of the representative system—action by trained men after careful debate and consideration—would be lost, and the system might as well be abolished and the compulsory referendum introduced instead. On the other hand, it may be argued that the people's interests will be best guarded if the people instruct the representatives how to vote, as each person cares most for his own interests. Nevertheless, the desire for re-election will usually give the representative sufficient interest in conforming to the wishes of his constituents. The superior educational effect upon the constituencies of carefully deliberating upon specific measures so as either to vote themselves or to instruct their representative, instead of simply making a choice between two or three candidates, can not be doubted, but is probably too small to outweigh the disadvantages mentioned.

Majority versus Minority or Proportional Representation.—In most countries members of representative bodies are elected each in a single territorial district, or when elected in larger districts, as earlier in France by the *scrutin de liste*, all members of each party are put on the same ticket, so that the majority of voters are likely to secure all the representatives and to leave the minority unrepresented. For example, in 1892, the Congressional vote of Iowa stood as follows: Republican, 219,215; Democratic, 201,923; Prohibition, 6,602; People's, 13,633. These votes elected ten Republicans and one Democrat, whereas a fair division, according to the relative strength of the parties, would have elected six Republicans and five Democrats. Likewise, in Kentucky, in 1894, 122,308 Republican votes, 179,359 Democratic, 1,559 Prohibition, and 23,735 People's elected one Republican and ten Democrats, instead of four Republicans and six Democrats, as would have been just. In Maine, 1894, with 65,637 Re-

publican and 55,778 Democratic votes cast, all four Congressmen were Republican, whereas in Maryland, with 91,762 Republican and 113,932 Democratic votes cast, all six Congressmen were Democrats. In both cases the votes were so nearly equal that the delegation should have been divided equally. Inasmuch as laws are passed by a majority vote of the representatives elected, it often happens that representatives of but little more than one-fourth the voters pass laws. In Switzerland, where bills passed may, on petition, be submitted to the people, it has happened more than once that a bill passed by a small majority in the Legislature has been rejected on the referendum by nearly a three-fourths vote, thus proving that the majority of the Legislature was not in harmony with the people.

To remedy these evils various plans for securing proportional representation to minorities have been proposed, of which only four will be mentioned: 1. The "limited vote." Under the English Reform Act of 1867 this plan was adopted as follows: "At a contested election for a county or borough represented by three members, no person shall vote for more than two candidates." So in New York in selecting members at large for the Constitutional convention of 1867 no voter was allowed more than sixteen votes, there being thirty-two members to be chosen. A similar plan has worked well in Pennsylvania in choosing judges for the Supreme Court, county commissioners, county auditors, and inspectors of elections—all to be elected in groups of three. 2. The "free vote" is applied in Illinois in the election of members of the lower house of the Legislature, in accordance with the Constitution of 1870. The part of the section regarding this is as follows: "Three representatives shall be elected in each senatorial district at the general election in 1872, and every two years thereafter. In all elections of representatives aforesaid each qualified voter may cast as many votes for one candidate as there are representatives to be elected, or may distribute the same, or equal parts thereof, among the candidates, as he shall see fit, and the candidates highest in vote shall be declared elected." Under this provision, by concentrating their votes upon one candidate, a large minority may secure representation. 3. The "Hare system," sometimes called the Andrae system because it was introduced by Andrae into Denmark before Hare proposed it in England. Under this system the quotient obtained by dividing the total number of votes cast by the number of places to be filled gives the quota needed to elect a candidate. Each voter casts a ballot containing the names of as many candidates as he pleases, the names numbered in the order of his preference. As the ballots are taken from the box each is credited to the name indicated as first choice. If the electoral quota has already been secured for this first name, the ballot is credited to the second choice, and so on till all the full quotas have been ascertained. The largest fractions of quotas then elect. Under this system few votes are wasted. The chief objections to it are its relative complexity, and the element of chance that enters in counting the second choice. Many voters may have the same first choice, but differ on second choice. In that case the election might be determined by the order in which the ballots were counted on first choice. This system, too, seems to favor voting for individuals regardless of parties more than does any other system, hence is not favored by politicians. It is apt to be the favorite system among advocates of minority representation. 4. The "free-list" system is in use in four cantons of Switzerland—Ticino, Neuchâtel, Geneva, Zug—and seems to give excellent satisfaction. Under it any body of voters large enough to be entitled to nominate candidates may nominate as many as it sees fit up to the whole number of places to be filled. In the election each voter may cast as many votes as there are members to be elected, distributing them as he will among the candidates, but casting no more than one vote for any candidate. The quota of representation is found by dividing the total vote cast by the number of places to be filled. The total vote cast by each party divided by this quota gives the number of representatives to which each party is entitled. Should there not be enough full quotas to elect the whole number, the required number shall be filled from those parties having the largest fractional quotas. Candidates in each party shall be taken in order of their standing on their respective tickets. This system gives representation to parties in fair proportion, and has stood the test of experience.

AUTHORITIES.—Sidgwick, *The Science of Politics*; Bryce, *The American Commonwealth*; Guizot, *History of the Origin of Representative Government in Europe*; Mill, *Considerations on Representative Government*; Hare, *The Election of Representatives*. The most complete work on proportional representation is *La Représentation proportionnelle* (published under the auspices of the Société pour l'Étude de la Représentation Proportionnelle). See also publications of the Proportional Representation League, Chicago; and articles in Lalor's *Cyclopædia of Political Science*.

JEREMIAH W. JENKS.

Representative Government: See DEMOCRACY and GOVERNMENT.

Representers: a Scottish controversial designation used about 1722. See PRESBYTERIAN CHURCH (*Some of the Existing Presbyterian Churches*).

Reprisals: See INTERNATIONAL LAW.

Reproduction: in biology, that phenomenon in which a portion of any animal or any plant separates from the rest and eventually develops into a form essentially similar to that which gave it origin. It must be observed that there is no interruption in the continuity of life; no new life is created; the process is rather, as it has aptly been termed, discontinuous growth. Reproduction is of two kinds, sexual and asexual. In the higher forms of animals, as in those of plants, the distinction between these two is strongly marked, but in the simpler types the line is not sharply drawn.

Sexual reproduction in its simplest expression merely calls for the union of two separate cells as a prerequisite for the formation of new individuals, and these uniting cells may be, so far as microscopic analysis shows, exactly similar; and, further, they may compose the entire parent organisms. We here have a case of sexuality without any differentiation of the sexes. In the animal kingdom examples may be instanced in the Infusoria. In all other forms, however, there is a differentiation of the sexes and of the reproductive cells. In animals the male reproductive element is called the spermatozoön, the female the egg, and the union of these two (impregnation) results in the formation of a germ capable of development. In exceptional cases, however (see PARTHENOGENESIS), the egg develops without union with the male cell. For an outline of the processes of development following impregnation the reader is referred to the article EMBRYOLOGY. In general the fertilized egg divides up into several or many cells; in the lower forms (Protozoa) each of these becomes by simple growth an adult, while in the other groups the whole of the resulting cells are required to make a single form like that with which the cycle had its origin.

Asexual reproduction is accomplished without such union of sexual cells. Most of the various modifications of the process may be arranged in two categories—fission and budding. In fission the organism directly divides into two or more distinct individuals. Sometimes the division is incomplete, the new individuals remaining connected to a greater or less extent, and thus "colonies," as among the corals, may result. In budding, found in animals only in the lower forms, a small portion of the organism is differentiated, and this, whether detached or remaining connected with the parent, subsequently becomes developed into the original form.

For the sexual reproduction of animals the most valuable text-books are Balfour's *Comparative Embryology* (1880–81); Haddon's *Embryology* (1889); Korschelt and Heider, *Lehrbuch der vergleichenden Entwicklungsgeschichte der wirbellosen Thiere* (1890–93); Marshall, *Vertebrate Embryology* (1893); Hertwig, *Text-book of Embryology* (translated by Mark, 1892); Minot, *Human Embryology* (1892, containing much on all groups of vertebrates). J. S. KINGSLEY.

Reproduction (in plants): the processes by which plants perpetuate their kind. In single-celled plants every cell is capable of producing new plants. The same is true of some few-celled plants. Reproduction is here one of the functions of every cell. With the increase in complexity of the plant-body this function is more and more restricted to certain cells and aggregations of cells. We can thus speak of reproductive cells as distinct from vegetative cells, and finally of the reproductive organs in contrast with the vegetative organs of the plant.

Broadly speaking, there are two general ways by which plants are reproduced. In the first, a cell or a mass of cells may become detached and grow into a new plant, as in the common cases of the production and development of zoöspores in many aquatic plants, of conidia among fungi, and of brood-cells and brood-masses (*gemmæ*) among liverworts and mosses. The case is essentially the same where true buds and even branches separate from the parent plant, as

in the bulblets in the axils of the leaves of some lilies, and in the inflorescences of some onions, the runners of strawberries, the trailing runner-like stems of buffalo-grass, the tubers of many plants, as the potato, and perhaps the spontaneously deciduous twigs of cottonwoods and some willows. In all these cases the essential feature is the separation from the parent plant of one or more living cells, which continue to grow, eventually producing a plant like the parent. We go but a step further when we purposely cut off portions of plants, which are then grown as cuttings by being placed in moist earth. Even the familiar operations of grafting and budding are essentially those of asexual reproduction (Figs. 1 and 2).

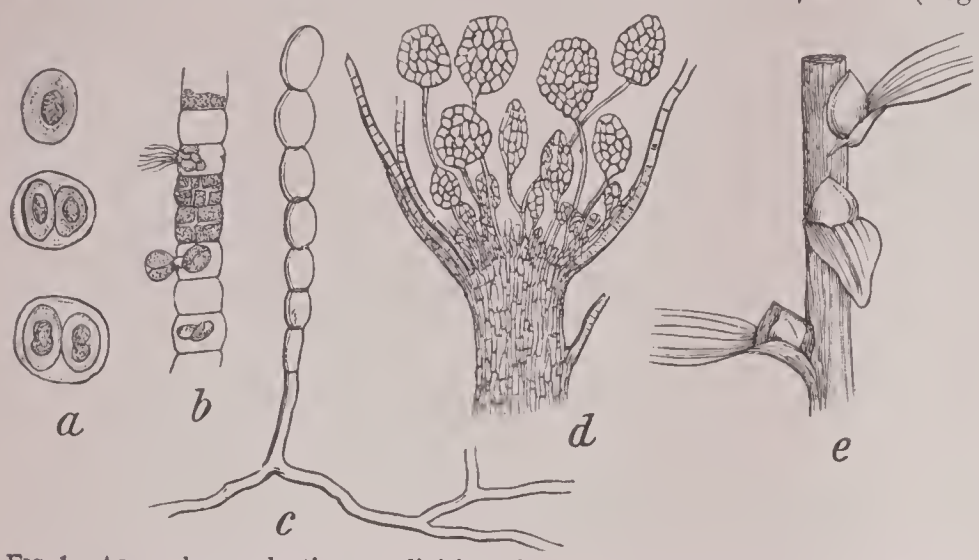


FIG. 1.—Asexual reproduction: *a*, division of *Glœocapsa*; *b*, formation of zoöspores of *Ulothrix*; *c*, conidia of *Podosphœra*; *d*, brood-masses of a moss; *e*, bulblets of lily.

In marked contrast to the foregoing are the various modifications of the sexual reproductive process, in which the essential feature is the union of two cells in the formation of the first cell of the new plant. In the simplest cases two apparently similar cells fuse into one (Fig. 3), but as we pass to higher plants there is an increasing differenee between the cells concerned; moreover, while in the simpler cases the fusion appears to involve the whole of each cell, in the higher plants it is confined to the nuclei.

Upon a close examination of sexual reproduction it is found that in the classes *Chlorophyceæ* and *Phæophyceæ* the two uniting cells may be alike in size and other obvious characters (isogamous), or they may be unlike in size and otherwise quite different also (oögamous). Thus all except the highest *Protococcoideæ*, all of the *Conjugatæ*, all but the higher *Siphoneæ* and *Confervoideæ* of the first-mentioned class, and nearly all of the second class, are isogamous. In the family *Volvocaceæ* (of the order *Protococcoideæ*) some genera are isogamous, while others are oögamous. The families *Vaucheriaceæ*, *Saprolegniaceæ*, and *Peronosporaceæ* (of the order *Siphoneæ*), and *Sphæropleaceæ*, *Cylindrocapsaceæ*, and *Œdogoneaceæ* (of the order *Confervoideæ*), are oögamous. Among the *Phæophyceæ* the *Fucoideæ* alone are oögamous. In all classes above the *Chlorophyceæ* and *Phæophyceæ* oögamy is the invariable rule.

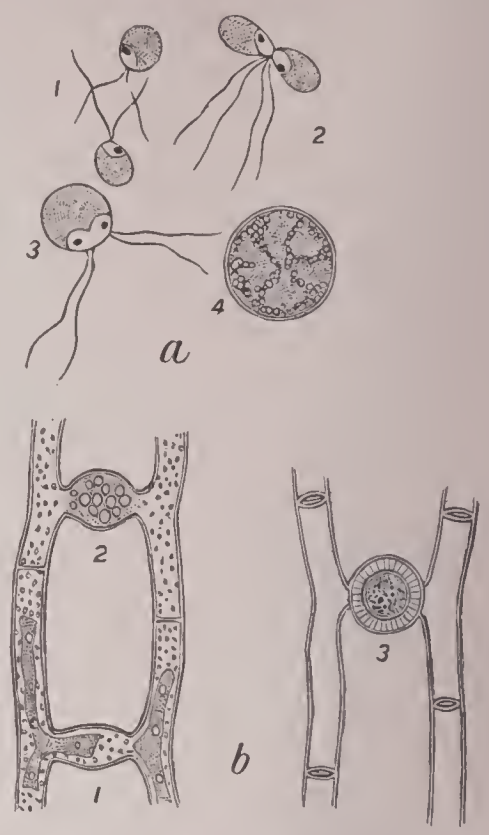


FIG. 3.—Sexual reproduction (isogamous): *a*, fusion of zoöspores of *Pandorina*; *b*, fusion of cells of *Mesocarpus* (highly magnified).

As we pass from the lower plants to the higher there is an increasing complexity in the results of the cell-union. In the *Chlorophyceæ* and *Phæophyceæ* the result is a single egg-like cell (oöspore), which sooner or later develops into one or more new plants (Figs. 3 and 4). The plants of these two classes are hence sometimes very properly called egg-spore plants. In passing to the *Coleochætaceæ* and *Florideæ* we find that in the former the single spore soon becomes invested with a cellular layer of protective tissue, and the spore itself upon germination becomes several-celled, thus forming a simple kind of spore fruit. In the *Florideæ* the fertilized cell not only divides early, but each segment emits a branch whose end segment becomes detached as a spore, and in the meantime the whole has become invested by a layer of protective tissue. In the *Charophyceæ* the growth of the protective tissue precedes fertilization, so that from a protective device which only *follows* fertilization we have now the same device developing much earlier and serving as a protection to the unfertilized

FIG. 2.—Asexual reproduction: *a*, bulbs in place of flowers in the onion; *b*, strawberry producing new plants by its "runner"; *c d*, cuttings set in the ground; *e*, graft set in a root.

cell (Fig. 5). In the bryophytes and pteridophytes we recognize in the archegone (Fig. 6) the homologue of the struc-

Fig. 4.—Sexual reproduction (oögamous) of *Vaucheria*: *a*, slightly, and *b*, highly magnified

ture just referred to in the *Charophyceæ*; in fact, it is difficult to separate the latter from the former

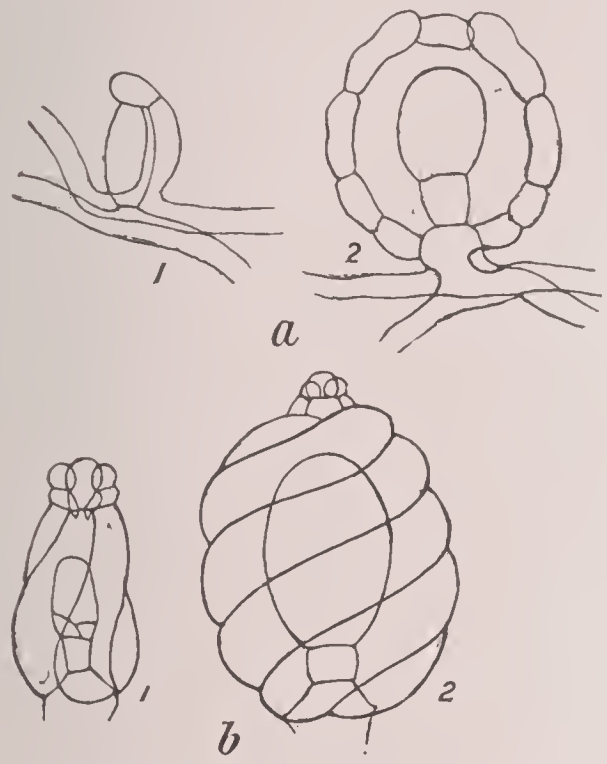


Fig. 5.—Sexual reproduction, formation of the spore-fruit: *a*, in *Podosphæra*; *b*, in *Nitella* (diagrammatic).

by any absolute characters. The results of fertilization, however, are of a greater degree of complexity in the bryo-

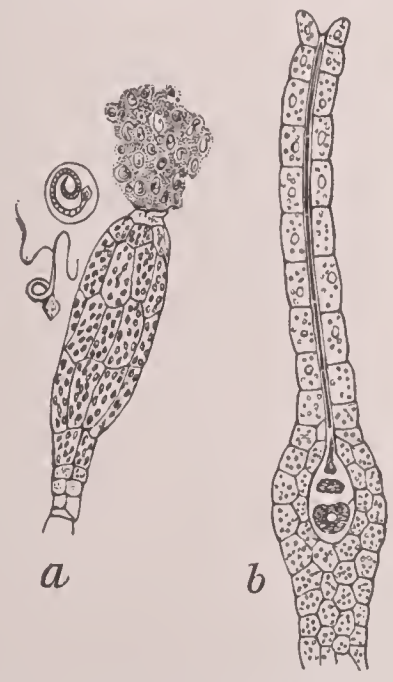


Fig. 6.—Sexual organs of a moss: *a*, the antherid emitting antherozoids, two more enlarged at the left; *b*, the archegone, highly magnified.

phytes and pteridophytes than in the *Charophyceæ*. While in the latter the result is a single spore, in bryophytes it is a cylindrical many-celled axis, the upper portion of which develops spores by the division of internal cells, and in the pteridophytes it is an axis terminating in roots below and bearing leaves above. There is a noticeable immersion of

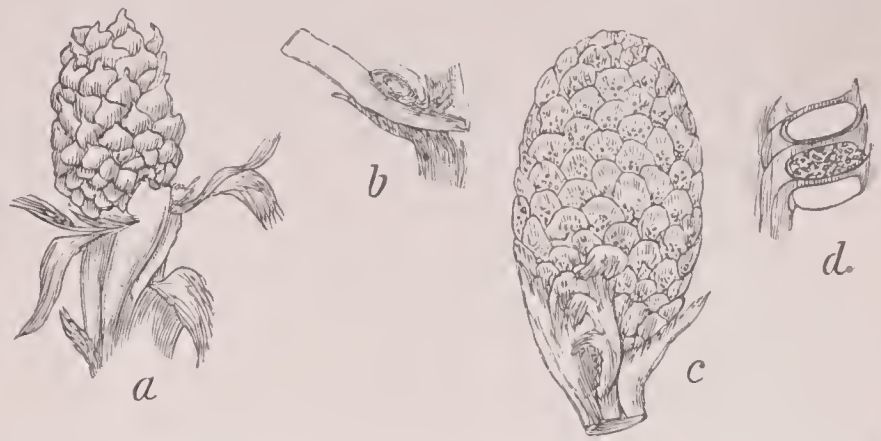


Fig. 7.—Reproduction in the pine: *a*, an ovuliferous cone; *b*, an ovule on its scale; *c*, a polleniferous cone; *d*, three stamens (magnified).

the archegone in the tissues of the parent plant in the pteridophytes, and in the gymnosperms there is a complete submergence. At the same time in the gymnosperms, with the retention of the macrospore within the sporangium (*nucellus*), and the development of one or two nucellar integuments, there is a still greater increase in the protective tissue surrounding the oösphere. This is carried a step further in the angiosperms, where the leaf (carpel) folds over and incloses the coated nucellus (ovule). The results of fertilization in gymnosperms and angiosperms (effected here by the pollen-tube) are little if any higher than in the pteridophytes, consisting in the development of an embryo plant with its root, stem, and leaves. The protective tissues surrounding the embryo, especially those of the seed-coats, are, however, notable additions, made necessary by the fact that the embryo is still to be separated from the parent plant.

When we take a comprehensive view of sexual reproduction, we note that as we pass from the lower plants to the higher there is, step by step, an increase in the aid given by the parent plant to the new organism. Additional protective devices appear and the period of parental care is prolonged in successively higher classes. See Botany and Embryology (in plants). Charles E. Bessey.

Reptil'ia [viâ Fr. from Lat. *rep'tilis*, creeping, crawling, deriv. of *re'pere*, creep. Cf. *serpent*, from Lat. *ser'pere*, crawl]: a class of vertebrates formerly associated with the *Batrachia*, but now known to be most nearly related to the birds and placed with them in a division called Sauropsida (*q. v.*). In form as well as in skeletal and other characters they vary greatly, but they may be briefly defined as having a three-chambered heart (incompletely four-chambered in crocodiles), an incomplete circulation, arterial and venous blood being mixed in the ventricles, respiration by lungs, functional gills never being developed, and cold blood. The body is covered by horny scales or bony plates. In the skeleton may be noted the suspension of the lower jaw by the quadrate bone, the presence of a single occipital condyle, a well-developed coracoid bone, and separate carpal and tarsal elements. Most of the species lay eggs, and the embryos, which develop without metamorphosis, have the fœtal structures amnion and allantois. See Embryology.

In most forms (the rhynchocephalian hatteria, lizards, snakes) the scales are horny and imbricated, passing on the ventral surface in the snakes into broader plates or scutes. In alligators and crocodiles these scales are strengthened by bony growths beneath, while in the turtles the scales have as a deeper support the peculiarly expanded and united ribs and vertebræ.

In the skeleton, besides the points noted above, may be mentioned the nearly complete ossification of the elements, cartilage being very scanty. The vertebræ may be concave either in front (*procœlous*), or behind (*opisthocœlous*), or on both surfaces (*amphicœlous*). When appendages are present four or five regions may be recognized in the vertebral column, but when limbs are lacking (snakes) no such distinctions are possible. These regions, which are given the same names as in mammalian anatomy, are exceedingly variable in the number of vertebræ they contain. The skull,

which varies considerably in form, usually has the bones distinct. Among the peculiarities separating these from other groups are the union of maxillary and premaxillary bones with the skull, the ossification and more or less complete union of palatine and quadrate with the cranial bones, the presence of a single occipital condyle on the basioccipital, and the distinctness of the bones (dentary, angulare, articulare, etc.) of the lower jaw. The quadrate bone, by means of which the lower jaw is connected with the cranium, is movable in some forms, firmly fixed in others.

The appendicular skeleton varies with the development of the limbs. A shoulder-girdle is present in all except the footless forms, while the pelvic girdle occurs even in some of these. The limbs vary greatly in character. Usually present and fitted for running or walking, they are modified into paddles in the ichthyosaurs and most *Sauropterygii*, while in the *Pterosauria* the anterior limbs are modified into organs of flight. In some lizards and all snakes the limbs are not developed, while in other lizards one (either) or both pairs are present. It is to be noted that in pythons and boas rudiments of the hind limbs exist. See Herpetology and Vertebrates, Fossil.

Besides the literature cited under Herpetology, see especially Hoffmann, *Reptilien*, in Bronn's *Classen und Ordnungen des Thierreiches*; Leydig, *Die in Deutschland lebenden Arten der Saurier* (1872); Rathke, *Entwickelung der Natter* (1839); *Schildkröten* (1848); *Crocodile* (1866); Agassiz, *Embryol. of Turtle* (1857); Günther, *Anatomy of Hatteria, Phil. Trans.* (1867). J. S. Kingsley.

Republic [from Lat. *respub'lica*, commonwealth; *res*, affair + fem. of *publicus*, of the people, public, deriv. of *po'pulus*, people]: a political community in which the sovereign power is lodged in the whole body of the people or in a portion of them, and exercised through representatives or agents directly or indirectly elected by them for that purpose. It is called an *aristocratic* republic when the exercise of the sovereign power is confined to a privileged class of whatever description, to the exclusion of all others; a *democratic* republic when all classes of the people participate in the exercise of that power alike. The purest form of the democratic republic exists where all the people periodically assemble in general meeting to make their own laws and to appoint their agents for the execution and enforcement of those laws—a system which has been found practicable only in small or at least very compact communities, while in larger states the sovereignty of the people can act only through the instrumentality of representation, at present generally adopted.

Of the republics of ancient Greece, Sparta had a strictly aristocratic government, while Athens might have been called a democratic republic but for the circumstance that a majority of its population were slaves, and as such excluded from all political rights, at the time of its greatest prosperity the number of its free citizens being only 135,000, while that of the slaves rose to 365,000. The republic of Rome was, during the first centuries of its existence, aristocratic in its political organization, but in the course of time the patrician aristocracy found itself compelled to yield to the lower orders of the people, the *plebs*, access to the high offices of the government, which thereby acquired a more democratic character; all the while, however, as in all republics of antiquity, a large part of the population remained slaves and without political rights. The Italian republics which became the most flourishing and powerful commercial communities of the Middle Ages—notably Venice and Genoa—were strictly aristocratic; a number of patrician families, who chose from among themselves the head of the government, called the doge, enjoyed a monopoly of political power. The first important republic of the modern era, the United Netherlands—formed, after their separation from Spain, out of seven confederate provinces (1580), and recognized by Spain as an independent republic (1609)—was of a more democratic tendency, as was also the republic or "Commonwealth" sprung from the English revolution, which, however, after an existence of only eleven years (1649–60), was overthrown by the restoration of the Stuart dynasty. Of a similar character were most of the free cities and Hanse towns of Germany, only three of which—Hamburg, Bremen, and Lubeck—have to this time preserved their republican institutions as members of the German empire. Two miniature republics in the south of Europe have survived to our day—San Marino, in Italy, and Andorra, in the Pyrenees—remarkable mainly for their insignificance as independent states. Spain had, immediately after the abdication of King Amadeus (1873), a short period of democratic republican government, which, however, appeared only as a mere episode in a series of revolutions and reactions. At present there are only two republics of importance in Europe—Switzerland and France. (For the history of the Swiss republic, see Switzerland, History of.) The third French republic was proclaimed Sept. 4, 1870, when Napoleon III. had fallen into the hands of the German forces after the battle of Sedan. The National Assembly, organized in 1871, ultimately framed a constitution which went into effect in 1876, and has been in successful operation ever since. It is not unlike the English constitution, with the substitution of an elective president for the hereditary sovereign and an elective senate for the House of Lords. See France, History of.

In America all states except the colonial possessions of European powers have republican governments with democratic institutions. The largest and most powerful of them, the republic of the U. S., presents the realization of the democratic republican idea on the greatest scale.

The distinction between aristocratic and democratic republics has now scarcely more than historical importance, inasmuch as there is at present not a single state with a republican form of government in existence in which a nobility or a privileged class of any description enjoys a monopoly of power; and since the abolition of slavery and the enfranchisement of the colored race in the U. S. there is none in which any considerable class of people is excluded from the exercise of political rights. But while all republics, with a uniform tendency, have drifted toward democracy, as far as the equality of political rights among citizens is concerned, we find an essential difference between them as to the character of their political institutions in another respect. (1) The constitution of a republic may be such as to make the general government in its legislative and executive capacity the depository of the whole sovereignty of the people, so as to give it control not only of national affairs, but also of local administration; or (2) the general government of a republic may be one of strictly limited powers, being confined in its constitutional sphere of action to a certain class of things which concern the nation as a whole, while the administration of affairs of a local nature is left to the "self-government" of the people in their local organizations respectively, with entire independence of the central authority; or (3) these two systems may be so mixed as to leave to the local self-government of the people only a limited range, subject to supervision and interference by the central government. A government of the first description would be called a *centralized*, of the second a *decentralized* government, and of the third either one or the other as it more nearly approaches the first or the second standard. The French republic presents an illustration of the centralized system in a but slightly modified sense, while the so-called *federal* republics—and among them most conspicuously and on the greatest scale the republic of the U. S.—exemplify that which combines the independent administration of local interests by the people in their local organizations with a central government controlling affairs of national concern. For the system of centralization the advantage is claimed that it imparts to the government great power, energy, and rapidity of action by enabling it to employ the whole machinery of general and local administration for its purposes. It is therefore by many thought preferable in a country whose surroundings and international relations are such as to render the possibility of an instantaneous employment of all its resources desirable, or whose internal peace is threatened by a lawless and turbulent spirit, so as to require prompt and vigorous measures for the maintenance of order and security. But while the centralized system thus creates, in the common acceptation of the term, a "strong government" which may be used for good ends, it produces at the same time an accumulation of power which may become, and sometimes has shown itself, very dangerous to popular liberty and to the permanency of republican institutions. The centralized system holds out a tempting prize to popular insurrection at the seat of government, as well as to the *coup d'état* on the part of those in power; and what appears as an element of strength and energy in the government becomes thereby in reality an element of instability. This tendency is the more dangerous as the centralized system fosters among the people the habit of looking for all that is to be done for their interests not to themselves, but to the superior wisdom

of those directing the machinery of power. It is essential to the success of democratic republican government that the political intelligence of the masses of the people be well developed, and this the centralized system fails to bring about. People who are not permitted to learn how to manage their local concerns by independent action can not be depended upon to act with steady judgment and wisdom in exercising a directing and decisive influence upon the government of a great republic.

In the so-called *federal* republics the *decentralized system* of government has been a thing of natural growth. They were formed by uniting in common political organizations a number of already existing communities (cantons, colonies, states), and these pre-existing communities, after their union still preserving their identity, and also a degree of independence necessary to that end, remained, as to their local concerns, self-governing bodies, while within them the smaller units of local organization (municipalities, townships, counties) continued to stand in a similar relation, subject to certain necessary restrictions, to the respective cantons, states, etc. The UNITED STATES (*q. v*) affords an example of this complex system. (See also CONSTITUTION OF THE UNITED STATES.) In spite of the many constitutional limitations on the power of the central authorities in the U. S., the history of a century has demonstrated that the national Government possesses vigor enough to accomplish all the objects for which it was instituted, and that it has been able successfully to carry on foreign wars of considerable magnitude, and also to overcome an insurrection supported by nearly one-third of the people, organized upon a tremendous scale, and commanding great resources. It has even now and then, when under the control of an ambitious party spirit or under the pressure of great emergencies, shown a tendency, for special ends, to break through its constitutional restrictions or permanently to enlarge the scope of its powers. Commercial developments, in railroads and other forms of centralized business extending over an area too wide for the authority of individual States, have done much to widen the jurisdiction of the Federal Government. There is also an increasing tendency to seek national control over all matters affecting the election of federal officers instead of leaving them to local authorities. It might also be apprehended that under such a system in some of the several States powerful interests may obtain control, wield an oppressive rule over a part of the people, and intrench themselves behind the right of the States to govern their local concerns. This was the case in the States in which slavery existed, and remained so until slavery was abolished in consequence of the rebellion. Since then that particular form of local oppression within State limits has been guarded against by constitutional provision. Attempts by political factions or party organization to exercise an oppressive rule may be expected to find their remedy in the resources of popular government. There have been now and then conflicts of authority between the national Government and individual States, but, with the exception of that which gave rise to the rebellion of the slave States, they have all been settled peaceably.

A republican government so organized is unquestionably less subject to certain dangers to which centralized republics are apt to succumb. A *coup d'état* or an insurrection at the seat of the national Government, set on foot for the purpose of effecting a general revolution by one stroke of force, would in a country like the U. S. be a mere blow in the air. Neither will a political party in possession of the national Government be able to maintain itself or to oppress opposition by an arbitrary stretch of power, for the rights of the citizen are sheltered by the protection of local self-government. If there is any real danger threatening the political institutions of the U. S., it is certainly not that of their overthrow by force, but it is their deterioration by the influence of corrupt practices and habits. In this respect nothing can be more deplorable than the usage which has developed itself in the U. S. since 1830—to treat the offices of the Government as the mere "spoils" of party victory. See CIVIL SERVICE AND CIVIL SERVICE REFORM.

On the whole, it will be admitted, even by those not partial to the republican theory, that, in spite of temporary abuses and occasional jarrings, the decentralized system of republican government with its "checks and balances" of power has not only proved itself entirely practicable, and very successful even in holding together in one national organization a very numerous population spread over a vast extent of territory, but that the people living under it, in Switzerland as well as in the U. S., have attained a social condition remarkably prosperous, progressive, and happy. This has undoubtedly been owing in a very great measure to the stimulus which active self-government imparts to popular education, enabling men to manage their own affairs, private and common, upon their own well-understood responsibility, giving them an opportunity to reap the benefit of their own wisdom, and to learn from their own errors and blunders, thus signally advancing the standard of general intelligence and practical sense among the masses.

See, further, *Congressional Government* (Boston, 1885); Woodrow Wilson, *The State* (Boston, 1889); Burgess, *Political Science* (New York, 1891); Bryce, *The American Commonwealth* (London, 1888; new ed. 1895). CARL SCHURZ.
Revised by A. T. HADLEY.

Republican Party: one of the two great political parties in the U. S. Its distinctive aims and achievements will best appear from a sketch of its development and an exposition of its views on important national issues. Historically it is the successor of the Federalist and Whig parties, while the Anti-federalists, afterward called Republicans, may be regarded as the former representatives of the modern Democratic party. Although the names have varied, the two great groups which have respectively borne them have continued essentially the same.

The Anti-slavery Movement.—The Federalists were the men who revolted against the imbecility of the Confederation and led in forming the Constitution. They then organized the Government and established the great lines of national policy. They were resisted by the Anti-federalists, who held to the colonial traditions of separatism and later to the doctrine of a strict construction of the Constitution. After the country emerged from the period of foreign complications which culminated in the war of 1812 there ensued what was termed the "era of good feeling." In this description there was more irony than truth, but it was really a period during which the governmental organization and general policies of the Federalists passed into general acceptance, and while personal politics reigned in public life and the old lines of battle faded away, the same party groups were forming again to take up fresh issues. These new questions were of a domestic character and involved the policies to be pursued in the development of the resources of the country by internal improvements and of industrial independence by a system of tariff protection. The Whigs supported and the Democrats in a greater or less degree opposed both policies. But while current politics were absorbed with national banks, national improvements and protective tariffs, another and far different question—one destined to overshadow everything else—was slowly rising up and taking definite shape. This was the question of slavery, moral in its nature, but affecting the whole social and economic system of half the republic.

The anti-slavery movement began with the Abolitionists, who roused the attention and awakened the conscience of the North, but who were unable to form an effective political force. The feeling which they created, however, although they themselves could neither control nor direct it, swelled and widened until it finally cut for itself a new channel. The anti-slavery sentiment could find no support among the Democrats, as a party, for that party, without going into details, could not by its very nature have become the ally or the exponent of an attack upon an existing institution. The mass of the Whigs, on the other hand, inclined naturally to the opposition to slavery, but the Whig party, as an organization formed on economic issues, had a strong minority in the slave States. This minority could not throw the party upon the side of slavery, but it could and did prevent the Whig organization, naturally unwilling to lose a large body of supporters, from becoming an avowed anti-slavery party. The situation therefore was this: One of the two great political organizations was devoted to slavery, the other was unable to move against it, and the declared opponents, the Abolitionists, were impractical, divided among themselves, tainted with separatism, and incapable of commanding general popular confidence. The time again had come for forming parties along new lines in order to reach some practical result. What was needed was a party which was opposed on principle to slavery, and which at the same time aimed to make its resistance within the limits of the Constitution and to embody its principles in practical legislation. The new movement, when it began to take shape, went to no extremes. It did not propose any infringement of the

rights of the States as to their domestic institutions, but proceeded along the line of least resistance. It did not set out to abolish slavery, but merely to prevent its further extension. The first expressions of this anti-slavery movement, in a national way, were in the Free-soil and Liberty parties, both outside the two great parties and polling only a small vote. They had the effect that a balance of power vote sometimes attains in closely divided States, of defeating one of the great parties with the other, but they achieved little of their direct purpose beyond showing that the Democratic party would stand firm for slavery, and that the Whig party as an organization was useless against it. The anti-slavery vote defeated Clay in 1844, and gave New York to the Whigs in 1848. Even after this the Whigs, accepting the compromise of 1850, still refused to take up opposition to slavery, and the elections of 1852 were disastrous to them. The canvass of the Free-soilers, small as their vote was, joined with the general discontent of the Northern Whigs, together with the helplessness of their party against the slave power, wrecked that great organization in nearly every Northern State. Thus the ground was cleared for the development of a party which should take the place and assume the traditions of the Whigs unencumbered by their obligations to slavery.

The Formation of the Republican Party.—As always happens in such periods of political change, the dissolution of the Whig organization gave rise to various side movements, of which the most conspicuous was the Knownothing or Native American party. This outbreak had a brief and in some places an overwhelming success, but its career was short, for it had no firm resting-place of principle, and did not recognize the great question which was the one then really in the public mind. It served, however, as the recent elections had, to clear the field for the new party organization which the times demanded, and it was in this situation of politics that the Republican party came into existence. It is generally admitted now that the first formal adoption of the name Republican was made by the Michigan State convention early in June, 1854, and that it was due to a suggestion in a letter from Horace Greeley. Certain it is that the name spread rapidly and was adopted by State conventions in Maine, Ohio, Indiana, Illinois, Wisconsin, and Iowa. The new party principle prevailed in the Northern States, and wherever the Republicans ran a straight ticket they carried everything before them. It had looked in 1852, after the Democrats had swept the country without effective resistance from the perishing Whigs, as if resistance to the Democratic party was hopeless, and as if the compromises of 1850 were really built on the rocks and not upon the sands. Yet only two years later this new party, because it gave the first opportunity for an expression of a deep popular feeling and because in the midst of negations it meant something real, carried the Northern States. In spite of its lack of national organization, it elected enough members of Congress to control the House and to choose Nathaniel Banks Speaker after a long and bitter contest. Such sudden success showed how greatly a new means of expression for popular feeling was needed.

Stimulated alike by their victories at the polls and by the Kansas-Nebraska Bill and other measures, which proved that to the South compromises were merely stepping-stones to further aggression, the new party went quickly forward to a national organization. The first convention met at Pittsburg on Feb. 22, 1856. A national organization was there formed, and a call issued for another convention to nominate candidates for President and Vice-President. This second convention met in Philadelphia on June 17.

The serious character and the importance of the new movement were strikingly shown by the quality of the delegates who assembled in this convention. There were to be seen not only those who had been leaders of the Free-soil movement in the days when it was a forlorn hope, but many men who had been conspicuous in the Whig party, while delegations of Democrats were also present. Edwin D. Morgan, afterward Governor of New York, called the convention to order, Robert Emmett was made its temporary chairman, and Henry S. Lane, of Indiana, its permanent president. The platform was reported by David Wilmot, the author of the famous proviso, and was practically confined to the single issue which had called the new party into existence. It declared against the establishment of slavery in the Territories, and the third resolution, which has become in political literature a familiar quotation, ran as follows: "Resolved, That the Constitution confers upon Congress sovereign power over the Territories of the United States for their government; and that in the exercise of this power it is both the right and the imperative duty of Congress to prohibit in the Territories those twin relics of barbarism, polygamy and slavery." The fourth resolution discussed at length the condition of Kansas and denounced the Democratic administration for their policy in that Territory. The fifth resolution demanded the admission of Kansas; the sixth assailed the doctrines of the Ostend circular. The seventh and eighth comprised the only portion of the platform which went outside the slavery issue. These two resolutions declared in favor of national aid for a railway to the Pacific coast, and also for liberal appropriations for rivers and harbors. Like all new organizations which are engaged in mustering their forces from different elements of the community, the Republican convention of 1856 had a great deal to say about the issue on which all were agreed and which was the vital question of the day, and very little about other questions of longer standing and upon which there had been earlier party divisions. Nevertheless, these two comparatively unimportant resolutions about railways and rivers and harbors marked at the start the political ancestry of the Republicans, for they commit the party to the doctrine of internal improvement, which was one of the doctrines growing out of the liberal construction of the Constitution, and which had formed the fundamental principle of Federalists and Whigs alike in opposition to the strict construction of the Democrats.

Upon this platform the Republican convention placed as its candidates John C. Fremont, of California, and William L. Dayton, of New Jersey. There was no serious contest over either nomination, but it is interesting to notice that the leading candidate against Dayton for the vice-presidency was Abraham Lincoln, of Illinois. Fremont had no political record, but had been for some little time a popular hero, owing to his exploring expeditions and his brilliant services in California. The event proved that he was a well-chosen candidate for the purpose of getting votes, and the Republican campaign was full of enthusiasm and energy. The Democratic candidate was James Buchanan, who was elected, but the Republicans carried every Northern State except Pennsylvania, New Jersey, Indiana, Illinois, and California, and gave their ticket 114 electoral votes. Of the popular vote the Republicans polled 1,341,264. When it is considered that only four years before all effective opposition to the compromise measures and to the Democratic party had appeared to be extinct, the results achieved by the Republicans in the elections of 1856 were most impressive.

During the next four years events steadily strengthened the Republican cause. The subserviency of Buchanan to the South, the publication of the Dred Scott decision, the continuance of the atrocious Democratic policy toward Kansas, and finally John Brown's raid intensified the hostility of the North to slavery, and day by day added votes to the Republican party.

The Election of 1860.—The War.—When the national Republican convention assembled in Chicago on May 16, 1860, they faced a situation very different from that which had confronted them in 1856, and they now saw success well within their grasp. The Democratic party had met in convention on Apr. 23 at Charleston, S. C., and had there split hopelessly on the slavery question. They had adjourned without action and the warring factions had called two conventions, one of which nominated John C. Breckinridge and Joseph Lane on an extreme pro-slavery platform, while the other, adopting the squatter-sovereignty theory, nominated Stephen A. Douglas and Herschel V. Johnson. With their enemies thus divided and with so sure a promise of victory the contest for the Republican nomination was both sharp and determined. The first choice of a majority of Republicans was William H. Seward, of New York, to whom the Eastern States were especially devoted. It was very natural that this should be the case, for Seward had been for years one of the boldest and most effective opponents of slavery, both as Governor of New York and in the Senate of the U. S. He had, however, many active enemies, which a career like his was sure to produce. These men, led by Horace Greeley, united with the Western candidate and thus defeated Seward and secured the nomination of Lincoln. It was the most fortunate choice ever made by a political convention. The often repeated statement that Lincoln was an unknown man, selected merely on account of his availability, is a mistake. He had long been distinguished in the public life of the West. He had been voted for as a candidate for Vice-

President in the convention of 1856, and his debate with Douglas in 1858 had given him a national reputation and had shown to all who looked below the surface of current events that the opponent of Douglas was a man of uncommon abilities. The choice as it stood in May, 1860, was both reasonable and intelligent; but, although the convention did not take a leap in the dark and pick up an unknown man, it was not then possible to realize that the party had chosen for its candidate the greatest statesman and popular leader of the nineteenth century.

The West having received the presidency, the convention went to the extreme East for its candidate for the second place and nominated Hannibal Hamlin, of Maine, for Vice-President—a wise selection of an able man. The platform of 1860 bears witness to the development of the party, and to the strong feeling it now had that it existed for more than a single issue, great as that issue was. The resolutions recognized the rights of States in regard to their domestic institutions, but denounced the threats of secession which then filled the air and declared the Republican party to be the party of the Union. It took the old ground with renewed strength in regard to Kansas and the extension of slavery to the Territories, demanded the admission of Kansas as a State, and declared the reopening of the slave-trade to be a crime. The resolutions also called attention to the frauds and corruptions of the Democratic national administration, and urged the necessity of a return to economy and accountability. The thirteenth clause declared against the alienation of the public lands to any but actual settlers and in favor of the Homestead Act, which had already passed the House of Representatives. The resolutions also reiterated the declaration of 1856 as to internal improvements, but they now took a much longer step in the direction of Whig and Federalist policies. The twelfth clause was as follows: "That, while providing revenue for the support of the general government by duties upon imports, sound policy requires such an adjustment of these imposts as to encourage the development of the industrial interests of the whole country; and we commend that policy of national exchanges which secures to the workingmen liberal wages, to agriculture remunerating prices, to mechanics and manufacturers an adequate reward for their skill, labor, and enterprise, and to the nation commercial prosperity and independence." Thus in its early development the Republican party came squarely on to the ground first marked out by Hamilton and adopted as their general doctrines the liberal construction of the Constitution and the policy of protection to home industry. Even if this had not been the sentiment of the great mass of those who composed the Republican party this line of development would none the less have been pursued by mere force of circumstances. The interests of slavery were closely linked with free trade. Where slavery ruled there was only one great staple grown, and there was no diversification of industry. It was therefore to the advantage of slavery, unable to build up an industrial system where a blight rested on free labor, to have the markets of the world to buy in at the cheapest possible prices. The resistance to slavery in the North depended for its material strength on the industrial growth of the Northern States. This industrial growth had been checked by the low tariffs imposed by the South, and the panic of 1857, which those tariffs caused, had aroused a strong feeling against the Southern economic policy. Protection therefore was the first weapon ready to the hands of the Republicans in their warfare against the slave power. They grasped it boldly, and the wisdom of their action, both on material and political grounds, was shown by the fact that they were thus enabled to swing the great industrial State of Pennsylvania into the Republican column and to wrest it finally from the grip of the Democratic party.

The election of 1860 was hotly contested. In the North the chief struggle was between the Douglas Democrats and the Republicans, except in the East, where the principal opponents of the Republicans were the few remaining Whigs. In the South the Breckinridge Democrats were almost unopposed, except in the border States, where the Whig or "Union" party was successful. The result was a decisive victory for the Republicans. Lincoln had a large majority in the electoral college and a large plurality of the popular vote. The figures stood as follows: Lincoln, 1,857,610; Douglas, 1,291,574; Breckinridge, 850,082; Bell, 646,124. The electoral vote was divided as follows: Lincoln, 180; Breckinridge, 72; Bell, 39; and Douglas, 12.

The victory of the Republican party was the signal for the beginning of the secession movement in the South to destroy the Union and break up the nation. The South entered upon secession because it lost an election. Without even waiting for the Republican party to come into power, before any overt act by any possibility could have been committed, the South, because it had been defeated at the polls, began its movement to destroy the Government. No greater blow to free government resting on the will of the people was ever struck, no more wanton political crime was ever attempted. South Carolina seceded in December; other States followed during the winter, and in February a rebel Confederate Government was formed at Montgomery.

Lincoln was inaugurated Mar. 4, 1861, and his inaugural speech was temperate and moderate, but firm on the great point of maintaining the Union. A terrible situation confronted the new party and its great leader. They found the treasury bankrupt, treason in the War, Navy, and State Departments, and civil war close at hand. In April the storm broke and fighting began.

It would be impossible to trace here even in the barest outline the history of the Republican party during the next four years, for this history through that period is the history of the war for the Union. The Republicans were charged with the heavy work of administration and with the preservation of the Government and the nation. They had to build navies, raise armies, provide money, and fight battles. They were bent on the prosecution of the war to a final, absolute, and victorious decision. The Democrats who had withered away in the first days of the war when the people rallied for the defense of the national life took heart as the struggle was protracted and defeats were sustained. Their activity took various forms. Sometimes it was embodied in treasonable movements like that of Vallandigham in Ohio and of the Knights of the Golden Circle in Indiana. Sometimes it took shape in rioting, as in the city of New York, but everywhere and always the Democratic party as a political organization was opposed to the administration and to the conduct of the war. Popular discontent with military defeats and popular disappointment at the length and stubbornness of the conflict nearly threw the House into Democratic hands in the elections of 1862, but after that time the victories of the national armies and the rising fortunes of the Union cause, steadily strengthened the Republicans.

On Jan. 1, 1863, the proclamation of emancipation went into effect, while the capture of Vicksburg and the victory of Gettysburg six months later marked the decisive turning-point in the great conflict. In the elections of that year the Republicans regained all the States they had lost in the elections of 1862. The following year came the presidential election. Some extreme Republicans, dissatisfied with the administration, met at Cleveland and nominated Fremont for President and John Cochrane for Vice-President. This performance looks merely absurd in the pages of history, and even at the time it had but little effect; both the candidates ultimately withdrew and left the Republican party to face the election with an unbroken front.

The Republican convention met at Baltimore on June 7, 1864, and Robert J. Breckinridge, of Kentucky, was made its temporary chairman, and William Dennison, of Ohio, its permanent president. Lincoln was renominated by acclamation, but there was an active contest for the vice-presidency, to which Andrew Johnson, of Tennessee, was finally nominated. The platform declared for the prosecution of the war and against any compromise with the rebels. The second resolution sustained in the strongest terms the proclamation of emancipation, and pledged the support of the party to Lincoln. They also pledged themselves to the redemption of the national debt, and denounced the attempt of France to establish itself upon the Western continent. The only resolutions not relating to the war were those favoring foreign immigration and supporting the policy of giving government aid to the construction of the Pacific railroads.

The Democratic convention was held in Chicago. It attacked the administration with the utmost bitterness, and in its platform declared the war to be a failure. The Democrats nominated, in strict accordance with the platform, George B. McClellan, under whom, as general of the Army of the Potomac, the war had certainly been a failure, and placed with him as Vice-President George H. Pendleton, of Ohio. The issue was plain and was also the gravest that ever had come to the American people for decision at the ballot-box. Nothing less than the existence of the nation was staked on the verdict of the voters. The Re-

publicans swept the country. Lincoln had the electoral vote of every State not in the rebellion, except Kentucky, Delaware, and New Jersey. He received 212 electoral votes against 21 for McClellan. His popular vote was 2,213,665 against 1,802,237. This sweeping victory at the polls confirmed the victories of the armies in the field. Early in the following spring Richmond fell and Lee surrendered at Appomattox. In the midst of the popular rejoicing at the end of the great struggle, which resulted in the preservation of the nation, Lincoln was assassinated by Wilkes Booth on Apr. 21, 1865.

Reconstruction.—The death of Lincoln was not only a terrible calamity to the nation, but a great misfortune to the Republican party, for the work of reconstruction which confronted the victorious North demanded both from President and Congress the exercise of the highest wisdom as well as great firmness and moderation. These qualities possessed in an unequaled degree by Lincoln were almost wholly lacking in Andrew Johnson, who succeeded him in the presidency. Johnson was a hot-headed man of unbalanced judgment. He began by taking an extreme position against the South, uniting with the most radical wing of the Republican party, whence opposition to Lincoln had always proceeded. He then suddenly changed his attitude and swung to the opposite extreme, entering upon a policy of ardent opposition to the Republican measures of reconstruction. The effect of this course was to place the party in antagonism to the President, and by alienating all moderate men from the administration, to throw the guidance of the party into the hands of its more extreme members. Such a situation was most unfortunate for the country, and could not fail to damage the work of reorganization. Nevertheless, the party succeeded in passing its reconstruction laws, which gave a vote to all men in the South, black and white, except those who had participated in the rebellion. The Republicans also passed the Fourteenth Amendment to the Constitution, which established the freedom of the Negro and provided that no debts contracted in aid of the rebellion should be paid by the U. S. or any State. All these great measures were forced through over the President's veto, and the bitterness between the President and the Republican party reached such a point that in Feb., 1868, the House of Representatives impeached him, resting their charges on his illegal removal of Stanton, his attacks upon Congress, and his stopping the execution of some of the acts of Congress. The President was acquitted, the vote standing guilty 35, not guilty 19—not a two-thirds majority, as required by the Constitution.

In that same year a new presidential election came on. President Johnson's efforts to build up a personal party failed as completely as those of Tyler under like circumstances. No one followed him and neither of the great parties would have anything to do with him. The Republican party met in Chicago on May 20 and nominated Gen. Grant for the presidency by acclamation. Schuyler Colfax, of Indiana, was nominated for Vice-President on the fifth ballot. The Democratic national convention met in New York on July 4, and nominated Horatio Seymour for President and Francis P. Blair, of Missouri, for Vice-President. The Republican platform sustained the Constitutional amendment, which recognized the results of the war, and the freedom of the slave, and which guaranteed protection to the Negro in his rights. They also sustained the reconstruction acts of Congress, pledged themselves to maintain the national credit and to provide for the soldiers, and denounced all forms of repudiation which had been much advocated by the Democratic leaders.

The Democrats took ground against this platform, and showed by their attitude and their nominations alike their hostility to the Republican policy. The people, however, wearied by four years of war and by the angry struggles with Johnson, were anxious above all things for a final settlement of these war issues. Gen. Grant tersely summed up the situation in his famous phrase: "Let us have peace." This became the watchword of the contest, and the Democratic campaign really broke down before the polls were reached. Gen. Grant was elected by a popular vote of 3,012,833 against 2,703,249, receiving in the electoral college 214 votes against 80 for Seymour. This election was decisive in favor of the acceptance of the results of the war, and drove the Democrats from any further attempt to take ground against them. It also sustained the Republican policy of equal suffrage and the rights of citizenship to all citizens without regard to color, and this policy was finally secured by the Fifteenth Amendment to the Constitution, which soon after passed Congress, and, after ratification by the States, was proclaimed on Mar. 20, 1870.

Under the administration of Gen. Grant the leading question was the condition of the Southern States under the Reconstruction acts. The State governments which were then set up, resting on the black vote, were generally feeble and gave rise to many scandals. On the other hand, the murderous outrages committed by the Southern whites against all Republican voters angered the North and kept all the States lately in rebellion in a condition of disorder which invited the constant interference of the national authority. From every point of view the situation in the Southern States was depressing, and the dissatisfaction which it caused was directed very naturally against the party in power. This period also was one of general demoralization, the inevitable outcome of four years of fierce civil war, and the demoralization extended not only to politics but to business and society. It gave birth to wild stock speculations and to many scandals and corruptions, and the burden of these also fell, as it was sure to fall, on the party in power.

The Liberal Republican Movement.—The discontent thus engendered took shape in an independent movement in the Republican party headed by a number of Republican leaders who had broken with the administration on account of the San Domingo policy of Gen. Grant, and who were also desirious of attacking the abuses and corruptions to which the war period had given rise. These dissatisfied or Liberal Republicans, as they called themselves, held a national convention in Cincinnati in May, 1872. The plan was to nominate Charles Francis Adams for the presidency, a selection which would have made the movement a formidable one, but the convention broke away from the leaders and nominated Horace Greeley for President and B. Gratz Brown for Vice-President. They declared in their platform that sectional issues should be buried, that all the settlements of the war should be accepted, that civil-service reform should be begun, and that specie payments should be immediately restored. They left the tariff an open question and opposed all further grants of land to railroads. The regular Republicans met in Philadelphia in June and renominated Gen. Grant by acclamation, placing with him on the ticket Henry Wilson, of Massachusetts, for Vice-President. Their platform was more elaborate and touched upon more questions than that of the Liberals, but on those subjects in regard to which both platforms spoke the declarations were in principle the same. The regular Republicans reviewed the history of their party, demanded the acceptance of the results of the war and the protection of the colored voter, opposed grants to the railroads, and favored the reform of the civil service. They denounced the repudiation of the public debt and supported specie payments. The Liberals had left the tariff an open question, but had nominated a high protectionist as President. The regular Republicans declared squarely for protection, which had always been one of the cardinal principles of the party.

The Democrats met in July at Baltimore, ratified the nomination of the Liberal Republicans and adopted their platform. Thus they accepted as their candidate for the presidency a lifelong opponent, who had been an extreme abolitionist and was always a zealous protectionist, while they adopted as their platform a set of Republican principles in no one of which they believed. The result of such a performance it was not difficult to foresee. On the one hand it demoralized the Democratic party, while on the other the absurdity of the whole position prevented any serious break in the ranks of the Republicans. A straight-out Democratic ticket, nominated at Louisville in September, came to nothing and played no part in the election. Grant carried every State, except Georgia, Kentucky, Maryland, Missouri, Tennessee, and Texas. His popular vote was 3,597,070 against 2,834,079 for Greeley. In the electoral colleges Grant received 286 votes against 80 thrown for various candidates, Greeley having died between the election and the meeting of the colleges.

Although the Liberal movement broke down so completely in the presidential campaign, it made itself felt very strongly two years later, stimulated as it was by scandals which were connected with appointees and friends of the administration. During the preceding years, moreover, owing to the business disasters which followed the panic of 1872–73, a strong movement for "cheap money"—that is, for the unlimited issue of greenbacks—had grown up in certain States. Gen. Grant's veto of the inflation act of 1874, fol-

lowed by the specie resumption act of 1875, was the final expression of the Republican position. This cheap-money movement, however, added to the dissatisfaction of the Liberal Republicans, resulted in the defeat of the Republican party in many Northern States in the election of 1874. The House for the first time since the war had a Democratic majority, and it seemed as if the tide had turned finally against the Republicans. There were abundant predictions that the days of the Republicans were numbered, that their work was done, and that they would soon disband. The spectacle of the Democratic House, however, and the rise of the cheap-money movement with which the Democrats were prompt to ally themselves, soon altered the situation. The Republicans regained in 1875 many of the States which they had lost in the preceding year, and faced the approaching presidential election with much brighter prospects than any one in 1874 would have anticipated.

Election and Administration of Rutherford B. Hayes.—The Republican convention met at Cincinnati June 14, 1876. Blaine was the leading candidate. The other candidates were Senator Morton, of Indiana, Roscoe Conkling, of New York, Gov. Hartranft, of Pennsylvania, Gov. Hayes, of Ohio, and Benjamin H. Bristow, of Kentucky, who had a strong support from the Liberal Republican element and from all who were dissatisfied with the Grant administration. The convention was an exciting one, but finally a combination was made against Blaine by the friends of the other candidates, which resulted in the nomination of Hayes on the seventh ballot. William A. Wheeler, of New York, was then nominated for Vice-President. The platform declared for the maintenance of the public credit and the resumption of specie payments, for the enforcement of national laws in the South, for civil service reform, for protection, and for an immediate investigation of Chinese immigration. It declared against appropriations for sectarian schools, and against polygamy in the territories.

The Democratic convention met in St. Louis June 27. They demanded reform of every kind, were somewhat vague upon the money question, declared for a tariff for revenue only, and denounced the Republican party at great length. Upon this platform they nominated Samuel J. Tilden, of New York, and Thomas A. Hendricks, of Indiana. The election was hotly contested, and very close. The Democrats had now regained control of most of the Southern States, and by great frauds attempted to take them all. After the vote had been counted, the electoral votes of South Carolina, Florida, Louisiana, and Oregon were in controversy, and Tilden lacked only one vote of a majority. The dispute was carried into Congress and assumed a most threatening aspect. The good sense and patriotism, however, of the leaders on both sides prevailed, and the disputed votes were referred to an electoral commission to decide the points at issue. This commission, after full hearing, awarded all the contested votes to Hayes, thus giving him 185 electoral votes to 184 for Tilden. In this way the country escaped a very serious danger, and on Mar. 4 Hayes was peacefully inaugurated. President Hayes at the outset abandoned the policy of national interference to protect voters in the Southern States, and those which had been Republican up to 1876 now passed finally under Democratic control. In other respects the Hayes administration was a successful one. Its greatest triumph was the resumption of specie payments and the refunding of the public debt under the able management of John Sherman, the Secretary of the Treasury. There was also a great improvement in general administration, and many of the abuses which had grown up during and after the war were curtailed. In Congress these four years were marked by the rise of the agitation for the free coinage of silver. A bill for free coinage passed the House, but resulted in the final passage of a compromise measure known as the Bland-Allison act. This bill was vetoed by President Hayes, but passed over his veto, and went upon the statute books in 1878, where it remained for twelve years.

Administrations of Garfield and Arthur.—The Hayes administration as a whole strengthened the party, and the Republican convention met at Chicago in June, 1880, under favorable auspices. It was the most memorable convention held by any party since the Democratic convention at Charleston in 1860. The contest in the convention, beginning with the question of district representation, lasted a week. The leading candidates were Gen. Grant and Mr. Blaine. Gen. Grant had to contend with the intense popular prejudice against a third term, and also the extreme hostility of those elements which had been so dissatisfied with his previous administrations. Yet notwithstanding these obstacles, Grant's great military services and personal popularity, combined with the support of Senators Conkling, Logan, and Cameron, made his candidacy very formidable. Blaine also had a large vote in the convention, but little short of that given to Gen. Grant. The balance of power was held by the supporters of John Sherman and of Senator Edmunds, who had the support of Vermont and Massachusetts. Finally, after a most stubborn contest, the minority candidates combined against Gen. Grant and nominated Gen. Garfield, of Ohio, on the thirty-sixth ballot. Chester A. Arthur, of New York, was nominated for Vice-President, as representing the Grant forces in the convention. The platform reviewed the history of the two parties, asserted the national principle as opposed to States rights, and declared for protection and against Chinese immigration.

The Democratic convention met at Cincinnati on June 22. Mr. Tilden, who represented in his own person the issue upon which the Democrats had been insisting that they had been defrauded of the presidency four years before, wrote a letter declining the nomination. Rather unexpectedly, perhaps, the convention took him at his word and nominated Gen. Hancock for President and William H. English for Vice-President. The campaign at first was rather languid, the principal question being the old Southern issue; but when the Democrats in combination with the Greenbackers carried Maine in September, the Republicans, thoroughly alarmed, forced the tariff issue to the front, and, attacking the Democrats on their plank for a tariff for revenue only, carried Ohio and Indiana in October and the country in November. The victory would have been even more decisive but for a forged letter purporting to be written by Gen. Garfield in favor of the Chinese, which came out in the last hours of the campaign and which cost the Republican party California and Nevada. As it was, Garfield had 214 electoral votes against 155 for Hancock.

Gen. Garfield made up a strong cabinet with Blaine at its head as Secretary of State, but a bitter quarrel between the administration and the Senators from New York broke out almost at once. The New York appointments were made from those persons who had opposed Senator Conkling and supported Blaine for President. Particularly objectionable to the Senators was the selection of W. H. Robertson as collector of the port of New York, and upon this came an open break. Senators Conkling and Platt resigned and appealed to the New York Legislature to sustain them in their course by a re-election. This the Legislature after a bitter contest refused to do, and elected in their places Messrs. Lapham and Miller. This quarrel, and the attacks upon the Star Route contracts by the Government, filled the first months of the new administration with bitterness and strife. Indirectly it excited a disappointed office-seeker, Guiteau, of unbalanced mind and criminal propensities. Angered at not securing an office, he lay in wait at the railway station at Washington, D. C., and there shot the President on July 2, 1881. Gen. Garfield lingered for many weeks after the shooting, but finally died, on Sept. 19, at Elberon, N. J.

He was succeeded by Vice-President Arthur, who filled out the remainder of the term and gave the republic a most excellent and business-like, although uneventful, administration. The conflicts, however, within the party at the beginning of the Garfield administration bore fruit after the general grief over the assassination of the President had subsided. The elections of 1882 went heavily against the Republicans, especially in New York, where the interference of the administration with the nominations produced so much dissatisfaction that Grover Cleveland was elected governor over Secretary Folger, the Republican candidate, by a majority which reached nearly 200,000.

The Campaign of 1884.—In the convention of 1884 the old fight between those who had supported Gen. Grant and those who had opposed him, or between the "Stalwarts" and the "Half-Breeds," as they were called at the time, was fiercely renewed. Blaine was the leading candidate, and against him were arrayed the supporters of President Arthur combined with the elements which had united with Blaine in 1880 to defeat Gen. Grant. Nothing, however, could withstand Blaine's great personal popularity. He was nominated on the fourth ballot, and Gen. Logan, of Illinois, was put on the ticket with him as Vice-President. The platform, after reviewing the history of the Republican party, declared for international bimetallism, the regulation of interstate commerce, the reform of the civil service, and the resump-

tion of lapsed land grants. It favored also liberal pensions and the building up of the navy, and declared against Chinese immigration, and fraud and violence in the South. The leading resolution, however, concerned the tariff, which of late years had been coming more and more steadily to the front, and upon this the Republican party took, as it had always taken, bold and advanced ground in favor of protection to American industries. The Democrats met on July 8, at Chicago, and nominated Grover Cleveland for president and Thomas A. Hendricks for Vice-President. The platform declared in favor of reform in general after the manner of opposition platforms, but most particularly for tariff reform.

Platforms, however, played but little part in the exciting and bitter campaign which followed. There was a great deal of Republican opposition to Blaine, especially in the Eastern States, where it took the form of an open revolt of a most serious character against the Republican party. Although the Republicans tried to fight their battle on the tariff issue, this revolt made the campaign a purely personal one, and it had all the odious features of savage abuse of the candidates, which such contests are sure to engender. Issues were lost sight of, and the struggle finally turned solely on the question whether Blaine should or should not be President of the U. S. Despite the great schism, Blaine's personal popularity was so great that he attracted large bodies of Democratic voters and made up the Republican losses. New York, which decided the election, gave Cleveland, instead of the 192,000 plurality, which he had received in 1882, less than 1,200, and it was by many persons believed that even this narrow margin was obtained only by counting in New York city for Cleveland the vote cast there for Gen. Butler, who ran as an independent candidate for the presidency. In the electoral colleges Cleveland and Hendricks received 219 votes against 182 for Blaine and Logan. During the first two years of Cleveland's term the general talk in favor of reform went on, but very little was accomplished of a specific kind, and the fact that the Senate remained Republican prevented any violent legislation, if such had been desired. The elections of 1886 went against the Democrats, but they still retained control in the House by a narrow majority. The failure thus far to accomplish anything led, however, to a new departure. President Cleveland sent in to the Fiftieth Congress a message devoted to the single subject of the tariff and demanding instant and radical reductions. This message resulted in the introduction of the Mills Bill, which the House debated at great length for three or four months. It passed the House on July 13, 1888, and on the issue thus raised the two great parties appealed to the country.

The Administration of Harrison.—The Republicans met on June 19 at Chicago. Blaine withdrew his name, and on the eighth ballot Benjamin Harrison, of Indiana, was nominated for President, and this was followed by the nomination of Levi P. Morton, of New York, for Vice-President. The Republican platform favored bimetallism, the building up of the merchant marine, the admission of new States, and the reform of the civil service. It attacked the Democrats for their failure to settle the fishery question and for their feeble foreign policy, but, as in 1884, it made the tariff the leading issue, and declared more uncompromisingly than ever in favor of protection.

The Democrats met in July at St. Louis and nominated Grover Cleveland for President and Allen G. Thurman, of Ohio, for Vice-President. They too made the tariff the leading issue, and, although they did not declare for absolute free trade, they demanded such heavy reductions that the practical result would have been the same. The campaign turned on the issue of protection or free trade, and the Republicans were victorious throughout the Northern States, except in Connecticut and New Jersey. They also carried the House and kept their hold upon the Senate. They were therefore in control of every branch of the Government, and the Fifty-first Congress, which followed, was a remarkable and memorable one.

The first great contest was in the House of Representatives, where the Democratic minority undertook by the use of the rules to prevent the transaction of business. Thomas B. Reed, of Maine, was elected Speaker, and under his lead a reform of the rules was accomplished, which gave the majority power to act. Reed's policy and rulings were the subject of bitter attack, but every one of his principles has since been adopted by the Democrats themselves and sustained by the Supreme Court, thus completely vindicating his action. The Republicans were in this way enabled to pass a large amount of most important legislation. To this Congress is due the international copyright law, a long-delayed measure of justice and good sense. To it are also due the inspection laws which opened the markets of Europe to the meat products of the U. S., generous appropriations for building up the navy, and mail subsidies to develop steamship lines. Many other valuable measures of a non-political character were also carried through. The two great party measures were the bill to regulate national elections, which passed the House and failed in the Senate, and the new protective tariff, which became law on Oct. 1, 1890. In the elections which followed for the House of Representatives, the Republicans were very badly beaten. The amount of legislation which they had secured brought, as it always does, reaction and opposition, but the chief cause of their defeat was the outcry raised against the McKinley Act on the ground that it was too extreme and that it would raise prices. During the remaining years of President Harrison's administration the fact that the two Houses were controlled by different parties prevented action.

The Campaign of 1892.—In 1892 the Republican party met in convention at Minneapolis, and after a contest caused by the hostility to the administration among many party leaders, President Harrison was renominated and Whitelaw Reid, of New York, was put on the ticket with him as Vice-President. The Democrats renominated Grover Cleveland, who was bitterly but unavailingly opposed by the delegates from his own State, and nominated with him for Vice-President Adlai E. Stevenson, of Illinois.

This campaign, like the preceding one, turned upon the question of the tariff, the McKinley Act furnishing the text as the Mills Bill had done in 1888. The Republicans made a partial recovery from the disasters of 1890, but were nevertheless decisively beaten, several Northern States giving their votes to the Democrats for the first time. In the electoral colleges Cleveland and Stevenson received 277 votes to 145 votes for Harrison and Reid, and 22 votes for Weaver and Field, the Populist candidates. The Democrats also carried both the Senate and the House, and on Mar. 4, 1893, came for the first time in thirty-five years into full control of all branches of the Government. In April a business panic began, which reached in the following summer great intensity. The Democrats declared that this was due to the existence of the Sherman Act passed by a Republican Congress as a compromise measure, providing for the purchase, by the Treasury, of 4,500,000 oz. of silver bullion every month. President Cleveland called Congress in extra session on Aug. 7, and after an obstinate struggle of three months the purchasing clauses of the Sherman Act were finally repealed by a combination of Republican and Democratic votes, but the repeal, which was a wise measure, did not relieve or improve business. The business depression still continued while the Democrats were engaged in a revision of the tariff, which bore no resemblance to the promises of their platform, and the Republican party made large gains at all the by-elections. At last in August the Democrats passed their Tariff Bill just as it came from the Senate, where the House bill received over 600 amendments of a protective character. The President refused to sign the bill, and, after denouncing it in the severest terms in public letters to two members of the House, permitted it to become law without his signature. In the general elections of Nov., 1894, the Republicans appealed to the people against the Democratic failure in the matters of tariff and finance, the business disasters they had caused, and also against their feeble and blundering foreign policy. The Republicans carried the elections overwhelmingly, gaining over 100 seats in the House and seven seats in the Senate. H. C. Lodge.

Repudiation [from Lat. *repudia're*, divorce, reject, scorn, repudiate, deriv. of *repu'dium*, a casting off; *re-*, back + *pudet*, it shames]: an act by which an administration declines to be bound by debts contracted by the governments which have preceded it. In European history there are numerous instances of a government annihilating a portion of its debt by converting it into a lower denomination, and similar instances have occurred in Mississippi and Pennsylvania.

Requests, Courts of: See the Appendix.

Requisitions [from Lat. *requisi'tio*, a search for, requirement, deriv. of *requi'rere*, search for, require; *re-*, back, again + *quæ'rere*, *quæsi'tum*, seek, ask]: (1) formal demands by one government on another for the extradition of criminals (for treatment, see Extradition); (2) in the international laws of war, demands for necessaries by an invader on an

invaded country. These have not always been distinguished from CONTRIBUTIONS (*q. v.*). Calvo, after De Garden, draws this line between them: that a *contribution* is what the inhabitants of a country occupied by an invading army are forced to pay or give in order to secure themselves from pillage, while a *requisition* is the demand made by the military authorities that the inhabitants shall place things, and even persons, at their disposal. A contribution is especially a payment in money, whether for the purpose of carrying on civil government in the occupied district or for general military uses. Requisitions, specifically, are forced supplies of material necessary for the carrying on of war, such as food and drink, fodder, horses, rolling-stock for railways and highways, lodging, labor, and a variety of other things. They may be levied under the authority of the commander of any detached force, but can not be made without authority, for that would be pillage, which is illegal. To account for them, especially for contributions, as payments for exemptions from pillage, is absurd; for pillage is barbarous, and in modern warfare the principle is that war is not waged against a quiet private person, and that his property is in general safe. But the requirements of an army of occupation for food and shelter, as well as the immediate needs of war, and outrages by *tirailleurs* and by unorganized natives, who yet are sympathized with by the district, have made summary and harsh impositions in some cases seem just and necessary.

The following rules express what the regulations of war ought to be, except in circumstances of extreme necessity, or where severe punishment of towns or communes is called for by their conduct: (1) The private citizen, nowise engaged in the war, is not to be treated as an enemy, and his property is to be respected. (2) The civil government in occupied territory must go on, under control of the invading commander, at the expense of the inhabitants. For this end taxes must be raised as before. (3) Special services for the army, supplies of food, and other necessaries ought to be paid for sooner or later, and for this end receipts should be given. However, these do not necessarily involve payment by the requisitioning force, though this is sometimes given. At the end of the war their payment may be provided for either by the invading party as one of the terms of peace, or by the government of the citizen whose property is requisitioned. (4) It is an unjust rule to make war pay for war. Wrongs ought to be repaired at the making of a peace. The prevalent practice of feeding, clothing, and supplying an army through its own commissariat has lessened the necessity for requisitions, but they are still lawful. (5) For penalties on a town or district in the way of fines, or of bodily inflictions on leading citizens, or of burning, which has been threatened even in quite recent times, there is very seldom a sufficient justification. Nor do severe requisitions or wholesale punishments do any good. Napoleon in his *Memoirs* acknowledges that the excesses in the way of requisitions during the war with Spain contributed not a little to the French reverses in the Peninsula.

The following are some typical modern opinions on this important but, unhappily, somewhat indefinite subject: (1) In *The Instructions for the Armies of the United States in the Field* the rightfulness of seizing private property is limited to cases of necessity, and the spoliated owner is declared to be entitled to a receipt, that he may obtain indemnity. (See WAR.) (2) Massé concedes to an enemy the right of forcing merchants or others to supply his army with the necessary provisions, but on condition of purchasing them at a certain price determined in advance. (3) Heffter is more harsh. According to him (§ 131 of his *Völkerrecht*), the enemy can impose and exact contributions, demand products of the soil and personal services; in case of necessity or resistance can even take them by force, leaving all adjustments to the political arrangements of the future. A definite limit to the right of taking can not be laid down, for there is no measure of rights in war. (4) Bluntschli (§ 653), after speaking of what the population of an occupied province ought to be required to do for an army of occupation, adds: "All these services furnish ground, according to circumstances, for compensation. We must distinguish between services which can be demanded simply on the score of war, and obligation of the population to pay taxes—the extent of which is either defined by legislation or by practice, and in regard to which, in these particulars, much must be left to the discretion of the commander—and services which go beyond this measure, and therefore, by natural law, are to be called for only as giving a right to compensation. But," he adds, "this duty of compensation is hard to be reduced to rule, and harder still to be carried through in practice." (5) Calvo (§ 905) admits, with most authors, that an army occupying an enemy's territory may demand from the communes or from the inhabitants that which is necessary for its support and movements, but these requisitions ought to be limited to things absolutely indispensable. (6) Gen. Scott, in Mexico, refrained from requisitions, paid for provisions, and took nothing by force without indemnifying those who held the property, except on rare occasions, when it was impossible to act otherwise. (See *Calvo*, § 903.) (7) The project of an international declaration concerning the rules and usages of war, adopted at Brussels in 1874, which differs somewhat from the project submitted by Russia at the same congress, but probably not for the better in respect to requisitions, contains the following provisions: Art. 40. "As private property ought to be respected, the enemy shall not demand from communities, nor from their inhabitants, articles or services except such as relate to the necessities of war generally acknowledged, and are proportionate to the resources of the country, and which do not imply for the population the obligation to take part in the war against their country." Art. 41. "The enemy levying contributions, whether as an equivalent to imposts or to objects to be furnished in kind, or by way of fine, shall proceed therein, as far as possible, only according to the rules of assessment and the plan of imposts in use in the occupied territory. For every contribution a receipt shall be given to the person making the payment." Art. 42. "Requisitions shall be made only with the authorization of the commander of the locality occupied. For every requisition an indemnity shall be granted or a receipt delivered." A part of the Russian project which was not accepted is worthy of notice: § lii. "The enemy can demand from the local population all the imposts, services, and dues, in kind or in money, to which the armies of the legal government have a right." See Woolsey's *Introduction to International Law*, § 130.

Revised by T. S. WOOLSEY.

Resaca de la Palma, rā-saa'kăă-dā-lăă-paal'măă, sometimes called **Resaca de Guerrero**, -gwā-rā'rō: a ravine in Southern Texas, 4 miles N. of Matamoras, Mexico. After his victory at Palo Alto (May 8, 1846), Gen. Taylor, with 2,200 troops, pursued the Mexicans (4,000 to 5,000, commanded by Arista) to this place; on the 9th he attacked and completely defeated them, capturing all the artillery and trains.

H. H. S.

Rescission [from Lat. *rescis'sio*, annulment, abrogation; deriv. of *rescin'dere*, *rescissus*, to cut up, to tear up, to annul; *re-*, back, again + *scin'dere*, cut]: in law, a vacating or making void; annulment; abrogation; in the law of contracts, the annulling or vacating of a contract so that it can no longer be enforced between the parties unless it is renewed by mutual consent. A contract may be expressly rescinded; or it may be treated as rescinded where one party to it fails to perform his part of the contract, or disables himself from performing it, and the other party has not been guilty of default on his part. Where, however, the failure in performance is partial, leaving a distinct part as a subsisting and executed consideration so that the other party may recover his damages for the part not performed in an action for that purpose, a contract can not generally be rescinded; nor can it generally be rescinded by one of the parties unless both can be restored to the condition they were in before the contract was made. See the general treatises on *Contracts* of Parsons, Story, and Bishop; Benjamin's *Law of Sale of Personal Property*, etc.

F. STURGES ALLEN.

Reservoir [from Fr. *reservoir* < Late Lat. *reservato'rium*, storehouse, deriv. of *reserva're*, keep, store up; *re-*, back, up + *serva're*, keep]: in engineering, a lake or basin for holding water fitted with appliances for regulating the outflow of water at different rates from the inflow, thus enabling either a more or less regular supply to be distributed at irregular intervals of time or an irregular supply to be distributed at a uniform rate. Of the first class are what are termed *storage reservoirs*, which are generally constructed on the course of a stream by the erection of a dam, enabling the constantly flowing water to be impounded when it is in excess of the quantity needed for regular use and to be drawn off when the natural flow of the stream is less than the average demand. Enormous reservoirs of this kind were constructed in India and in Egypt at periods antedating any historical records, and many of them are still used

for their original purpose of making agriculture possible in regions where the seasons of rainfall and of the growing crops are separated by a considerable interval of time, while of many others traces alone remain. It is claimed that in Egypt the building of such reservoirs may in all probability be traced back to the days of the patriarch Joseph. In India there remain traces of the Poonairy reservoir, which by the construction of 30 miles of dams flooded 40,000 acres of land, and the Veeranum reservoir, which flooded 22,000 acres. The great Mudduk Masoor reservoir in India, constructed in the fifteenth century, was 108 feet deep, flooded 26,000 acres, and held 280,000 million gal. In the island of Ceylon there is an ancient reservoir covering an area of 10,000 acres.

No reservoirs of such magnitude as these have been constructed for several hundred years, but there are many thousand smaller ones. In Madras alone there are 50,000. In the nineteenth century the largest have been built by the British in India for storing water for irrigation, and several of considerable size have been constructed in California and New Mexico for the same purpose. A number of large reservoirs have been built in Spain, also for irrigation. In the rest of Europe and in the eastern portion of the U. S. the principal purpose for which storage reservoirs have been constructed is the supply of water to cities, and a large number of such have been built.

The question of the capacity necessary to insure the most economical results in reservoirs fed by streams which are subject to great variations of flow and the water of which is to be used for supplying the demands of a population which is constantly increasing and which at the same time is irregular in its requirements, has received careful study from civil engineers. The determination of this question involves considerations of climatic peculiarities, the relation between different topographical and geological conditions and the amount of water which a watershed will annually yield to a stream, and the rate at which at different seasons of the year a given population will consume water. The general conclusions reached by hydraulic engineers with reference to the economical dimensions of storage reservoirs for city water-supply in the temperate zone are that such reservoirs should contain a quantity of water equivalent to one-half of the total annual consumption anticipated in the city, and that the greatest efficiency can be obtained from any reservoir when its capacity is about 100 million gal. for each square mile of territory from which its supply is derived.

Among the largest storage reservoirs for water-supply to cities are the Vyrnwy for Liverpool, containing 11,900 million gal.; the Vehar for Bombay, containing 10,800 million gal.; the San Mateo for San Francisco, holding 31,000 million gal.; the Yan Yean for Melbourne, Australia, 6,400 million gal.; on the Croton river, New York, the Boyd's Corners, 2,727 million gal.; the Middle Branch, 4,004 million gal.; the East Branch, 9,028 million gal.; the Titicus, 7,000 million gal.; the Carmel, 9,000 million gal.; and the new Croton, begun in 1894, to hold 32,000 million gal. There are numerous storage reservoirs for other cities in both Europe and America holding from 500 to 1,000 million gal. See the article Reservoir Dams.

For the immediate daily demands of cities *service reservoirs* are required, and their capacity need not be much in excess of a single day's supply, their function being merely to keep the supply constant during the varying draughts at different times of day and different seasons of the year. They are generally located as near the center of distribution as practicable, and the water furnished to them by gravity from storage reservoirs or by pumping from the source of supply. Wherever possible, they are constructed on a summit by excavating sufficient material to make an embankment around the pit, and thus give the greatest capacity at the highest elevation. The largest reservoir of this type is in Central Park, New York city, and covers 96 acres and contains 1,200 million gal. A good example of a service reservoir constructed entirely above the surface of the ground with masonry walls is the Murray Hill reservoir in New York city, which is 400 feet square and holds 24 million gal. In many cases of small supply in flat regions service reservoirs are iron tanks or stand pipes from 5 to 40 feet in diameter and 50 to 250 feet in height. A fine example of such a reservoir is at Princeton, N. J., where a tank 20 feet in diameter and 60 feet high is placed on an iron trestle 60 feet high. On top of the tank is a meteorological observatory.

J. James R. Croes.

Reservoir Dams: artificial structures built across valleys through which streams flow, for the purpose of obstructing the natural flow of the water, raising its level, and thereby forming lakes or reservoirs. The simplest dam is one formed by filling a narrow gorge between high banks with loose rock and stones and gravel and then permitting the interstices to become clogged by the sediment brought down by the stream in freshets or by earth thrown in above the dam for the purpose. This method has been adopted even in works of recent construction in the western parts of the U. S., but such dams have in several instances been destroyed by freshets.

Where this crude method seems impracticable or injudicious and yet small expenditure is essential, dams are built of a cribwork of timber filled in with stones and sometimes faced with plank with close joints and frequently backed up with earth. There is a dam of this type, 1,017 feet long and 28 to 32 feet high, across the Connecticut river at South Hadley Falls, Mass. In such dams as those above named the water of freshets in the stream may be allowed to flow over the top of the dam. In cases where the water of freshets can be carried off by an independent channel, the best form of construction of a dam not exceeding 40 to 50 feet in height is usually an earth embankment, the width at the bottom being from three to four times the height of the dam. It is essential to the safety of a dam of this kind that its foundations should be made secure against the percolation of water through the bank, that the bank should be built of selected material put on in thin layers and thoroughly moistened, rammed, and rolled, and that the face of the dam on the water side should be protected with a stone paving. Owing to the difficulty of making an earthen dam under heavy pressure absolutely tight, it is customary to build in the center of the embankment a wall either of puddled clay or of masonry. The neglect of proper precautions to prevent the percolation of water through high earthen dams, either with or without masonry heart walls, has resulted in severe disasters, such as the failure of the Dale dyke at Sheffield, England, in 1864, the Mill river dam in Connecticut in 1875, the Worcester dam in Massachusetts in 1876, the South Fork dam at Johnstown, Pa., on May 21, 1889, the Pottsville dam in 1892, and the Portland, Me., reservoir dam in 1893. There are in the U. S. ten earthen dams more than 60 feet high for waterworks, two of which—the dam at Pilarcitos, Cal., 95 feet high, and that at San Andreas, Cal., 93 feet high—have no central wall either of puddle or masonry. The highest is that at Druid Lake at Baltimore, which is 119 feet high and has a puddle heart wall.

A structure of water-tight stone masonry is the type of dam which is most susceptible of being built on scientific principles, so that the minimum amount of material may be used with the maximum beneficial effect. The earliest application of masonry to the construction of large dams is believed to have been made by Spanish engineers about the middle of the fifteenth century. The dam of Almanza, 69 feet high with a thickness of 10 feet at top and 34 feet at bottom, has stood for over 300 years, and sustains a greater pressure per square foot than any other reservoir dam or than is considered prudent in construction at present. The Alicante dam, 141 feet high, is still in use, creating a reservoir for irrigation which holds 975 million gal.

In France the earliest high masonry dam was built at Lampy about 1776. Several others were constructed during the first half of the nineteenth century. All the masonry dams over 50 feet in height built prior to 1850 are believed to be as follows:

NAMES.	Date.	Height.	THICKNESS.	
			Top.	Bottom.
Almanza, Spain	1560–65	69	10	34
Alicante, Spain	1579–94	141	66	111
Elche, Spain	1590	76	30	40
Huesca, Spain	1690	66	36	53
Lampy, France	1776–82	53	16	37
Puentes, Spain*	1785–91	165	36	146
Val de Infierno, Spain	1785–91	116	41	138
Grois Bois, France	1830–38	93	21	46
Chazilly, France	1840–45	74	13	53
Nijar, Spain	1843–48	101	24	68
Zola, France	1843–50	120	19	42
Lozoya, Spain	1850	105	22	128

* Failed.

It will be observed that there is a great difference in the proportions of these dams, displaying great diversity of opinion among the engineers who designed them. It was not

until the middle of the nineteenth century that an analytical investigation of the principles which should govern the proportioning of masonry walls to resist water was attempted. In 1852 Sazilly, a French engineer, published the results of such an investigation, and formulated a type of cross-section for masonry dams. He was followed by Delocre in 1858, by Molesworth in 1873, by Bouvier in 1875, and by Prof. Rankine in 1881. The principles established by these investigators are now generally accepted, and the efforts of scientists like Krantz, Harlacher, Wegmann, and Kreuter have been devoted chiefly to simplifying the very laborious calculations required to design a perfect form of dam.

The first dam constructed on Delocre's type was at Furens, in France, in 1860–65, and is noteworthy as being the first high masonry dam built on correct scientific principles, the highest dam then constructed, and as having been in every respect successful. Since then the masonry dams built by French and Spanish engineers in Europe and also in Algeria have been designed on the same general principles. The most important of these dams are as follows:

NAMES.	Date.	Height.	THICKNESS.	
			Top.	Bottom.
Furens, France	1860–65	184	11	162
Ternay, France	1865–68	130	16	82
Tlelat, Algiers	1865–69	69	13	40
Habra, Algiers	1865–73	110	14	88
Verdon, France	1866–70	59	14	49
Ban, France	1867–70	166	16	128
Villar, Spain	1870–78	170	15	155
Pas du Riot, France	1872–78	113	13	85
Djijionia, Algiers	1873–75	83	13	53
Hijar, Spain	1875–80	141	16	147
Bouzey, France	1880–82	75	13	46
Gran Cheurfas, Algiers	1882–84	130	13	134
Pont, France	1883	86	16	63
Cotatay, France	1884–87	113	13	85
Vingeanne, France	1884–88	114	11	80
Puentes, Spain (new)	1885	160	13	125
Hamiz, Algiers	1885	135	16	91
Tache, France	1887	161	13	160
Remilly, France	1886–90	116	15	94
Chartrain, France	1888–92	200	13	162
Mouche, France	1887–91	112	12	67
San Roque, Argentine Republic.	1889	115	16	90

British and other foreign engineers were slow in adopting the French type, but since 1880 have generally followed it, with two remarkable exceptions, in building the Vyrnwy dam for the Liverpool water-supply, and the Geelong dam in Australia. The most important of these dams are as follows:

NAMES.	Date.	Height.	THICKNESS.	
			Top.	Bottom.
Cagliari, Sardinia	1866	70	16	53
Gileppe, Belgium	1870–75	156	49	216
Gorzente, Italy	1882	121	23	100
Komatau, Bohemia	1880	133	13	86
Vyrnwy, Wales	1882–89	146	20	118
Chemnitz, Germany	1890–93	92	13	66
Tytam, China	1890–93	95	23	63
Geelong, Australia	1872–75	68	3	44
Beetaloo, Australia	1890–93	118	14	115
Poona, India	1868–70	100	14	61
Bhatgur, India	.....	127	12	76
Toolsee, India	.....	79	19	51
Tansa, India	1887–92	118	12	100
Periyar, India	1890–95	173	12	139

The first high masonry dam in the U. S. was designed by Gen. George S. Greene in 1866 for a storage reservoir for the New York city water-supply at Boyd's Corners, N. Y. Except that for the upper 10 feet it was somewhat thinner, this dam approximated very closely to the type which the investigations of later years have agreed upon as the best. The design and construction of this dam were described in a paper read before the American Society of Civil Engineers in 1874. It is 78 feet high, 8·6 feet thick on top, and 53·6 feet at bottom. A masonry dam for Mt. Eden reservoir, Cincinnati, O., built 1868–74, was 118 feet high, 15 feet thick on top, and 48 feet at bottom. In 1885 it cracked from defective design.

In 1881 Benjamin S. Church, C. E., suggested the construction of a dam about 240 feet high on the Croton river for the New York water-supply. His suggestion, which was approved by other eminent civil engineers and the city authorities, aroused a discussion of the principles governing the construction of high masonry dams which extended over a period of ten years, and resulted in the adoption of plans and the beginning of the construction in 1893 of the largest masonry dam as yet designed, being 248 feet high, 16 feet thick on top, and 185 feet at bottom. The design as finally adopted by A. Fteley, the chief engineer, conforms closely to the French type. In the meantime three other dams for Croton storage reservoirs had been begun, and several dams had been built in the Western States, chiefly to create storage reservoirs for irrigation. Most of these differed materially from the standard type, and two of them, although of much less thickness than the standard type, are claimed by their designers to possess greater resisting power on account of their being curved in plan and thus acting as arches. It is still a disputed question among civil engineers whether a curved masonry dam does so act except where the gorge closed is very narrow and the radius of curvature short, as in the cases of the Zola, Geelong, and Bear Valley dams.

UNITED STATES DAMS.

NAMES.	Date.	Height.	THICKNESS.	
			Top.	Bottom.
Boyd's Corners, N. Y.	1866–70	78	8·6	53·6
Eden Park, Ohio*	1868–74	118	15	48
Sweetwater, Cal.	1887	99	12	46
Bear Valley, Cal.	1888	64	2·5	20
Butte City, Mont.	1890	120	10	83
San Mateo, Cal.	1890–94	170	20	176
Sodom, N. Y.	1888–92	95	12	53
Titicus, N. Y.	1890–94	121	18	75
Carmel, N. Y.	1891–94	87	12	54
Turlock, Cal.	1891–93	127	11	90
Folsom, Cal.	1891–93	98	24	87
Austin, Tex.*	1892–94	68	18	66
La Grange, Cal.	1893	128	11	90
New Croton, N. Y.	1893	248	16	185

* Failed.

J. James R. Croes.

Reservoir Floods: See Floods.

Reshd, also **Resht**: town of Northern Persia; capital of the province of Gilan (see map of Persia and Arabia, ref. 1–G). It is well built and contains many bazaars and caravanserais. It is the chief entrepôt for the trade in silk, large quantities of which are sent from here to Russia and Turkey. Iron goods and metal ware are imported. Its port on the Caspian Sea is Enzelli, 16 miles distant, and the communication between this place and Reshd is by boat for 12 miles and by a road passing through forest and swamp for 4 miles, once noted for its almost impassable condition, but now fairly well maintained. Pop. about 25,000.

Revised by C. C. Adams.

Reshid Pasha (*Mustapha Mehemet*): statesman; b. in Constantinople, Feb. 18, 1802. He was educated by his brother-in-law, Ali Pasha, and early entered the Ottoman civil service. Rapidly promoted, he was ambassador in Paris at the death of Mahmud II. (1839). He was at once recalled and appointed Minister of Foreign Affairs. The quadruple alliance (Austria, Great Britain, Prussia, and Russia) nullified the victories of Mehemet Ali (*q. v.*), rescued the Ottoman empire from destruction, and greatly facilitated his task. The young Sultan Abd-ul Medjid was earnestly desirous of continuing his father's reforms, and found a supple and astute assistant in the new minister. Reshid Pasha had an important share in drawing up the Hatt-i-sherif of Gulhane —a sort of constitutional charter—wherein the sultan accorded many rights and privileges to his Christian subjects, who had hitherto occupied a position of civil inferiority. He was forced to resign in 1841, was grand vizier from 1846 to 1852, and was recalled to office on the outbreak of the Crimean war (1853). During that struggle he was hardly more than the tool of Lord Stratford de Redcliffe, the British ambassador, commonly called by the Ottomans Buyuk Eltchi, the Great Ambassador, and upon the close of the war was superseded. British influence caused his restoration, but his influence entirely waned before his death, which occurred on Jan. 7, 1858. A man of literary and scientific tastes, of large views and much diplomatic ability, enjoying exceptional opportunities, he was weak, timid, and often unreliable. The apparent reforms he instituted were the work of his master and not of himself, while the commercial treaties which he concluded with Great Britain and France were an injury to his country.

E. A. Grosvenor.

Resilience [from Lat. *resili're*, spring back; *re-*, back + *sali're*, leap]: the capacity of a material to resist shocks or repeated stresses, the measure of which is one-half the product of the force by the linear elongation or compression produced, provided the material is not strained beyond the elastic limit. Thus if two bars of metal stretch 0·03 and 0·06 inches under tensile stresses of 1,000 and 2,000 lb. respectively, their relative resiliences are as 0·03 by 1,000 to 0·06 by 2,000, or as 1 to 4. The modulus of resilience is the resilience for a bar 1 inch in length and 1 sq. inch in cross-section when the stress is equal to the elastic limit of the material. Approximate average values of the modulus of resilience for timber, cast iron, and wrought iron are 3, 1, and 12 inch pounds respectively. The total work done in rupture of a beam or bar is called its ultimate resilience. See Strength of Materials. Mansfield Merriman.

Resi'na: town of Italy; province of Naples; 5 miles S. E. of the city of Naples; at the foot of Vesuvius between Portici and Torre del Greco (see map of Italy, ref. 7–F). It is built on masses of lava which cover a large part of ancient Retina and Herculaneum. The sinking of a shaft here in 1709 led to the discovery of remains of the theater of Herculaneum 90 feet below. In the vicinity are many attractive villas, the most frequented being La Favorita, the principal hall of which is inlaid with marbles from the palace of Tiberius at Capri. Pop. 13,626. E. A. Grosvenor.

Resins [viâ O. Fr. from Lat. *resi'na*, from Gr. ῥητίνη, resin, pitch]: a class of bodies that occur very widely distributed in plants mostly together with volatile oils, dissolved in which they frequently flow from trees accidentally or intentionally cut. Crude resins are never crystallized, but have the form of drops, like gum. They are generally colored yellow. Most resins consist of several simple compounds which, however, as a rule, can not be separated from one another. The number of resins is very large. They are used for preparing Varnishes (*q. v.*), sealing-wax, soap, for stiffening hat-bodies, etc. The most important are Amber, Copal, Dammar, Dragon's Blood, Mastic, Lac, Rosin (or colophony), and Sandarach (*qq. v.*). See also Gum-resins.

Ira Remsen.

Resistance of a Ship: See the Appendix.

Resolution of Forces: the mathematical separation of forces into component parts; the converse of Composition of Forces (*q. v.*).

Resolution of Rotations: See Motion.

Resor'cin [*resin* + *orcin*], or **Resorcinol**: $C_6H_4(OH)_2$, a diatomic phenol prepared on the large scale by the action of caustic soda on benzene-disulphonic acid; soluble in water, alcohol, and ether, and used for preparing fluorescein, eosin, and other phthalic acid colors. See Phthalic Acid.

Respiration [from Lat. *respira'tio*, breathing, deriv. of *respira're*, breathe, inspire and expire; *re-*, again + *spira're*, breathe]: the special function of the lungs, the process which has for its ultimate object the supplying of red blood-globules with oxygen for transmission to the various parts of the body. To accomplish this result, atmospheric air must be introduced frequently and continuously, an extensive surface of contact for air and blood must exist, and the effete products of the chemico-vital interchange must be exhaled.

The physical act of respiration or breathing embraces two parts, inspiration and expiration, and there are two distinct methods of breathing, the abdominal and the thoracic. In abdominal breathing the muscles of the abdomen by contraction force the viscera upward against the diaphragm, which becomes arched into the thoracic cavity and forces the air out of the lungs. Then the diaphragm, contracting, pushes the abdominal viscera downward, and thereby makes room for entrance of inspiratory air. In the thoracic type of breathing various external muscles elevate the ribs and sternum, and thus materially increase the chest capacity, causing inspiration. This completed, the weight of the chest walls, with the assistance of certain muscles, causes descent of the sternum and ribs, and, in conjunction with the natural contractility of the lung substance, forces the air out. The abdominal type of breathing is predominant in men, the thoracic in women.

Respiratory action of the lungs is involuntary, although it may be voluntarily modified. The *besoin de respirer*, or involuntary incentive to breathe, is the result of impressions received by the medulla oblongata from the several regions of the body, which constantly demand oxygen, and transmitted to the respiratory muscles of the thorax and abdomen. From eighteen to twenty respiratory acts take place per minute, at each of which an average of about 26 cubic inches of air is inspired and expired. This definite volume of air which ebbs and flows is termed *tidal air*. In addition, fully 100 cubic inches of air, unaffected by respiratory movement, remains in the smaller bronchi and air-sacs, and is termed *residual air*. Tidal inspiratory air is fresh and pure; it enters as far as the fourth divisions of the bronchi, and becomes a part of the relatively impure residual air. Tidal expiratory air contains carbonic-acid gas, which is exhaled and removed from the body. Each inspiratory act, therefore, adds an increment of oxygen to the bulk of air in the lungs; this oxygen, by the law of diffusion of gases, permeates the residual air and reaches the air-sacs. The air-sacs are thin-walled; indeed, their walls are essentially a network of capillary vessels held together by a film of elastic tissue. In the aggregate, the walls of the innumerable air-sacs constitute a surface of many hundred square feet, upon which the *rete mirabile* or delicate network of capillary blood-vessels is spread. The pulmonary artery brings impure or venous blood to this extensive surface, carbonic-acid gas is exchanged for oxygen, and the purified, reddened, oxygenated blood is returned by the pulmonary vein to the left side of the heart, thence to be propelled through the entire circulation. The red blood-globules are the carriers of oxygen, and the full object of the preliminary respiratory efforts and the intermediate chemico-vital interchange is really attained as these red globules yield their quota of oxygen to the cells and tissues which constitute the body. For a description of the respiratory organs see Histology; for artificial respiration see Resuscitation; and for respiration in animals see Anatomy, Comparative, and Vivisection. See also Respiratory Sounds.

Revised by W. Pepper.

Respiration (in plants): See Physiology, Vegetable.

Respirators [from Lat. **respira'tor*, one who breathes, deriv. of *respira're*, breathe]: mouth-pieces of fine gauze and cloth, to be worn by persons with diseased or weak lungs to prevent the ingress of cold and damp air or foreign matter, as smoke, dust, or the grit of stone. They are little used in the U. S., but are much employed in Great Britain, especially by grinders and stone-carvers, and wherever the air is permeated by impalpable particles.

Respiratory Sounds [*respiratory* is from Lat. *respira're*, breathe]: the sounds produced by inspiration and expiration, as heard by the method termed auscultation, the application of the ear to the chest directly, or indirectly through the medium of the stethoscope. If the entire period of a respiratory act be represented by ten, inspiration will occupy five-tenths of this period; expiration immediately follows during the succeeding four-tenths; and finally a period of silence and rest from breathing during the supplementary period of one-tenth. During the entire period of the inspiratory act the ear applied to a healthy chest detects a clear, full, breezy, or blowing sound, gentle at its commencement, full and well defined at its middle, and graduated and faint as it is terminating. The inspiratory sound is soft and low-pitched in adults; in children is ruder and exaggerated, possessing tubular or friction quality. Expiratory sound is comparatively faint, occupying but a small part of the period of the expiratory act. It also is soft and low-pitched, but more feeble and distant than inspiratory sound, since the recedence of expired air from the chest-walls conducts the sound-waves away from the ear of the listener. Expiratory sound is loudest at its commencement, just as the transition from inspiration has taken place, and gently graduates until it ceases. Inspiratory sound is the result of air-friction with the system of bronchial tubes through which it passes. Hence inspiration is a compound sound, possessing an element of laryngeal origin, elements of sound developed in the trachea, the large and small bronchial tubes, and especially where the tubes bifurcate; and finally an important element developed by the entrance of air into the numberless air-sacs or pulmonary vesicles. This vesicular element of inspiratory sound is a test of the healthy lung. Departures from the normal respiratory sounds are evidences of bronchial, pleural, or pulmonary disease. The sounds are harsh in early bronchitis, replaced or accompanied by *râle* or musical sounds in advanced bronchitis; they are masked or completely obscured by pleurisy; their inspiratory and expiratory periods have changed relations and qualities in asthma and emphysema; and in

pneumonia, tuberculosis, and other consolidations of the lung respiratory sounds are brought to the ear with increased intensity and clearness, and much raised in pitch. For detailed description of respiratory sounds in health and disease see the works of A. Flint, Sr., on the *Respiratory Organs*.

Respiratory System (in animals): See ANATOMY, COMPARATIVE.

Responden'tia [Mod. Lat., liter., conformity, deriv. of Lat. *responde're*, answer, conform]: a maritime loan made upon the hypothecation of a ship's cargo or some part thereof. It is a written contract and frequently in the form of a bond. Unless a specific lien on the goods is stipulated for, the respondentia obligation is a personal one of the borrower. Where such a lien is created it gives no claim to the lender in case the goods are lost; for it is the essence of this form of loan that the principal and interest are hazarded upon the safe arrival of the cargo. From this principle it follows that nothing can be hypothecated which is not in danger of perishing by maritime risk during the time that the loan is running. (*Brett* vs. *Van Praag*, 157 Mass. 132.) Most of the rules applicable to this form of loan are identical with those relating to loans of BOTTOMRY (*q. v.*), and need not be repeated. The master of a ship may bind her cargo by respondentia in cases of necessity, but not without communication with the cargo's owner, if communication is practicable. *Kleinwort* vs. *The Cassa*, 2 Appeal Cases 156.

FRANCIS M. BURDICK.

Responsibility: See OBLIGATION, MORAL.

Rest-cure: the term by which medical writers designate a plan of treatment first systematized by S. Weir Mitchell. It is especially useful in the treatment of the various forms of neurasthenia and hysteria. The patient is kept at rest in bed, the diet is regulated, milk generally forming the principal element, and the muscles and circulation are kept in a healthy condition by massage. W. P.

Restigouche, res-ti-goosh': a small river of New Brunswick and Quebec which falls into Chaleur Bay; celebrated for its excellent canoeing and fishing. It has five large and nearly equal tributaries. Its course is but little impeded, its current strong, full, and unflagging, and its waters very clear. The Restigouche salmon is celebrated for its size and for its fighting qualities. (See *Scribner's Magazine*, May, 1888.) The Restigouche trout is hardly inferior to the salmon in attractive fishing qualities. The best fishing-grounds are in private hands. MARK W. HARRINGTON.

Restorationists [from Lat. *restaura'tio*, restoration, deriv. of *restaura're*, set up again]: those Christians, of whatever sect, who entertain the belief that the wicked who die in an impenitent state will, after suitable punishment and repentance, be restored to divine favor, and that all the human race will at last become for ever holy and blessed. The first who taught this doctrine was Origen, and it seems to have spread widely in the East. It was, nevertheless, condemned by the Council of Constantinople, 543, and in the West it found no adherents. In the Middle Ages it was held by the Brethren of the Free Spirit, in the Reformation by the Anabaptists, in the eighteenth century by the Rationalists, and always by the Universalists.

Restraint of Trade, Contracts in: See the Appendix.

Restre'po, JOSÉ MANUEL: statesman and historian; b. at Envigado, Antioquia, New Granada, about 1780. He studied law at Bogotá, and during the war for independence took a prominent part in politics; under Bolivar he was Secretary of State, and he was personally acquainted with many distinguished men of the period. His most important work was *Historia de la Revolución de la República de Colombia* (7 vols., with 3 appendatory of documents, 1827; 3d ed., 4 vols., 1858). It is one of the most important contributions to the history of the South American war for independence, and is remarkable for its moderation and fairness. D. at Bogotá about 1860. HERBERT H. SMITH.

Resurrection [from Lat. *resurrec'tio* (deriv. of *resur'gere*, rise again, rise from the dead; *re-*, again + *sur'gere*, go up, rise), trans. of Gr. ἔγερσις, awakening, raising up, deriv. of ἐγείρειν, excite, rouse up, awaken, raise from the dead]: the future general raising of the bodies of the dead by the power of God. It is a doctrine peculiarly of revelation. Hints of it appear in the Brahmanic and Stoical theories of "returning cycles," the "great year" of Plato, and the Egyptian mysteries. It was definitely taught by the Zoroastrians. It is implied, alluded to, or foretold in the Old Testament (Job xix. 26 (?); Ps. xvi. 10; xlix. 15; lxviii. 18; Isa. xxvi. 19; lxvi. 24; Ezek. xxxvii.; Hos. xiii. 14; Dan. xii. 2). It was believed by most of the later Jews, and appears in the Apocrypha (Wisd. iii. 7; 2 Macc. vii. 9, 14, 23, 29). It was a formal doctrine of the Pharisees, but was disputed by the Sadducees. It was clearly revealed in the New Testament by Christ and the apostles, has been accepted by all parts and ages of the Church, and is a prominent doctrine of Mohammedanism.

As held now, this doctrine rests on the incontrovertible historical fact of the resurrection of Christ. He rose on the third day after his death in the body, which, though changed as to its mode of being, was the identical body which was crucified. He was seen often in different places and circumstances by many witnesses. The proofs of Christ's resurrection rest on his predictions and references to it as a miraculous attestation of his truthfulness; on the testimony and assertions of the apostles, who had been intimate with him for three years, who were at first incredulous and so cool-headed, and showed their sincerity by dying for the truth of that which they asserted; on the testimony of disciples and friends, who were persons of the highest character and piety; of soldiers, and indirectly of Jews and enemies, who tried to hush up the facts, not to deny them. They rest also on the universal belief of the early Church, the gift of the Holy Spirit according to Christ's promise, the powers given to the apostles, the institution of the Lord's Day, and the Christian religion. It is impossible that in this matter there should have been invention, mistake, collusion, self-deception, or imposture. The fact is beyond doubt. It was the fulfillment of prophecies and promises, the vindication of the past, Christ's triumph over pain and evil, the divine seal, the consummation and confirmation of Christ's work on earth, part of his exaltation, the introduction to his heavenly work and mediatorial kingdom.

The New Testament teaches that all the dead are to rise at the last day to judgment—the good to bliss, the bad to punishment. It speaks of the resurrection of the dead, or from the dead, or of the *body* (σῶμα), not of the *flesh* (σάρξ, *caro*). The creeds and symbols of the Church have generally used the grosser form, the resurrection of the *flesh*. The Gnostics and Manichæans rejected the phrase, because, like the Oriental heathen and the Platonists, whom they resembled in a measure, they despised the body, they taught a merely spiritual resurrection. Most of the Fathers held the gross view, against which the early infidel attacks were directed. Origen first reaffirmed the distinction between the resurrection of the body and the flesh, between the essence and the phenomenal form. Augustine held at first to the spiritual view, afterward to the sensuous, though not in its grosser form. The Alexandrian and Eastern schools held the spiritualizing view—the Western schools, the literal. The Reformers mainly returned toward Origen's interpretation.

The doctrine is maintained by reference to Christ's rising —to the express words of Christ and his apostles (they were false if that was not a fact). It is confirmed by the fact that in a human person there is body as well as spirit. It has been illustrated by the analogies of the renewal of life in seeds and plants, the seasons, the morning, the waxing moon, the butterfly, etc.

Opponents of the doctrine have maintained that (1) Christ's body was stolen; (2) was resuscitated from a swoon; (3) the belief arose from subjective visions, or (4) grew up as a myth, or (5) from the determination of the disciples not to be disappointed in their projects or hopes, or (6) to meet the prejudices of the Jews; or (7) it was a conscious imposture, or (8) an allegory of the soul after death, or (9) of the regeneration of society, or (10) of the rising from sin, or (11) of the rising of souls from Hades to judgment.

The resurrection of Christ is treated as the fountain, type, and power of a new life—the corner stone of the Christian system, without which everything falls. It is related closely to every doctrine, and has always been a chief point of attack. The doctrine of the resurrection meets our desires and our intense belief in our indestructible personality. It is part of the antidote of the fall, from which, under the covenant of grace, the whole of human nature is to be redeemed and united to Christ. It gives dignity to the body which was created by God, redeemed by Christ, and is the "temple" and organ of the Holy Spirit. It gives hope and comfort—relief, in part, from the terror of death. It shows the power, love, and truth of God; fulfills the promises and prophecies; confirms the inspiration of the Scriptures; assures us of immortality; shows that the soul and body,

united in sin and redemption, will be united in judgment and glory or shame. It confirms the divinity of Christ and his atonement, and is intimately related to justification, faith, repentance, sanctification, and the whole Christian system. It is the foundation of the Christian week and year.

The resurrection implies the continued identity of the body —that the future body is in essence identical with the present body, one being the veiled germ, the other the glorious development. Concerning identity, it has been taught that (1) all the particles of matter that have ever been in the body are brought together again; (2) only the particles present at death; (3) certain more enduring parts are preserved, as an indestructible corporeal germ from which is made by divine power an organ of the soul adapted to its higher condition; (4) some of the particles remain, however few; (5) there is a "vital germ"; (6) a spiritual, "ethereal, luminous" body is evolved at the moment of death; (7) that the plastic formative principle of life (*anima, psyche*) is continually gathering and casting off the matter it needs for a body wherever it may be. The continuance of the vital principle constitutes identity, however the particles of matter may change, as in a flowing stream. In the case of Christ and those alive at his coming, the body then present supplies the material; in the case of the dead, the anima or psyche gathers in matter as it needs and makes the psychical body. The fundamental "form" or principle of bodily organism, which here appropriates earthly materials, shall in the resurrection appropriate higher materials: (8) That identity is in the spirit (*νοῦς*), the rational, immortal principle which shows itself in the body which it occupies and stamps with its own personality. Identity in an inorganic body—e. g. a stone—is in its substance and form; in an organic body, in the whole organism; in a person it rests in the consciousness.

The resurrection body is (1) spiritual (*soma pneumatikon*), as opposed to the "natural" (*soma psychikon*); (2) like Christ's body; (3) glorious, powerful, incorruptible, immortal.

The doctrine, held by some, of two resurrections at different times—one of the righteous, to which the New Testament specially refers, and the other of the wicked—rests on (1) the declaration, Rev. xx. 5, 6; (2) the use of the phrase "resurrection *from* the dead," used fifty times, and always referring to the good; the phrase "*of* the dead," referring to the bad; (3) on the New Testament distinctions concerning the resurrection of the just and unjust, the resurrection to life or condemnation; (4) the longing of the apostle to attain the first; and (5) on the order given, 1 Cor. xv. 23.

Revised by F. H. Foster.

Resurrection Plant: a popular name of several plants which, after drying, on the application of moisture expand again. One of these is the Rose of Jericho (see Jericho, Rose of) of the east Mediterranean region. Another common one is *Selaginella lepidophylla*, a Lycopod of the family *Selaginellaceæ*, a native of Mexico and Central America. It is a vivid green, rosulate, branching plant, covering a space on the ground from 5 to 8 inches in diameter. When dry it rolls up into a dull-grayish ball, but upon the return of moisture it expands again into a beautiful green rosette. These plants are imported into the U. S. in considerable numbers, and sold as curiosities. Charles E. Bessey.

Resuscitation, or **Artificial Respiration** [*resuscitation* is from Lat. *resuscita'tio*, deriv. of *resuscita're*, stir, rouse up again; *re-*, again + *subs*, from under, up + *cita're*, urge, excite, rouse]: motion of the ribs and exchange of air produced by external instead of internal and vital force. The natural exchange of air in respiration is effected by a mechanical process; and when the muscles which conduct it are deprived of their nervous stimulus by poisoning of the nerve-centers, that mechanical process can be kept going or be recommenced by mechanical means, and thus life be rekindled from apparent death. By compression of the ribs the chest-cavities are diminished, and a proportionate quantity of foul air is forced out by the mouth. On relinquishing that compression, the ribs by their own elasticity bound back to their former position, the chest-cavities are enlarged, and the air (if that be the surrounding medium) is sucked in to prevent a vacuum. Whatever the method, it is upon this principle alone, with the observance of proper alternation and rhythm, that such an exchange of air can be effected as to be a substitute for natural breathing. Its use is in suspended animation from suffocation, as in drowning and hanging, also from vapor of chloroform or other noxious gases, in which, death occurring from exclusion of air, a supply of air to the lungs is the one remedy.

The following is known as the "direct method" for artificial respiration:

Rule 1. To drain off Water from Chest and Stomach (in cases of Drowning).—Instantly strip the patient to the waist. Place him face downward, the pit of the stomach being raised above the level of the mouth by a large, hard roll of clothing placed transversely beneath the body. Throw your weight forcibly two or three times, for a moment or two, upon the patient's back, over the roll of clothing, so as to press all fluids in the stomach out of the mouth.

Rule 2. To perform Artificial Breathing.—Quickly turn the patient upon his back, the roll of clothing being so placed beneath as to make the breast-bone the highest point of the body. Kneel beside or astride patient's hips. Grasp front part of the chest on either side of the pit of the stomach, resting your fingers along the spaces between the short ribs. Brace your elbows against your sides, and, steadily grasping and pressing forward and upward, throw your whole weight upon the chest, gradually increasing the pressure while you can count *one—two—three.* Then suddenly let go with a final push, which springs you back to your first position. Rest erect upon your knee while you can count *one—two*; then make pressure again as before, repeating the entire motions at first about four or five times a minute, gradually increasing to about ten or twelve times. Use the same regularity as in blowing bellows and as is seen in natural breathing, which you are imitating. If another person be present, let him with one hand, by means of a dry piece of linen, hold the tip of the tongue out of one corner of the mouth, and with the other hand grasp both wrists and pin them to the ground above the patient's head.

Sylvester's method is the most generally applicable. The body being placed upon the back, with the head slightly elevated, the flexed arms, grasped just above the elbows, are carried outward and upward from the chest almost perpendicularly, and retained in their position for about two seconds. They are then lowered and brought closely to the sides of the chest, against which they are firmly pressed for the same length of time, in order to expel the air as during the act of expiration. These alternate movements of elevation and depression are repeated from twelve to fourteen times a minute, and are performed with all possible gentleness. *Fell's method* of direct artificial respiration is applicable especially to opium-poisoning or other forms of narcosis. A tube is inserted into the larynx and trachea and warmed air forced in by a bellows. By this method persons apparently dead have been resuscitated. Mouth-to-mouth insufflation, in children especially, is easily practicable and very useful.

The length of time persons have been under water, or have remained apparently dead after leaving the water, and yet been resuscitated, is uncertain. The reported time is so remarkably long in some cases as to justify efforts for resuscitation for at least an hour, the patient having breathed within half an hour or perhaps an hour. In experiments by a committee of the Royal Medico-Chirurgical Society of London in 1862, dogs after complete submersion a minute and a half never recovered. After respiratory acts had ceased, the heart continued to act never more than four minutes. In the human subject these periods doubtless may be much longer, governed largely by the continuousness of submersion, the rate of the circulation at the last moment of consciousness, the temperature of the water, the amount of it which enters the lungs, etc. Revised by W. Pepper.

Retaining Wall: a wall of stone built to sustain banks of earth in position. The lateral pressure of the earth depends upon its nature and upon the inclination of the wall. (See Earthwork.) The thickness of the wall at the top will be usually 2 feet or more, and its thickness at the base is to be so determined that ample security against sliding, rotating, and crushing will be secured. The last of these is liable to occur only in very high walls, and the first can be always avoided by inclining the joints backward. The use of formulas for computing the thickness is hence mainly confined to the case of rotation for ordinary walls, and these are deduced so that under the most unfavorable circumstances the line of direction of the resultant of the earth pressure and the weight of the wall shall cut the base within its middle third. The cross-section of the wall is usually trapezoidal, but walls with curved front surfaces are occasionally built. If the back of a trapezoidal wall be vert-

ical, and P be the horizontal pressure of the earth behind it, for a length of a foot, a be the top thickness in feet, and v the weight of a cubic foot of the masonry, then the formula

$$b = -\frac{a}{2} + \sqrt{\frac{2P}{v} + \frac{5a^2}{4}}$$

gives the proper base thickness for security against rotation. Retaining walls should be furnished with holes to permit drainage, and the top of the back should be arranged so that the frost may not exert a heavy lateral thrust. See Howe's *Retaining Walls for Earth* (1886), and Merriman's *Retaining Walls and Masonry Dams* (1892).

MANSFIELD MERRIMAN.

Retaliation: See INTERNATIONAL LAW (*International Relations as Affected by War*).

Rete Mirabile: See CIRCULATION OF THE BLOOD.

Ret'ene [from Gr. *ῥητίνη*, pine resin]: a hydrocarbon (formula $C_{18}H_{18}$) polymeric with benzene (C_6H_6), discovered in 1837 by Fikentscher and Trommsdorff. It occurs in fossil pine-stems, in peat and lignite, and associated with fichtelite. It is found among the products of the destructive distillation of very resinous pine and fir wood, and is produced with other bodies when acetylene or the product of the distillation of rosin (colophony) is passed through a red-hot tube. It is extracted from fossil wood or lignite by means of alcohol, and is purified by solution in bisulphide of carbon, then in benzene, and in combination with picric acid. The picrate is recrystallized, decomposed with ammonia, and the retene recrystallized from alcohol. It may also be obtained from the semisolid products of the latter part of the distillation of pine-tar. Retene appears in soft, shining, nacreous laminæ, inodorous and tasteless. It melts at 98° to 99° C. It evaporates at ordinary temperatures, and when melted gives off white fumes which condense to a woolly sublimate. It boils at about the boiling-point of mercury, and distills almost unchanged. It is insoluble in water, slowly soluble in cold, readily in boiling alcohol, easily in warm ether, in fixed and volatile oils, in benzene, and in bisulphide of carbon.

Revised by IRA REMSEN.

Retention of Urine [*retention* is from Lat. *reten'tio*, deriv. of *retine're*, *reten'tum*, hold back; *re-*, back + *tene're*, hold]: a condition in which the urine can not be evacuated from the bladder at all, or only with great difficulty, the former being known as complete, the latter as incomplete, retention. It should not be confounded with *suppression*, in which the urine has not been excreted by the kidneys, and consequently the bladder is empty. The symptoms consist of a great and urgent desire to pass water, and partial or complete inability to do so; this is accompanied by repeated straining efforts and violent pain, and extreme distress and restlessness; the countenance assumes an anxious expression, the pulse is quick, and the skin dry. The bladder is more or less distended according to the protraction of the trouble, and its position may be ascertained by percussion above the pubes. If this condition is not speedly relieved, it results in rupture of some portion of the urinary tract and extravasation of the contents of the bladder into the surrounding parts. Here the urine acts as a foreign body, and, by virtue of the bacteria which it contains, causes an inflammation which soon terminates fatally.

The causes may be classified as those due to (1) mechanical obstruction; (2) paralysis of the bladder, partial or complete; (3) hysteria; (4) miasm. The agents mechanically obstructing the flow of urine are numerous. Organic stricture of the urethra is a very common one, but it causes complete retention only when, after exposure of some kind or over-indulgence in spirituous liquors or sexual excitement, there is congestion or spasm added to it, and the urethral canal thus made impervious. The attempt should here be made to use a small catheter, but if this can not be done, the warm bath, local abstraction of blood, and the administration of ether or chloroform should be superadded. Should these means fail, the only resource left is to "tap" the bladder, either through the rectum or above the pubes. This is done by means of the aspirator. The relief, however, is only temporary; the stricture still remains, and some operation must be resorted to for its relief. Spasmodic contraction of the muscle surrounding the neck of the bladder or the muscular coat of the urethra sometimes exists as a cause of retention: when such is the case, the warm bath, purgatives, opium, and chloroform are the remedial agents. Inflammation along the urethral canal (gonorrhœa) often has retention of urine as a complication. Here it is caused by an intensely congested and swollen mucous membrane, and the same treatment as for muscular spasm may be adopted. Among the other mechanical causes the most important are (*a*) a small calculus impacted in the urethra; (*b*) small tumor in the urethra; (*c*) clotted blood in the urethra or bladder; (*d*) foreign bodies, as pieces of bougies, catheters, etc., in the urethra; (*e*) tumors of any kind, external to the urethra, which press upon it; (*f*) the results of falls upon the perineum or blows in that location, by which the urethra is ruptured. These causes operate quite frequently, and embrace all cases of retention due to chronic enlargement of the prostate, inflammation or acute congestion of the prostate, abscesses in the perineum, pressure of a loaded rectum, a displaced uterus, the head of the child during labor, or a pelvic tumor of any kind upon the neck of the bladder. The treatment should always be directed to the removal of the cause, and where this requires any great amount of time, the catheter and aspirator are palliative means. Paralysis of the bladder, causing retention, may be due to voluntary retention repeated and long kept up, apoplexy, injury to the spine, acute overdistention of the organ, shocks to the system from capital operations, and in certain high fevers, as typhoid, typhus, etc. The treatment in all these cases should be by the catheter. Hysterical retention is a disease of the mind, and depends wholly upon the volition of the patient. (See HYSTERIA.) Gross mentions a form of retention which is periodical in its nature, and which he ascribes to malarial influences, and accordingly adopts the treatment of miasmatic diseases, as quinine, etc.

Revised by ROSWELL PARK.

Rethel, rā'tel, ALFRED: painter; b. at Aix-la-Chapelle, Germany, May 15, 1816; studied at Düsseldorf under Schadow, and at Frankfort under Veitt; visited Italy in 1844–45; painted after his return four great frescoes representing incidents in the history of Charlemagne in the city hall of his native city, and produced several grand and very interesting designs—*Hannibal crossing the Alps*, *Dance of Death*, etc.—but became insane in 1852. D. at Düsseldorf, Dec. 1, 1859.

Reticula'ria [Mod. Lat., dimin. derived from Lat. *rete*, a net]: a name used for the FORAMINIFERA (*q. v.*), in allusion to the network formed by the protoplasmic processes (*pseudopodia*) sent out by the body.

Retina: See EYE and HISTOLOGY (*Organs of Special Sense*).

Retrogradation [from Lat. *retrograda'tio*, a going backward, deriv. of *retrograda're*, go backward, retrograde, deriv. of *retrogra'dus*, going backward, deriv. of *retrogradi*; *retro-*, back + *gra'di*, step, go]: in astronomy, an apparent or real motion of a celestial object from E. to W., or contrary to the order of the signs in the heavens. Motion from W. to E. is called direct. The motion of all the primary planets of the solar system is direct, but that of some of the comets is retrograde. The planets, however, seem at times to have a retrograde motion, which is because their velocities in their orbits differ from that of the earth. The inferior planets move more rapidly than the earth, and the superior less rapidly. It happens, therefore, that the inferior planets have a motion apparently retrograde near the times of their inferior conjunctions. The apparent motion of the superior planets is retrograde for some time before and some time after their oppositions. Between the periods of direct and retrograde motion there are times when to the naked eye these bodies are apparently stationary. The mean periods of retrogradation are—for Mercury, 22 days; for Venus, 42; for Mars, 73; for Jupiter, 120; for Saturn, 140; for Uranus, 152; for Neptune, 158½.

Revised by S. NEWCOMB.

Retrospective Laws: See LAW.

Retting: See FLAX.

Returned-letter Office: See DEAD-LETTER OFFICE.

Retz, GILLES DE LAVAL, de, generally called **Marshal Retz**: b. at Machecoul, department of Loire-Inférieure, France, in 1404; distinguished himself in the wars of Charles VII.; fought at the side of the Maid of Orleans; was made a marshal of France, but retired subsequently from public life to his castle of Retz. Implicated in a process with the Duke of Bretagne, the proceedings disclosed the most hideous crimes committed by him. During fourteen years he had enticed over one hundred children into his castle and sacrificed them to his lust and superstition, being a worshiper of Satan and addicted to magic. He was strangled and burned Oct. 25, 1440. See BLUEBEARD.

Retz, Jean François Paul de Gondi, Cardinal de: b. at Montmirail-en-Brie, France, Oct., 1614. His family held high ecclesiastical dignities, and forced him against his will into the Church. He led, nevertheless, an irregular life, and devoted himself to the service of a restless political ambition. He was active in intrigues against Richelieu, after whose death he was, in 1643, appointed by the queen-regent coadjutor to his uncle, the Archbishop of Paris. The power he acquired as a pulpit orator he turned to political ends and tried to supplant Mazarin, taking advantage of the troubles of the Fronde. He acquired a cardinal's hat in 1651 by his intrigues, but was outgeneraled by Mazarin, arrested in 1652, and imprisoned, first at Vincennes, then at Nantes. While in prison he became Archbishop of Paris. He escaped, fled to Spain, and remained a fugitive there and in Italy and Holland till after Mazarin's death, when, in 1662, he made his peace with Louis XIV., exchanged his archbishopric for the abbacy of St. Denis, in Paris, and spent the rest of his life in dignified and sumptuous quiet, employed in some delicate diplomatic missions to Rome, in writing his *Mémoires*, and in paying his debts. D. in Paris, Aug. 24, 1679. His *Mémoires* cover the years 1643–55, are very frank, not always truthful, but brilliantly written. They were first published in 1717; the best recent edition is that in the series of *Grands Écrivains de la France* (first 9 vols., Paris, 1872–87). A. G. Canfield.

Retzius, Magnus Gustaf: histologist; b. in Stockholm, Sweden, Oct. 27, 1842; widely known and quoted as an authority in anthropology. His work *Finska Kranier* (Finnish Skulls), published in 1878, is standard. In 1884 he compiled his German work *Das Gehörorgan der Wirbelthiere*. Since 1872 he has edited the volumes of *Ur vår tids Forskning*, and in 1881–82 he edited *Biologische Untersuchungen*, mainly written by himself. R. B. A.

Reuchlin, roich-leen' (Hellenized Capnio), Johann: classical and Hebrew scholar and humanist; b. at Pforzheim, Baden, Germany, Feb. 22, 1455. He was educated in the chapel of the Margrave of Baden, and followed in 1473 the young margrave to the University of Paris, where he began his studies in Greek. During two years' residence at Basel he wrote his Latin dictionary, *Vocabularius breviloquus sive Dictionarium, singulas Voces Latinas breviter explicans*; and during a second visit to France in 1478 he studied law at Orleans. In 1481 he lectured on jurisprudence and belles-lettres at the University of Tübingen, received the title of imperial counsellor from the emperor, and lived subsequently for several years at the court of the elector palatine, Philip, at Heidelberg (1492–96). To this period belong his first studies of the Hebrew language and his comedy, *Sergius, sive Capitis Caput*, whose satire against the clergy was heartily enjoyed. In 1498 he went to Rome, his patron, the elector palatine, having fallen under the papal ban, and he succeeded in procuring his absolution. After his return he was appointed president of the Suabian confederate tribunal, but he found time to continue his studies of Hebrew, the results of which were his *Rudimenta Hebraica* (1506), *De Arte Cabbalistica Libri III.*, and *De Accentibus et Orthographia Hebræorum Libri III.* (1518). By these works he inaugurated the study of the Hebrew language in Western Europe. He exercised a similar stimulating influence by his handbooks, editions (e. g. Xenophon's *Agesilaus, Hiero*, and the two speeches of Æschines and Demosthenes on *The Crown*), and personal exertions in the study in Germany of Latin and Greek. The pronunciation of the Greek language known as Iotacism originated with him. He was too liberal to escape clashing against the prejudices of his age. A converted Jew, Johann Pfefferkorn, proposed in 1510 that all Hebrew books, with the exception of the Bible, should be burned. The Dominicans were in raptures over the proposition; the Inquisition immediately recognized it as a new weapon of persecution; the emperor acquiesced. Meanwhile Reuchlin remonstrated, the emperor withdrew his consent, and the Inquisition and the monks flew into a fury. Reuchlin published his *Speculum Oculare* (*Augenspiegel*) (1512) and *Defensio contra Calumniatores* (1513), while Ulrich von Hutten and Franz von Sickingen kept guard over his personal safety. In 1515 appeared the first part of the *Epistolæ Obscurorum Virorum*, most of which were written by a friend of Reuchlin, Crotus Rubianus, others by Ulrich von Hutten. The success of this famous satire was instantaneous, and did not a little in paving the way for the Reformation. With Luther himself Reuchlin felt a deep sympathy, but he declined an invitation to come to Wittenberg, sending in his stead his nephew Melanchthon, and maintained his connection with the Roman Catholic Church to the last. In 1520 he was appointed professor at Ingolstadt, but when the plague broke out in that city he determined to retire to Tübingen, but died at Liebenzell, June 30, 1522. His *Life* was written by Gehres (1815), Meyerhoff (1830), Geiger (1871), and Horawitz (1877). Geiger also edited his *Letters* (1876). Revised by A. Gudeman.

Réunion, rā'ü'ni-ōn', called **Bourbon** prior to 1848; also **Île Bonaparte**: an island and French colony in the Indian Ocean; belonging to the Mascarene group; about 100 miles S. W. of Mauritius; lat. 20° 51′ 43″ S., lon. 55° 30′ 16″ E. It is 38 miles long, 28 miles wide; area, 965 sq. miles. It is volcanic, and is traversed by a mountain-chain the direction of which is N. and S. This mountain-range, of which one peak rises 10,000 feet above the sea, divides the island into two portions, differing in climate and productions. The Piton de la Fournaise, 7,200 feet high, is an active volcano, the eruptions of which occur on an average at least twice a year. The soil in some parts is very fertile, and the scenery is generally extremely beautiful. The climate was formerly healthful, but Europeans now suffer much from typhoid fever and dysentery. The mean annual temperature is about 77° F. The island is often visited by terrific hurricanes, which demolish houses and tear up trees by the roots. The chief articles of export are sugar, coffee, and dyewoods. Maize, rice, and tobacco are also cultivated. Réunion has no good harbors, and the coast is consequently dangerous. Capital, St. Denis. The chief port is Pointe-de-Galets, from which extends a railway 78 miles long. This island was discovered in 1545 by the Portuguese, and was occupied by the French in 1649. Pop. (1893) 171,713, of whom 23,161 are Hindus. Revised by M. W. Harrington.

Reuss, rois: the name of two small principalities of Germany belonging to an elder and younger line of the family of Reuss, and consisting of several separate territories situated between Prussia, Saxony, and Bavaria. The dominion of the elder line, Reuss-Greiz, has an area of 122 sq. miles. Pop. (1900) 68,287. Capital, Greiz. That of the younger line, Reuss-Schleiz Gera, has an area of 319 sq. miles. Pop. (1900) 138,993. Capital, Schleiz. The surface of both principalities is hilly, reaching over 2,000 feet high in the Thüringer Wald. More than a third is covered with forests, and there are extensive meadows on which cattle are fattened. Woolen, cotton, and silk goods are woven.

Reuss: a river of Switzerland. It rises in the canton of Uri, near St. Gothard, descends in its upper course 4,500 feet in a series of wild cataracts and magnificent cascades, enters the southern end of Lake Lucerne, issues from the northern end as a clear, deep-green, navigable stream, and joins the Aar in the canton of Aargau at Windisch after a course of about 100 miles.

Reuss, Édouard Guillaume Eugène, D. D.: theologian; b. at Strassburg (then a part of France), July 18, 1804; educated at the seminary of his native city; studied theology at Göttingen under Eichhorn, Oriental philology at Halle under Gesenius, and pursued the latter branch at Paris under Silvestre de Sacy; taught biblical criticism and Oriental languages in the theological school of Strassburg 1829–34; became extraordinary professor there 1834, and ordinary (regular) professor 1836; retired on a pension 1888; declined a call to the University of Jena; published (in German) a *History of the Books of the New Testament* (Halle, 1842; 6th ed. Brunswick, 1887; Eng. trans. from 5th ed. 1874, by E. L. Houghton, 2 vols., Boston, 1884), and *Geschichte der heiligen Schriften Alten Testaments* (1881; 2d ed. 1890); *Histoire de la Théologie chrétienne au siècle apostolique* (2 vols., Strassburg, 1852; 3d ed. 1864; Eng. trans. Edinburgh, 1872); *Histoire du Canon des Saintes Écritures dans l'Église chrétienne* (1863; Eng. trans. Edinburgh, 1884); and prepared an annotated French translation of the entire Bible (19 vols., Paris, 1874–81), and the same in German (Brunswick, 1892, *seq.*). He edited for many years a German review which appears at Jena (*Beiträge*, etc.), contributed largely to Colani's *Revue de Théologie*, and was one of the most learned and liberal theologians of the French Protestant Church. With Baum and Cunitz, and after their death alone, he edited the monumental edition of Calvin's *Opera*, not yet finished (vol. l., 1894). D. in Strassburg, Apr. 15, 1891. Revised by S. M. Jackson.

Reuter, roi'ter, Paul Julius, Baron: promoter of the telegraphic system on the continent of Europe; b. at Cassel,

Germany, July 21, 1821; became identified with the telegraph system at its first establishment; organized the first news agency in Aix-la-Chapelle 1849; transferred his office to London 1851, and instituted and completed the system until it finally included all parts of the world. He obtained a concession for the submarine telegraph line between England and Germany 1865; obtained a concession from the French Government for the construction of a cable between France and the U. S., which was completed in 1869; was granted in 1872 the exclusive privilege of constructing railways, working mines and forests, and making use of all the natural resources of Persia. This concession was annulled in 1889, and in lieu of it Baron Reuter received the concession of the Imperial Bank of Persia. C. H. THURBER.

Reutlingen, roit'ling-*en*: town of Würtemberg, Germany; on the Echatz, a tributary of the Neckar; 20 miles S. of Stuttgart (see map of German Empire, ref. 7–E). It is old, but well built and picturesque. The Gothic church of St. Mary (1247–1343) has a tower 243 feet high. The town lies in a fertile district rich in corn, wine, and fruit, and carries on a lively trade and extensive manufactures of woolen and linen fabrics, hosiery, leather, and cutlery. Pop. (1895) 19,822.

Rev'al, or **Revel**: capital of the government of Esthonia, European Russia; on the southern side of the Gulf of Finland; 232 miles by rail W. S. W. of St. Petersburg (see map of Russia, ref. 5–C). The upper or old town contains the cathedral, the castle, and the houses of the German nobility. The lower or new town extends outside the walls. Reval is an important port, exporting grain, spirits, flax, etc., to the value of about $13,000,000 annually; imports of cotton, coal, etc., about $32,000,000. Reval was founded by Waldemar II. of Denmark in 1219; became a flourishing Hanse town; was held by the Livonian knights from 1346 to 1561; then belonged to Sweden, and was finally annexed to Russia in 1710. Pop. (1897) 64,578.

Revelation [from Lat. *revela'tio*, an unveiling, revealing, deriv. of *revela're*, unveil; *re-*, back + *vela're*, to veil, deriv. of *ve'lum*, a veil]: in its active meaning, the act of God by which he communicates to man the truth concerning himself —his nature, works, will, or purposes; in the passive meaning, the knowledge resultant upon such activity of God. The term is commonly employed in two senses: a wider—general revelation; and a narrower—special revelation. In its wider sense it includes all modes in which God makes himself known to men; or, passively, all knowledge concerning God however attained, inasmuch as it is conceived that all such knowledge is, in one way or another, wrought by him. In its narrower sense it is confined to the communication of knowledge in a supernatural as distinguished from a natural mode; or, passively, to the knowledge of God which has been supernaturally made known to men. The reality of general revelation is disputed by none but the anti-theist and agnostic, of whom one denies the existence of a God to make himself known, and the other doubts the capacity of the human intellect, if there be a God, to read the vestiges he has left of himself in his handiwork. Most types of modern theology explicitly allow that all knowledge of God rests on revelation; that God can be known only because and so far as he reveals himself. In this the extremest "liberals," such as Biedermann, Lipsius, and Pfleiderer, agree with the extremest "conservatives." Revelation is everywhere represented as the implication of theism, and as necessary to the very being of religion: "The man who does not believe that God can speak to him will not speak to God" (*A. M. Fairbairn*). It is only with reference to the reality of special revelation that debate concerning revelation continues; and it is this that Christian apologetics needs to validate. Here, too, the controversy is ultimately with antitheistic presuppositions, with the postulates of an extreme deism or of an essential pantheism; but it is proximately with all those types of thought which seek to mediate between deistic or pantheizing conceptions and those of a truly Christian theism.

In the eighteenth century the debate was chiefly with deism in its one-sided emphasis upon the divine transcendence, and with the several compromising schemes which grew up in the course of the conflict, such as pure rationalism and dogmatistic rationalism. The deist denied the reality of all special revelation, on the grounds that it was not necessary for man and was either metaphysically impossible or morally unworthy of God. Convinced of the reality of special revelation, the rationalist still denied its necessity, while the dogmatist, admitting also its necessity, denied that it constituted the authoritative ground of the acceptance of truth. Kant's criticism struck a twofold blow at rationalism. On the negative side his treatment of the theistic proofs discredited the basis of natural (general) revelation, in which the rationalist placed his whole confidence. Thus the way was prepared for philosophical agnosticism and for that Christian agnosticism which is exemplified in the school of Ritschl. On the positive side he prepared the way for the idealistic philosophy, whose fundamentally pantheistic presuppositions introduced a radical change in the form of the controversy concerning the reality of a special revelation without in any way altering its essence. Instead of denying the supernatural with the deists, this new mode of thought formally denied the natural. All thought was conceived as the immanent work of God. This change of position antiquated the forms of statement and argument which had been wrought out against the deists; but the question at issue still remained the same—whether there is any special revelation of God possible, actual, extant, whether man has received any other knowledge of God than what is excogitable by the normal action of his own unaided faculties. Men's ontology of the human faculties and activities was changed; it was now affirmed that all that they excogitated was of God, and the natural was accordingly labeled supernatural. But a special supernatural interposition for a new gift of knowledge continued to be denied as strenuously as before. Thus it has come about that, in the nineteenth century, the controversy as to special revelation is no longer chiefly with the one-sided emphasis upon the transcendence of God of the deist, but with the equally one-sided emphasis upon the immanence of God of the pantheist, and with the various compromising schemes which have grown up in the course of the conflict, through efforts to mediate between pantheism and a truly Christian theism. It is no longer necessary to prove that God may and does speak in the souls of men; it is admitted on all hands that he reveals himself unceasingly through all the activities of creaturely minds. The task has come to be to distinguish between God's general and God's special revelations, to prove the possibility and actuality of the latter alongside of the former, and to vindicate for it a supernaturalness of a more immediate order than that which is freely attributed to all the thought of man concerning divine things.

In order to defend the idea of distinctively supernatural revelation against this insidious undermining, it has become necessary, in defining it in its highest and strictest sense, to emphasize the supernatural in the mode of knowledge and not merely in its source. When stress is laid upon the source only without taking into account the mode of knowledge, the way lies open to those who postulate immanent deity in all human thought to confound the categories of reason and revelation, and so practically to do away with the latter altogether. Even when the data on which our faculties work belong to a distinctively supernatural order, yet so long as the mode of acquisition of knowledge from them is conceived as purely human, the resultant knowledge remains natural knowledge; and, since intuition is a purely human mode of knowledge, so-called intuitions of divine truth would form no exception to this classification. Only such knowledge as is immediately communicated by God is, in the highest and strictest sense, supernaturally revealed. The differentia of revelation in its narrowest and strictest sense, therefore, is not merely that the knowledge so designated has God for its source, nor merely that it becomes the property of men by a supernatural agency, but further that it does not emerge into human consciousness as an acquisition of the human faculties, pure and simple.

Such a conception may give us a narrower category than that usually called special revelation. In contending for its reality it is by no means denied that there are other revelations of God which may deserve the name of special or supernatural in a distinctive sense. It is only affirmed that among the other modes in which God has revealed himself there exists also this mode of revelation, viz., a direct and immediate communication of truth, not only from God but by God, to minds which occupy relatively to the attainment of this truth a passive or receptive attitude, so that the mode of its acquisition is as supernatural as its source. In the knowledge of God which is acquired by man in the normal use of his own faculties—naturally, therefore, as to mode—some deserves the name of special and supernatural above the rest, because the data upon which the human faculties work in acquiring it belong to a supernatural order. Such knowledge forms an intermediate class between that obtained by the facul-

ties working upon natural data and that obtained in a supernatural mode as well as from a supernatural source. Again, in the knowledge of God, communicated by the objective activities of his Spirit upon the minds of special organs of revelation—supernaturally, thus, as to immediate origin as well as to ultimate source—some may emerge into consciousness along the lines of the ordinary action of the human faculties. Such knowledge would form a still higher intermediate class—between that obtained by the natural faculties working according to their native powers on supernatural data and that obtained in a purely supernatural mode, as well as from a supernatural source and by a supernatural agency. These modes of revelation are not to be overlooked. But neither is it to be overlooked that among the ways in which God has revealed himself is also this way —that he has spoken to man as Spirit to spirit, mouth to mouth, and has made himself and his gracious purposes known to him in an immediate and direct word of God, which is simply received and not in any sense attained by man. In these revelations we reach the culminating category of special revelation, in which its peculiar character is most clearly seen. And it is these direct revelations which modern thought finds most difficult to allow to be real, and which Christian apologists must especially vindicate.

Theories of Revelation.—In the state of the case which has just been pointed out, it is a matter of course that recent theories of revelation should very frequently leave no or but little place for the highest form of revelation, that by the direct word of God. The lowest class of theories represent revelation as taking place only through the purely natural activities of the human mind, and deny the reality of any special action of the Divine Spirit directly on the mind in the communication of revealed truth. Those who share this general position may differ very greatly in their presuppositions. They may, from a fundamentally deistic standpoint, jealously guard the processes of human thought from all intrusion on the part of God; or they may, from a fundamentally pantheistic standpoint, look upon all human thought as only the unfolding of the divine thought. They may differ also very greatly as to the nature and source of the objective data on which the mind is supposed to work in obtaining its knowledge of God. But they are at one in conceiving that which from the divine side is spoken of as revelation, as on the human side, simply the natural development of the moral and religious consciousness. The extreme deistic theory allows the possibility of no knowledge of God except what is obtained by the human mind working upon the data supplied by creation to the exclusion of providential government. Modern speculative theists correct the deistic conception by postulating an immanent divine activity, both in external providence and in mental action. The data on which the mind works are supplied, according to them, not only by creation, but also by God's moral government; and the theory grades upward in proportion as something like a special providence is admitted in the peculiar function ascribed to Israel in developing the idea of God, and the significance of Jesus Christ as the embodiment of the perfect relation between God and man is recognized. (Biedermann, *Christl. Dogmatik*, i., 264; Lipsius, *Dogmatik*, 41; Pfleiderer, *Religionsphilosophie*, iv., 46.) The school of Ritschl, though they speak of a "positive revelation" in Jesus Christ, make no real advance upon this. Denying not only all mystical connection of the soul with God, but also all rational knowledge of divine things, they confine the data of revelation to the historical manifestation of Christ, which makes an impression on the minds of men such as justifies us in speaking of him as revealing God to us. (Herrmann, *Der Begriff der Offenbarung*, and *Der Verkehr des Christen mit Gott*; Kaftan, *Das Wesen*, etc.)

We are on higher ground, however, although still moving in essentially the same circle of conceptions as to the nature of revelation, when we rise to the theory which identifies revelation strictly with the series of redemptive acts (Koehler, *Stud. und Kritiken*, 1852, p. 875). From this point of view, as truly as from that of the deist or speculative theist, revelation is confined to the purely external manifestation of God in a series of acts. It is differentiated from the conceptions of the deist and speculative theist only in the nature of the works of God, which are supposed to supply the data which are observed and worked into knowledge by the unaided activities of the human mind. In emphasizing here those acts of a special providence which constitute the redemptive activity of God, this theory for the first time lays the foundation for a distinction between general and special revelation; and it grades upward in proportion as the truly miraculous character of God's redemptive work is recognized, and acts of a truly miraculous nature are included in it. And it rises above itself in proportion as, along with the supernatural character of the series of objective acts with which it formally identifies revelation, it recognizes an immediate action of God's Spirit on the mind of man, preparing, fitting, and enabling him to apprehend and interpret aright the revelation made objectively in the redemptive acts. J. Chr. K. Hofmann in his earlier work, *Prophecy and Fulfillment*, announces this theory in a lower form, but corrects it in his later *Schriftbeweis*. Richard Rothe (*Zur Dogmatik*, p. 54) is an outstanding example of one of its higher forms. To him revelation consists fundamentally in the "manifestation" of God in the series of redemptive acts, by which God enters into natural history by means of an unambiguously supernatural and peculiarly divine history, and which man is enabled to understand and rightly to interpret by virtue of an inward work of the Divine Spirit that Rothe calls "inspiration." But this internal action of the Spirit does not communicate new truth; it only enables the subject to combine the elements of knowledge naturally received into a new combination, from which springs an essentially new thought which he is clearly conscious that he did not produce. The theory propounded by Prof. A. B. Bruce in his well-known lectures on *The Chief End of Revelation* stands possibly one stage higher than Rothe's, to which it bears a very express relation. Dr. Bruce speaks with great circumspection. He represents revelation as consisting in the "self-manifestation of God in human history as the God of a gracious purpose—the manifestation being made not merely or chiefly by words, but very specially by deeds" (p. 155); while he looks upon "inspiration" as "not enabling the prophets to originate a new idea of God," but "rather as assisting them to read aright the divine name and nature." Dr. Bruce transcends the position of the class of theorists here under consideration in proportion as he magnifies the office of inner "inspiration," and, above all, in proportion to the extent of meaning which he attaches to the saving clause that revelation is *not merely* by word, but *also* by deed. The theory commended by the great name of Bishop B. F. Westcott (*The Gospel of Life*) is quite similar to Dr. Bruce's.

By these transitional theories we are already carried well into a second class of theories, which recognize that revelation is fundamentally the work of the Spirit of God in direct communication with the human mind. At its lowest level this conception need not rise above the pantheistic postulate of the unfolding of the life and thought of God within the world. The Divine Spirit stirs men's hearts, and feelings and ideas spring up, which are no less revelations of God than movements of the human soul. A higher level is attained when the action of God is conceived as working in the heart of man an inward certainty of divine life—as, for example, by Schultz (*Old Testament Theology*); revelation being confined as much as possible to the inner life of man apparently to avoid the recognition of objective miracle. A still higher level is reached where the action of the Spirit is thought of—after the fashion of Rothe, for example—as a necessary aid granted to certain men to enable them to apprehend and interpret aright the objective manifestation of God. The theory rises in character in proportion as the necessity of this action of the Spirit, its relative importance, and the nature of the effect produced by it are magnified. So long, however, as it conceives of this work of the Spirit as secondary, and ordinarily if not invariably successive to the series of redemptive acts of God, which are thought to constitute the real core of the revelation, it falls short of the biblical idea. According to the biblical representations, the fundamental element in revelation is not the objective process of redemptive acts, but the revealing operations of the Spirit of God, which run through the whole series of modes of communication proper to Spirit, culminating in communications by the objective word. The characteristic element in the Bible idea of revelation in its highest sense is that the organs of revelation are not creatively concerned in the revelations made through them, but occupy a receptive attitude. The contents of their messages are not something thought out, inferred, hoped, or feared by them, but something conveyed to them, often forced upon them by the irresistible might of the revealing Spirit. No conception can do justice to the Bible idea of revelation which neglects these facts. Nor is justice done even to the rational idea of revelation when they are neg-

lected. Here, too, we must interpret by the highest category in our reach. "Can man commune with man," it has been eloquently asked, "through the high gift of language, and is the Infinite mind not to express itself, or is it to do so but faintly or uncertainly, through dumb material symbols, never by blessed speech?" (W. Morrison, *Footprints of the Revealer*, p. 52).

The Doctrine of Revelation.—The doctrine of revelation which has been wrought out by Christian thinkers in their effort to do justice to all the biblical facts, includes the following features. God has never left himself without a witness. In the act of creation he has impressed himself on the work of his hands. In his work of providence he manifests himself as the righteous ruler of the world. Through this natural revelation men in the normal use of reason rise to a knowledge of God—a *notitia Dei acquisita*, based on the *notitia Dei insita*—which is trustworthy and valuable, but is insufficient for their necessities as sinners, and by its very insufficiency awakens a longing for a fuller knowledge of God and his purposes. To this purely natural revelation God has added a revelation of himself as the God of grace, in a connected series of redemptive acts, which constitute as a whole the mighty process of the new creation. To even the natural mind contemplating this series of supernatural acts which culminate in the coming of Christ, a higher knowledge of God should be conveyed than what is attainable from mere nature, though it would be limited to the capacity of the natural mind to apprehend divine things. In the process of the new creation God, however, works also inwardly by his regenerating grace, creating new hearts in men and illuminating their minds for apprehending divine things: thus, over against the new manifestation of himself in the series of redemptive acts, he creates a new subject to apprehend and profit by them. But neither by the presentation of supernatural facts to the mind nor by the breaking of the power of sin within, by which the eyes of the mind were holden that they should not see, is the human mind enabled to rise above itself, that it may know as God knows, unravel the manifestation of his gracious purposes from the incompleted pattern which he is weaving into the fabric of history, or even interpret aright an unexplained series of marvelous facts involving mysteries which "angels desire to look into." It may be doubted whether even the supreme revelation of God in Jesus Christ could have been known as such in the absence of preparatory, accompanying and succeeding explanatory revelations in words: "the kingdom of God cometh not with observation." God has therefore, in his infinite mercy, added a revelation of himself, strictly so called, communicating by his Spirit directly to men knowledge concerning himself, his works, will, and purposes. The modes of communication may be various—by dreams or visions, in ecstasy or theophany, by inward guidance, or by the simple objective word; but in all cases the object and result are the direct supernatural communication of special knowledge.

Of this special revelation it is to be said: (1) It was not given all at once, but *progressively*, "by divers portions and in divers manners," in the form of a regular historical development. (2) Its progressive unfolding stands in *a very express relation to the progress of God's redemptive work.* If it is not to be conceived, on the one hand, however, as an isolated act, wholly out of relation to God's redemptive work, neither is it to be simply identified with the series of his redemptive acts. The phrase, "revelation is for redemption and not for instruction," presents a false antithesis. Revelation as such is certainly just "to make wise," though it is to make wise only "unto salvation." It is not an alternative name for the redemptive process, but a specific part of the redemptive process. Nor does it merely grow out of the redemptive acts as their accompanying or following explanation; it is rather itself one of the redemptive acts, and takes its place along with the other redemptive acts, co-operative with them to the one great end. (3) *Its relation to miracles* has often been very unnecessarily confused by one-sided statements. Miracles are not merely credentials of revelation, but vehicles of revelation as well; but they are primarily credentials; and some of them are so barely "signs" as to serve no other purpose. As works of God, however, they are inevitably revelatory of God. Because the nature of the acts performed necessarily reveals the character of the actor is no proof, nevertheless, that their primary purpose was self-revelation; but this fact gives them a place in revelation itself; and as revelation as a whole is a substantial part of the redemptive work of God, also in the redemptive work of God. (4) *Its relation to predictive prophecy* is in some respects different. As a rule, at all events, predictive prophecy is primarily a part of revelation, and becomes a credential of it only secondarily, on account of the nature of the particular revelation which it conveys. When a revelation is, in its very contents, such as could come only from God, it obviously becomes a credential of itself as a revelation, and carries with it an evidence of the divine character of the whole body of revelation with which it stands in organic connection. (5) *Its relation to the Scriptures* is already apparent from what has been said. As revelation does not exist solely for the increase of knowledge, but by increasing knowledge to build up the kingdom of God, so neither did it come into being for no other purpose than the production of the Scriptures. The Scriptures also are a means to the one end, and exist only as a part of God's redemptive work. But if, thus, the Scriptures can not be exalted as the sole end of revelation, neither can they be degraded into the mere human record of revelation. They are themselves a substantial part of God's revelation; one form which his revealing activity chose for itself; and that its final and complete form, adopted as such for the very purpose of making God's revealed will the permanent and universal possession of man. Among the manifold methods of God's revelation, revelation through "inspiration" thus takes its natural place; and the Scriptures, as the product of this "inspiration," become thus a work of God; not only a substantial part of revelation, but, along with the rest of revelation, a substantial part of his redemptive work. Along with the other acts of God which make up the connected series of his redemptive acts, the giving of the Scriptures ranks as an element of the building up of the kingdom of God. That within the limits of Scripture there appears the record of revelations in a narrower and stricter sense of the term, in nowise voids its claim to be itself revelation. Scripture records the sequence of God's great redeeming acts. But it is much more than merely "the record, the interpretation, and the literary reflection of God's grace in history." Scripture records the direct revelations which God gave to men in days past, so far as those revelations were intended for permanent and universal use. But it is much more than a record of past revelations. It is itself the final revelation of God, completing the whole disclosure of his unfathomable love to lost sinners, the whole proclamation of his purposes of grace, and the whole exhibition of his gracious provisions for their salvation.

BENJAMIN B. WARFIELD.

Revelation, Book of [*Revelation* is from Lat. *Revela'tio* (see REVELATION), used as transl. of Gr. Ἀποκάλυψις, Revelation, liter., an uncovering, revealing; ἀπό, off + καλύπτειν, cover]: the concluding book of the New Testament as now arranged; sometimes called the APOCALYPSE. There are in a voyage three points to observe: (1) the moment of departure; (2) the way: and (3) the arrival. Such is also the general division of the book of Revelation. (I.) After indicating the subject by these words, "I am Alpha and Omega, the beginning and the ending, saith the Lord, which is, and which was, and which is to come" (i. 8), John fixes the point of departure in the first three chapters; it is the state of the Church at the moment in which he writes. The state is depicted in the letters which he addresses from the Lord to the seven chosen churches of Asia Minor. (II.) From ch. iv. to xix. 10 he describes the coming itself—that is, the chastisements of the Judge, who calls the world to repent before the final judgment, and the graces of the Bridegroom, who elevates his Church to perfection for the wedding-day. (III.) Finally, from xix. 11 he describes the arrival with all its consequences, both for the world and for the Church, and he finishes with a proper conclusion, intended to make the reader feel the importance of the book.

This book of mysteries has received various explanations. The traditional interpretation seeks in the vision for a detailed picture of all the events of the history of the Church from the first century to the return of Christ. Faber, Bengel, Elliot, Gaussen, de Rougemont, and many others have in this way produced wonders of exegetical ability and historical learning. But the method carries along with it a signal of warning in its character of arbitrariness. The same vision—that of the locusts, for instance, in ch. ix.—designates, according to one, the great invasion by the Arabs in the seventh century; according to another, the invasions by the Persians under Chosroes; according to a third, the introduction of the Talmud among the Jews; according to

a fourth, the introduction of monachism, etc. Such a diversity rises simply from the imagination having been set free and working without any fixed rule. It is, moreover, inadmissible that it should be necessary to possess the whole treasury of learning belonging to a professor of history in order to understand a book which God has given to his people for the purpose of edification. The modern rationalists have broken with this method of interpretation for many reasons, good and bad; first, no doubt, because it presupposes divine inspiration, but also because their whole system leads them to seek the key to the interpretation of a book in the circumstances under which it was written. Hence the interpretation of the beast as the Roman empire, and of the head wounded to death, but reappearing as Antichrist, as the Emperor Nero. Insurmountable difficulties are, however, involved in this method of explanation; and it seems very singular that a book so holily conceived and so severely planned should be a mere tissue of fancies and hallucinations.

There remains the method which recognizes in the Revelation a picture of the general progress of the Church, to whose understanding no other premises are necessary than such as may be drawn from the Scriptures themselves. There is still room for individual views. Thus Bossuet sees in the destruction of the beast the fall of the Roman empire; Hengstenberg considers the reign of a thousand years as the predominance of Christianity from Charlemagne to our days; John Nelson Darby, the principal founder of the Plymouth Brethren, holds that the whole history of the Church from the apostolic age up to that preceding the return of Christ is omitted in the picture, and must be placed in the interval between the third and fourth chapters, so that the whole vision (iv.–xix.) relates exclusively to the future, to that which precedes immediately the coming of the Lord. It is impossible to enter here into a discussion of these individual points of view, but it is hoped that the reader, following the outline which has been given, will find in the Revelation points sufficiently precise to indicate the course of the religious progress of humanity, and at the same time sufficiently elevated to enlighten and fortify his heart under all the various events of his life. There is the same power in this vision as in that through which God revealed to Moses in six successive pictures the origin of the world. At every moment of a person's life he finds himself in contact with the religious bearing of this vision in Genesis. At every moment, too, but especially when he is under the cross, his soul gathers new life from the spirit of the apocalyptic expectations. It is solely for this purpose of edification, and not in order to satisfy our curiosity, that God has permitted us to see, on the one hand, through the eyes of Moses, the stream of the times issuing forth from eternity, and on the other, through the eyes of John, the times returning to the sea of eternity. Christ is coming (the Old Testament); Christ has come (the gospel); Christ shall come again (the Revelation)—such is the sum of the history of mankind.

One of the chief problems of the book relates to Antichrist. There are two leading opinions respecting his person. Some consider him merely as a poetical personification of a principle, of the spirit of rebellion against God and Christ, which shall go on increasing till the final triumph of the gospel. Others recognize in him a real man, who shall concentrate in his own person to the utmost extent the spirit of apostasy. The second chapter of the Second Epistle to the Thessalonians, in which his apparition is described, speaks decidedly in favor of the second explanation. Antichrist is here designated as the man of sin, who shall place himself as a god in the temple of God; he is called the wicked man whom the Lord shall destroy by the breath of his mouth. His theological system may be summed up in the three following theses: (1) There is no personal God without and above the universe; (2) man is himself his own god—he is the god of this world; (3) "I am the true representative of humanity; by worshiping me mankind worships itself." Even from this general point of view there still remain certain differences of opinion. According to some this person has already appeared on the stage; he is the pope. It is evident, however, that the pope has never actually substituted himself for God or Christ; on the contrary, he rests his authority on that of Christ and God. The pope may be said to be on the way which ends with the arrival of Antichrist, but he is not yet Antichrist himself. Others hold that the Antichrist announced in the Revelation is only an empty supposition, which has never been revealed. The author of the prophecy, they say, thought of the Emperor Nero, that matchless monster, the first persecutor of the Church, whose death the world could not believe in, and whom the terrified Church feared to see return suddenly and assume the part of the man of sin and the universal suppressor. The number 666, which, according to xiii. 18, is the number of the beast, was explained in accordance with this view. The letters of the two words KAISAR NERON, when taken as ciphers and counted in Hebrew, give indeed the sum of 666. This fear was never realized, however, and thus the Revelation became an unfulfilled prophecy on this capital point. It is difficult to understand how under such circumstances the book can have survived in spite of the discredit which fell on it immediately after its appearance, and how the author, if he was a serious man, could suffer it to circulate without retraction. It must also be noticed that in order to obtain the sum of 666 from this name it must be written *Kesar*, and not *Kaisar*, which is against custom and orthographical rules. Finally, it would be somewhat strange if the name which was to be figured out of the number had been put down in Hebrew, while all the rest of the work is in Greek. In speaking of the man of sin, St. Paul, far from identifying this person with the Roman emperor, hints that, on the contrary, it was the imperial power which prevented Antichrist from appearing. "Ye know," he says (2 Thess. ii. 6), "what withholdeth that he might be revealed in his time." The apostle considers Antichrist as the realization of the false Messiah, the terrestrial king, the new Solomon, whom the carnal Israel expects. What was it that prevented the Jews of that time from putting forth this false Messiah, the object of their hearts' longings? It was the Roman legions, which on the mere nod of the emperor would have invaded the Holy Land and put down any attempt at insurrection. It is the powers instituted by and inherited from the Roman empire which up to this very day have prevented Antichrist, the false Messiah of the Jews, from appearing; but he will not fail to come forth as soon as these powers fall; the Jewish people will then have acquired that preponderance in all civilized states which is necessary before it can give its insatiable ambition the reins. With respect to the number 666 numerous solutions of this enigma have been given, but none which is thoroughly satisfactory. A peculiar fact has lately attracted attention. The Greeks do not designate numbers by particular signs called ciphers, but by the letters of the alphabet, to which a numerical value is assigned. Thus 600 is expressed by the letter χ (*ch*), 60 by ξ (*x*), and 6 by ϛ (*s*). The name of Christ (*Christos*) is represented by the first and last letters, χϛ, and these two letters represent the two numbers 600 and 6. If between these two letters the letter ξ, which signifies 60, is introduced, the sum of 666 is obtained; and the three letters, χξϛ, represent the abridged form of the name of Christ, but in such a manner that the first and third letters are separated by the ξ, the emblem of the serpent. Thus in Greek 666 is the emblem of the Messiah, of Satan, or of Antichrist. It may also be noticed that, according to the symbolism of numbers employed in the Revelation, the number 7 always expresses the divine plenitude, and that God, as the Father, the Son, and the Holy Spirit, must consequently be represented in ciphers by 777. Thus the number 666 would signify the creature's highest though still impotent effort at attaining divine glory and power, and the representation would comprise the three persons which form the diabolical trinity—namely, Satan, or the dragon, the beast, or Antichrist, and the second beast, or the false prophet. Satan can not become God, nor can Antichrist attain the dignity of the Son-Messiah, nor the false prophet equal the Holy Ghost. Nevertheless it is no doubt wise to apply to our age that which in the second century the pious Irenæus said to his: "If the author of the propheey would have made the name known to this time, he would have designated it more plainly." Irenæus mentions several explanations propounded in his time, of which the least improbable is the word *Lateinos*—that is, Latin, Roman, the Roman emperor. The Greek letters of which this word is composed give, indeed, when added together as ciphers, the exact sum 666.

FRÉDÉRIC GODET.

The author calls himself "John" in i. 1, 4, 9, xxii. 8, and traditionally the Revelation has been assigned to the apostle John. Bishop Boyd Carpenter, in Elliott's *Commentary on Revelation*, thus sums up the case on the orthodox side: 'The author represents himself as John in a way and at a

time that would naturally suggest that he was either John the apostle and evangelist or wished to pass as such. The general consensus of early opinion believed that the apostle was the writer. The doubts grew out of doctrinal prejudice. There is no reasonable ground for disputing the residence of the apostle in Asia Minor. There are not wanting traces of personal reminiscences such as the beloved disciple would have cherished. The portrait of Jesus Christ is in complete harmony with apostolic teaching; and the difficulties which beset the theory that there were two Johns —one who wrote the Gospel, and the other the Apocalypse —are greater than those which surround the theory of a common authorship." As the above summary suggests, the so-called "critical" position disputes each of the statements. The most recent theories are (1) that the book is composed of literary strata of different periods, and in it may be discovered traces of the glacial action of early heresies (*Völter*); (2) that the book is a Jewish apocalypse with Christian interpretations (*Vischer*). Both theories have failed of general acceptance.

The question of date is apart from that of authorship, and those who accept the apostolic authorship do not agree. The choice lies between A. D. 68 or 69 and A. D. 96—i. e. prior or subsequent to the destruction of Jerusalem. The preponderance of scholarly opinion inclines to the earlier date, but the arguments are evenly balanced.

LITERATURE.—The reader will be best served by using commentaries and treatises upon the book of recognized sober and scholarly character. Such are the commentary by Moses Stuart (n. e. 2 vols., Andover, 1864); E. B. Elliott's *Horæ Apocalypticæ* (4 vols., 5th ed. London, 1862); and especially the masterly works on the Revelation by W. Milligan, *The Revelation of St. John* (Baird lectures, London, 1886); *Lectures on the Apocalypse* (1892); *Discussions on the Apocalypse* (1893); the commentary in Schaff's *Popular Commentary*, and the volume in the *Expositor's Bible* (1889). Milligan's theory of the interpretation of the Revelation deserves separate mention. Briefly it is this, using his own language: "The book is not prophetic in the ordinary sense of the word. It is not intended to set before us any *series of events* which were to occur during the long period known to us, though not to the early Christians, or to precede the Lord's second coming. We shall be wrong, therefore, if we treat the book as predictive, and if we seek in particular events either of the Church's or the world's history for the fulfillment of its supposed predictions. The book is mainly occupied with the enunciation of the great principles which guide the action of the Church's Lord until the time of his return. It shows us in symbolical presentation the principles upon which God founds and propagates his Church in the world. The action of the book covers the whole Christian era from its beginning to its end. Everything contained in the Apocalypse is to be understood symbolically and spiritually." *Book by Book*, pp. 556, *seq.*

SAMUEL MACAULEY JACKSON.

Revenue [from O. Fr. *revenue*, liter., that which comes back, deriv. of *revenir*, come back, return]: (1) income or annual proceeds from land or other property. (2) The income of a state or nation derived from duties, taxes, and other sources for public use. See FINANCE and TAXATION.

Revere, PAUL: patriot; b. in Boston, Mass., Jan. 1, 1735; served in the campaign on Lake George as lieutenant of artillery 1756; became a goldsmith, and afterward a copperplate engraver; produced prints illustrative of the repeal of the Stamp Act, of the "Boston Massacre," and the landing of the British troops at Boston; was a member of the "tea-party," and at the instance of Gen. Warren rendered an important service to his country by secretly leaving Boston at ten o'clock on the night of Apr. 18, 1775, and riding through Charlestown to Concord to announce the British expedition of the following day, which was resisted at Lexington and Concord. (See Longfellow's poem, *The Midnight Ride of Paul Revere.*) In the same year he engraved the plates and printed the bills of the paper-money of Massachusetts; afterward set up a powder-mill; became lieutenant-colonel of State artillery and participated in the Penobscot expedition of 1779; after the war established a foundry for casting cannon and church-bells, and built extensive copper-rolling mills at Canton, Mass. As grand master of the Masonic order he assisted in laying the corner-stone of the Boston State-house 1795. D. in Boston, May 10, 1818. In his honor the town of North Chelsea, Mass., took the name of Revere, Mar. 24, 1871.

Reversion: See EVOLUTION (*Heredity*).

Reversion (in law): See LANDLORD AND TENANT and REMAINDER.

Réville, rā′veel′, ALBERT, D. D.: clergyman and author; b. at Dieppe, France, Nov. 4, 1826; became a leading minister of the French Protestant church at Nîmes and Luneray; pastor of the Walloon church at Rotterdam, Holland, 1851; retired to Dieppe 1872; went to Paris as Professor of History of Religions in the College of France in 1880. He has published many translations of religious works from the English and the German; is author of *De la Rédemption* (1859); *Essais de Critique religieuse* (1860); *Études critiques sur l'Évangile selon S. Matthieu* (1862); *La Vie de Jésus de M. Renan devant les Orthodoxes et devant la Critique* (1863); *Manuel d'instruction religiense* (1863; 2d ed. 1866; Eng. trans. *Manual of Religious Instruction*, London, 1864); *Notre Christianisme et notre Bon Droit* (1864); *Histoire du Dogme de la Divinité de Jésus-Christ* (1869; Eng. trans. *History of the Doctrine of the Deity of Jesus Christ*, 1870); *Prolégomènes de l'histoire des religions* (1880; 4th ed. 1886; Eng. trans. *Prolegomena to the History of Religion*, 1884, 1885); *Histoire des religions* (4 vols., 1883–88); Eng. trans of vol. ii., *The Native Religions of Mexico and Peru.*

Revised by S. M. JACKSON.

Revision of the Bible: See BIBLE REVISION.

Revival of Learning: See RENAISSANCE and HUMANISM.

Revolution: in politics, the overthrow of an established political system; a radical change in the government effected by extra-legal means. For a discussion of the right of revolution, see the article POLITICAL SCIENCE, and for an account of particular revolutionary movements, see the articles on the various countries, especially ENGLAND, HISTORY OF, for the Revolution of 1688, FRANCE, HISTORY OF, for the Revolution of 1789, UNITED STATES for the Revolution of the North American colonies, and MEXICO and the different states of South and Central America for the numerous revolutions that have marked the history of these countries.

Revolver: a magazine small arm resembling a pistol. It has a chamber which carries a number of cartridges, usually five or six, and which revolves, thus bringing the cartridges in succession in front of the barrel. Revolvers were known to have been used in the early part of the seventeenth century. Colt perfected the revolver by causing the cocking of the hammer to revolve the chamber. A later form of revolver is a hammerless self-cocker; by simply pulling the trigger the chamber is revolved and the piece is fired.

Re'wah: a state of India, under the protection of the British Government. Area, 10,300 sq. miles. Pop. (1891) 1,508,943. It extends from lat. 22° 39′ to 25° 12′ N., and from lon. 80° 46′ to 82° 51′ E. The northern and smaller part is a fertile plateau, yielding abundant crops. The southern part is rich in timber and coal, but not in agriculture. The capital, Rewah, has (1891) 23,626 inhabitants.

Revised by C. C. ADAMS.

Reward [from O. Fr. *reward*, earlier form of *regard*, deriv. of *rewarder*, *regarder*, regard, mark, notice again; *re-*, again + *warder*, *garder*, mark, heed, from O. H. Germ. *wartên*, watch over > Germ. *warten*, wait]: in law, compensation offered indefinitely to any one for a particular act, such as the restoration of stolen property, or the apprehension of a criminal. The offer may be withdrawn, in the manner in which it was made, at any time before acceptance. Accordingly where a reward for the arrest of a criminal is offered by public proclamation, and withdrawn in the same manner, a person who procures the arrest of the criminal after the withdrawal, although ignorant that the offer had been revoked, can not recover the reward. (*Shuey* vs. *U. S.*, 92 U. S. 73.) Acceptance of the offer consists in the performance of the particular act, with knowledge of the offer (*Fitch* vs. *Snedeker*, 38 N. Y. 248), although there are decisions to the effect that knowledge of the offer is not essential to acceptance. (*Russell* vs. *Stewart*, 44 Vt. 170.) From considerations of public policy a peace officer can not claim a reward for services which are a part of his official duties. Nor can one recover a reward which was made necessary by his own misconduct. (*Harsan* vs. *Doe*, 38 Me. 45.)

FRANCIS M. BURDICK.

Reybaud, rā′bō′, MARIE ROCH LOUIS: author; b. at Marseilles, France, Aug. 15, 1799; educated for commercial business; traveled much in India and other Eastern countries;

settled in 1829 in Paris, and devoted himself to literature, writing for many liberal journals; edited *Histoire scientifique et militaire de l'Expédition française en Égypte* (10 vols., 1830–36); published from 1836 to 1840, in the *Revue des Deux Mondes*, his *Études sur les Réformateurs, ou Socialistes modernes*, which in 1841 received the Montyon prize from the Academy and has since passed through several editions; published in 1843 *Jérôme Paturot à la Recherche d'une Position sociale*, his most popular work, which was followed in 1848 by *Jérôme Paturot à la Recherche de la meilleure des républiques* (1848). He became a member of the Academy in 1850, and continued to write romances, economical essays, political pamphlets, and literary and social criticisms. He was several times elected to the legislature, and after the *coup d'état* of 1851 was a member of the consultative commission. D. in Paris, Oct. 28, 1879.
Revised by F. M. Colby.

Reyer, rā'i-ā', Louis Étienne Ernest (real name **Rey**): composer; b. at Marseilles, France, Dec. 1, 1823; began to study music there; when sixteen years of age went to Algiers, in the service of the Government. In 1848 he returned to France and continued to study in Paris. His first important composition was *Le Sélam*, an Oriental symphony with choruses, produced Apr. 5, 1850. Since then he has composed several operas with more or less success, prominent among which are *Sacountala* (1858); *La Statue* (1861); *Érostrate* (Baden, 1862; Paris, 1871); and *Sigurd* (Brussels, 1884). His latest work is *Salammbô* (1893). He is also an accomplished feuilletonist. He was decorated with the Legion of Honor in 1862 and raised to the rank of commander in 1891. He is a member of the Academy of Fine Arts.
D. E. Hervey.

Reykjavik, rīk'yaa-vik: the capital of Iceland, on the southwestern coast of the island, in lat. 64° 8′ N., lon. 21° 5′ W., at the head of Faxafjord. It is the seat of the government, has a college with a library of 10,000 volumes, medical and divinity schools, an observatory and a museum, an important annual fair, and regular communication by steamships with Leith and Copenhagen. It was founded in 874. Pop. 1,400. Revised by P. Groth.

Reynard the Fox: a popular epic of European origin. Despite the efforts of Jacob Grimm (*Reinhart Fuchs*, 1834) to establish the existence of a native and purely popular Germanic beast-epos, of which *Reynard the Fox* formed the most conspicuous example, scholars now agree in regarding this beast-epos in general, and *Reynard* in particular, as an outgrowth of the old fables which were worked into this or that shape for prevailingly satirical purposes. To be sure, we must admit a certain admixture of native material, and not ascribe every shred of these fables to the Orient. Yet in any case, whatever the material, monks, not popular fancy, were responsible for the development of the fables into later forms; they used the stories which came mainly from the East and drifted, by way of Greece and Italy, over Western Europe. A fable of Æsop got footing in German literature as early as the seventh century; another, the story of the sick lion and the fox, soon followed, and was treated as independent or purely local tradition. In the tenth century this fable was used as a convenient allegory for the fortunes of a monk; and a few years later, probably in Flanders, names were given to the principal beasts: Isengrim (iron-masked) to the wolf; Noble to the lion; and Reynard (originally the Germanic word meaning good or firm in counsel; the Low German form is Reineke or Reinke, while French Renard, as a generic name, has actually supplanted the Old French *goulpil*, from Latin *vulpes*) to the fox. Bruin for bear is almost as common in English. The earlier literature had been in Latin and was didactic or satirical; but now, like the mediæval legend, this popular material found voice in the vernacular. It grew into a sort of epos; and indeed the Latin *Isengrimus* (about 1150) had already assumed epic proportions. The first German epos of Reynard was composed about 1180. French jongleurs worked the material into a sort of romance, the *Roman de Renart*, with many so-called branches. About the middle of the thirteenth century one of these French versions was used by a Fleming named Willem as basis for the admirable *Roman van den Vos Reinaerde*. This, again, was worked over and furnished with sundry additions by an unknown Fleming in the fourteenth century, under the name of *Reinært's Historie*; this, in turn, toward the close of the fifteenth century, was enlarged by explanations in prose; and finally it was translated into Low German as the famous *Reinke de Vos*, or *Reineke Vos*, appearing about 1500. Enormously popular, these versions made their way into the various tongues of Europe. Caxton translated one of them and printed it, June, 1481, as *The History of Reynard the Fox*. (See Arber's reprint in the *English Scholar's Library*.) In modern times Goethe has told us this familiar story, the *Unheilige Weltbibel*, as he called it—in hexameters which hold a nice balance between epic and satire—*Reineke Fuchs*; an English translation was made by T. J. Arnold, and was published with Kaulbach's and Wolfe's illustrations.

It was Willem who gave Reynard his commanding place as hero of the little epic and representative of desperate craftiness. Willem, however, takes sides against his hero; while later versions make the fox a thoroughly triumphant rascal. The ethical problem involved is discussed half humorously, half seriously, by Froude in his *Short Studies on Great Subjects*. The student must be referred for details of bibliography to E. Martin, *Le Roman de Renart* (Strassburg, 1882 ff.), and *Reinaert* (Paderborn, 1874); also to the preface of Arber's reprint of Caxton, and the introduction by W. J. Thoms to *The History of Reynard the Fox* (Percy Society, 1844). Francis B. Gummere.

Reynolds, Henry Robert, D. D.: clergyman and author; b. at Romsey, Hampshire, England, Feb. 26, 1825; educated at University College, London; became minister of a Congregational church at Halstead, Essex, England, in 1846; of East Parade Congregational church, Leeds, in 1849; president of Countess of Huntingdon's College, at Cheshunt, in 1860, and also Professor of Theology and Exegesis; was one of the editors of *The British Quarterly Review* 1866–74; author of *Beginnings of the Divine Life* (1858); *John the Baptist, a Contribution to Christian Evidences* (1874); *The Philosophy of Prayer, and other Essays* (1881); commentaries on Hosea and Amos, on the Gospel of John, *Athanasius, his Life and Work* (1889), and of important contributions to theological cyclopædias and reviews. D. at Broxbourn, Herts, Sept. 10, 1896. Revised by G. P. Fisher.

Reynolds, Ignatius Aloysius, D. D.: bishop; b. near Bardstown, Ky., Aug. 22, 1798; educated at St. Mary's College, Baltimore, Md.; ordained a Roman Catholic priest 1823; was successively vicar-general of Kentucky, rector of St. Joseph's College, and president of the Nazareth Female Institute of Kentucky, and was consecrated Bishop of Charleston, Mar. 19, 1844. D. at Charleston, Mar. 9, 1855.

Reynolds, or **Rainolds**, John, D. D.: clergyman and author; b. at Pinhoe, Devonshire, England, in 1549; studied at Merton College, Oxford, 1562; became fellow of Corpus Christi 1566; lectured on Aristotle; was appointed reader of the theological lecture founded by Sir Francis Walsingham 1586; was dean of Lincoln 1593; refused a bishopric in order to accept the presidency of Corpus Christi College 1598; was eminently distinguished as a Hebraist, regarded as the leader of the Puritan party, and was said by Hallam to have been "the most eminently learned man of Queen Elizabeth's reign"; took a prominent part in the Hampton Court conferences of 1603, where he maintained the necessity of a new version of the Bible; executed a small portion of King James's version, and revised much more in the weekly meetings of the translators held at his chambers. D. at Oxford, May 21, 1607. His works consist chiefly of separate sermons, controversial treatises against the Church of Rome, academical discourses, and some writings upon biblical criticism, the most elaborate being one successfully directed against the admission of the Apocrypha as part of the Old Testament canon—*Censura Librorum Apocryphorum Veteris Testamenti*, posthumously printed (Oppenheim, 2 vols., 1611). —His brother, William Reynolds, b. at Pinhoe about 1540, was educated at Oxford; became a Roman Catholic; was Professor of Divinity and Hebrew at Douay and Rheims; took an important part in the translation of the Rheims Testament; translated from English into Latin all the works of Thomas Harding; wrote several theological and controversial treatises, and became chaplain to the Beguin nunnery at Antwerp, where he died Aug. 24, 1594.

Reynolds, John Fulton: soldier; b. at Lancaster, Pa., Sept. 20, 1820; graduated at the U. S. Military Academy, and appointed brevet second lieutenant of artillery, July, 1841; captain 1855; served in the war with Mexico, winning the brevets of captain and major; in Sept., 1860, was selected as commandant of cadets at West Point; in May, 1861, was transferred to the infantry with rank of lieutenant-colonel (colonel, June, 1863), and in August appointed brigadier-general of volunteers, and assigned to command of

a brigade of the Pennsylvania Reserve Corps, which he commanded in the Virginia peninsular campaign of 1862 at Mechanicsville, Gaines's Mill, and Glendale, where he was taken prisoner. Exchanged in August, he commanded a division in the second battle of Bull Run, and in the Maryland campaign of Sept., 1862, was selected to command the Pennsylvania militia for the defense of the State. In Nov., 1862, he was promoted to be major-general of volunteers, and placed in command of the First Corps of the Army of the Potomac, which was engaged on the left in the battle of Fredericksburg, Dec. 13, 1862. At Chancellorsville his corps was held in reserve, along with the Fifth, and not allowed to engage the enemy. At the battle of Gettysburg, on the opening day (July 1, 1863), after having made the disposition of his troops in person, he was killed by a rifle ball.

Revised by JAMES MERCUR.

Reynolds, JOSEPH JONES: soldier; b. at Flemingsburg, Ky., Jan. 4, 1822; graduated at the U. S. Military Academy, and entered the army as brevet second lieutenant of artillery July 1, 1843. After serving in garrison and in Texas, he was in 1846 selected as Assistant Professor of Geography, History, and Ethics at West Point; in 1847 became Assistant Professor of Natural and Experimental Philosophy, and from 1849 to 1855 was principal assistant professor. In 1857 he accepted the chair of Mechanics and Engineering in Washington University, St. Louis, Mo., which he held until 1860. In 1861 he was appointed colonel and brigadier-general of Indiana volunteers, and May, 1861, was commissioned brigadier-general of U. S. volunteers, serving in West Virginia. He again resigned in Jan., 1862, but was reappointed Sept. 17, 1862, and on Nov. 29, 1862, was promoted to be major-general of volunteers, serving with the Army of the Cumberland. At the battle of Chattanooga he was chief of staff of that army. Subsequently he held various important commands in the Southwest. On July 28, 1866, he was appointed colonel of the Twenty-sixth U. S. Infantry; transferred to Twenty-fifth Infantry Jan., 1870, and to Third Cavalry Dec. 15, 1870; brevet brigadier and major-general for gallantry. Retired June, 1877.

Revised by JAMES MERCUR.

Reynolds, Sir JOSHUA: painter; b. at Plympton-Earle, Devonshire, England, July 16, 1723. He showed much natural bent toward drawing, and at the age of eighteen was sent to London to the studio of Thomas Hudson, a portrait-painter. Two years later he began to paint portraits professionally, sometimes at Plymouth Dock, now Devonport, and sometimes in London; but in 1749 he accepted the invitation of Capt. Augustus Keppel, afterward admiral and viscount, to go with him to the Mediterranean. This gave Reynolds the opportunity to study Italian painting, and he remained over two years at Rome and other cities in Italy. In 1752 he returned to London, and was almost immediately successful as a portrait-painter. Although already very deaf, in consequence of a chill and resulting illness while in Italy, he was a model of graceful courtesy and won everybody's good word. In 1760 he took the house in Leicester Square, London, in which he lived and painted until his death. In 1768 the Royal Academy was founded, and Reynolds was elected its president. He was knighted soon after by George III. The presidency he retained until 1790, his long term setting an example which in the academy has been generally followed since. He took up the custom of delivering each year at the distribution of awards a carefully prepared address on some topic immediately connected with fine art, usually painting, and these are the well-known *Discourses of Sir Joshua Reynolds.*

He remained a bachelor, and was the central figure in several clubs or societies of literary, artistic, and political men. Among his especial friends were Edmund Burke, Dr. Johnson, Garrick, and Oliver Goldsmith. It was in connection with one of these gatherings that Goldsmith wrote his poem *Retaliation*, in which occurs a celebrated passage about Reynolds. An enormous number of pictures were painted by Reynolds, and he accumulated a fortune large for the time and almost unprecedented as the result of an artist's work for the public. D. in London, Feb. 23, 1792.

As a painter Reynolds is remarkable for the beauty of color which he seems to have gained from the study of the Venetian painters, except in so far as it was an inborn gift. His painting was in a high degree experimental; even in his maturity he painted in a tentative way, trying different ways of producing his effect, and the result has been that many of his pictures have faded very badly. He avows, in his *Discourses*, an opinion that very few colors should be used by the painter, and bases this untenable theory upon the alleged practice of some of the ancient Greeks. His teaching and his practice, however, often differ; thus he is never weary of advocating the grand style and of lauding Michelangelo as the first of painters, but his life's work was portrait-painting, with scarcely any interruption or change, even his so-called "ideal" pictures being mere groups of portraits, and his way of work is based upon that of Titian much more than upon that of Michelangelo. Moreover, although his especial merit is as a colorist, his work was always begun in monochrome or what was almost wholly monochrome, and the coloration is only in the surface-painting.

At the Royal Academy in London are a number of important pictures, among them *Portrait of Lord Heathfield*; *Portrait of Admiral Keppel*, Reynolds's early friend; *Portrait of the Prince of Wales*, afterward George IV.; his own portrait in his early manhood and another of a later date; portrait group of *Members of the Society of Dilettanti* and a second and similar group; *The Age of Innocence*; *The Graces Decorating the Altar of Hymen*; *Heads of Angels*, being several different studies on the same canvas of the head of a daughter of Lord William Gordon; *Robinetta*, a fancy portrait of Mrs. Tollemache. A large number of portraits are in the National Portrait Gallery; among them one of Edmund Burke and one of Sir William Chambers, the architect. In the Royal Academy permanent exhibition are an admirable portrait of himself, one of George III., and a second one of Sir William Chambers. In the South Kensington Museum, the Soane Museum, Grosvenor House (the Duke of Westminster's private gallery), Devonshire House, and several other private houses open to the public are perhaps thirty important works, so that Reynolds can be perfectly well studied without leaving London. At the Dulwich Gallery, the Edinburgh National Gallery, the Oxford University Gallery, and at the Hermitage, St. Petersburg, are many other pictures.

Many of his paintings have been engraved, about twenty-five of them by Francis Bartolozzi in stipple, but many more in mezzotint by John Dixon, Edward Fisher, Valentine Green, John Jones, James McArdell, and J. Raphael Smith, besides many engravers who made two or three plates each. These mezzotints are among the finest ever made, and constitute by themselves an important department of art.

RUSSELL STURGIS.

Reynolds, WILLIAM MORTON, D. D.: clergyman and educator; b. in Fayette co., Pa., Mar. 4, 1812; graduated at Jefferson College 1832; became a clergyman of the Lutheran Church; was professor in Pennsylvania College 1833–50; president of Capital University, Ohio, 1850–57, and of Illinois State University 1857–60; was ordained in the Protestant Episcopal Church 1864. Author of *Discourse on the Swedish Churches*, of several occasional essays, addresses, and pamphlets; edited the *Captivi* of Plautus (1846); founded and conducted *The Evangelical Magazine* (1840), *The Literary Record* (1845), and *The Evangelical Review* (1849–62). Dr. Reynolds translated from the Swedish with introduction and notes *A History of New Sweden, or the Settlements on the River Delaware, by Israel Acrelius, Provost of the Swedish Churches in America, and Rector of the Old Swedes' Church, Wilmington, Delaware*, published by the Pennsylvania Historical Society. D. at Oak Park, Ill., Sept. 5, 1876.

Revised by W. S. PERRY.

Re'zin [from Heb. *Retsīn*, liter., prince]: the eighth and last of a line of kings of Damascus, beginning with Hadad, contemporary with David. He began to reign about 745 B. C. (2 Kings xv.). He fought against Judah in conjunction with Pekah of Samaria (2 Kings xv. 37; xvi. 5, *seq.*). Against them King Ahaz hired Tiglath-pileser, who came and took Damascus and put Rezin to death (B. C. 732). The Assyrian inscriptions show that Rezin, or *Rasun*, was paid tribute in 738, and that when Damascus was taken many of the inhabitants were carried into captivity.

Revised by S. M. JACKSON.

Rezonville, Battle of: another name for the Battle of Gravelotte. See GRAVELOTTE.

Rhachiglos'sa [Gr. *ῥάχις*, spine + *γλῶσσα*, tongue]: a group of carnivorous marine gasteropod molluscs, embracing the volutes, olive-shells, harp-shells, miter-shells, whelks, etc.

Rhachitis: the technical name of RICKETS (*q. v.*).

Rhadaman'thus (in Gr. *Ῥαδάμανθος*): son of Zeus by Europa, and a brother of Minos, King of Crete. He was driven

out of Crete by Minos and fled to Bœotia, where, after the death of Amphitryon, he married Alcmene. As a special favor Zeus translated him to the Elysian Fields, where later on he became a judge. J. R. S. S.

Rhæ'tia: an ancient province of the Roman empire; bounded N. by Vindelicia, E. by Noricum, S. by Gallia Cisalpina, and W. by Helvetia. It corresponded to the modern Tyrol and the Swiss canton of Grisons. Its inhabitants, the Rhæti, who lived as shepherds, were said by Livy and Pliny to be of Etruscan descent, and were subdued by the Romans 15 B. C. During the last days of the Roman empire, when the barbarian hordes swarmed around its frontiers and devastated its provinces, Rhætia became nearly depopulated.

Rhæto-Romance, or **Rhæto-Romanic Dialects**: a group of Romance dialects on the border between German and Italian speech. The region in which they are spoken embraces most of the canton Graubünden (Grisons), including the Engadine, in Switzerland, two or three strips of territory in Tyrol, and the whole of Friuli in the corner of Italy N. E. of Venice and extending as far as the Isonzo. The Swiss part of the territory has a population of about 40,000, the Tyrolese about 11,000, and the Friulan about 464,000, making a total of about 515,000, according to Gartner in his grammar of these dialects (1883). The name Rhæto-Romance is given from the Roman province Rhætia (or Rætia); other names, not generally applied to all the dialects, are Romansch, Romaunsch, Rumonsch, etc. (from a Latin adverbial form *Romanice*), and Ladin (i. e. Latin). These dialects vary considerably in vocabulary, phonology, and inflections, and they have not many distinctive features common even to most of them, which at the same time distinguish them from the adjoining Lombard and Venetian dialects of Italy, nor is it possible to draw a sharp line of division from these latter. Some generally convenient tests are, for example, the words for head, brother, sister, son, daughter, sun, which in these dialects usually are descended from Latin (or Low Latin), *caput*, *frater*, *soror*, *filius*, *filia*, *soliculus* (a diminutive of *sol*), while the Italian dialects here concerned have forms corresponding to the literary Italian *testa*, *fratello*, *sorella*, *figliuolo*, *figliuola*, *sole*. The treatment of Latin vowels after the accent is not dissimilar to that in French or Provençal; Latin initial *bl*, *pl*, *fl*, *cl*, *gl* are generally retained and not changed as in Italian; the treatment of original *ca* and *ga* shows a resemblance to that seen in French; Latin final *s* is retained in certain inflectional endings; the imperfect subjunctive is much used as a conditional also, and perhaps this use was formerly regular in regions where now another conditional form is found. There are interesting features of certain dialects, and not all those which may serve to distinguish Rhæto-Romance from Italian are here mentioned. In the phonology occur vowels like those written *u* and *eu* in French, also a vowel resembling the French so-called "mute *e*." Latin *au* is in some regions retained without change. Some dialects have also peculiar inflectional formations in verbs, for instance, the conditional. The future indicative in the western region is formed by using an auxiliary from Latin *venire*; in Tyrol and Friuli the common Romance formation is found. The descendant of the Latin perfect indicative is nearly or quite lost in the spoken dialects. Both German and Italian have exerted a considerable influence on these dialects.

In literary production only Graubünden and Friuli need be considered, and in Friuli, though documents are preserved from the fourteenth century on, yet the strong Venetian influence has prevented the development of an independent literature, and the productions are comparatively unimportant, serving for temporary amusement only—as comedies, or otherwise having little value, as newspapers. (See the *Archivio glottologico italiano*, iv., 185 ff.) In Graubünden, however, in the dialects along the Rhine (Oberländisch, including Obwaldisch, or Surselvisch, and Niedwaldisch) and in the Engadine (Upper and Lower are here to be distinguished) a stronger literary movement has produced more ambitious works, the main cause being the religious feeling due to the Reformation. Noteworthy especially are Bifrun's translation of the New Testament (1560) in the Upper Engadine, Chiampel's translation of the Psalms (1562) in the Lower Engadine, Bonifaci's *Catechismus* (a translation from German, 1601) in an Oberland dialect, L. Gabriel, *Ilg Nief Testament* (The New Testament, 1648), also some epic or historical verse, as *Tobia* (probably of the sixteenth century; see *Romanische Studien*, i., 336 ff.), Travers's *Chanzun dalla guerra dalg Chiasté d'Müsch* (sometimes referred to as the *Müsserkrieg*, sixteenth century), and Giocrin Wietzel's poem, commonly referred to as the *Veltlinerkrieg* (seventeenth century). There are some dramatic works belonging to the sixteenth and seventeenth centuries; those of the sixteenth at least are nearly if not quite all translations. To the sixteenth century belong a *Susanna*, *Joseph*, and some others (see *Zeitschrift für romanische Philologie*, ii., 515 ff., v., 461 ff., and *Romanische Studien*, vi., 239 ff.). To the seventeenth century belong some by Fadri Wietzel and others (see *Zeitschrift für romanische Philologie*, iv., 1 ff., *Le Sacrifice d'Abraham* in *Romania*, viii., 374 ff., *Susanna* in *Archivio glottologico italiano*, viii., 263 ff., *Revue des langues romanes*, xxvii., 121 ff., 162 ff.). Some early Oberland texts of interest under the general title *Quattro testi soprasilvani*, among them a *Barlaam and Josaphat* (*Vita de Soing Giosaphat*, etc.), were published by Decurtins in *Archivio glottologico italiano*, vii., 149 ff. The later literary production comprises (besides religious compositions) lyric poems, tales, translations, schoolbooks, etc. A fairly adequate view of the literature can be obtained from J. Ulrich's *Rhätoromanische Chrestomathie* (2 vols., with glossaries, 1882–83), supplemented by reference to texts and articles in the periodicals mentioned above, particularly the bibliographical lists of Böhmer entitled *Verzeichniss Rätoromanischer Litteratur* in *Romanische Studien*, vi., 109–238. The *Catalogue of the Rhæto-Romanic Collection* presented to the Cornell University Library by Willard Fiske (1894) contains some other titles; see also the bibliographies in the *Zeitschr. für roman. Philol.* For the grammatical and historical study of the dialects, see especially Ascoli, *Saggi ladini* in *Archivio glottologico italiano*, i.; Gartner, *Rætoromanische Grammatik* (1883); *id.*, in Gröber's *Grundriss der romanischen Philologie*, i., 461 ff. (1888), etc. See also ROMANCE LANGUAGES. E. S. SHELDON.

Rhamnus: See BUCKTHORN.

Rhamphas'tidæ [Mod. Lat., named from *Rhamphas'tus*, the typical genus, from Gr. *ῥάμφος*, a crooked beak of birds]: a family of carinate birds, including the toucans. They are distinguished by their bills, which are long, high, and compressed, decurved at the tip, and with the lateral margins serrated; the nostrils are inconspicuous, superior, and at the base of the upper mandible; no bristles are developed; the wings are rather short and rounded; the tail is moderate and more or less convex; the tarsi are rather robust and covered with broad scales; the toes in pairs, two being directed forward and two backward; the inner toes anteriorly and posteriorly, shorter than the outer; the claws strong and curved. They are somewhat related to the cuckoos. The species are peculiar to America, especially the tropical regions; a few, however, extend northward into Mexico, but none is found within the limits of the U. S. They are generally combined under two genera—*Rhamphastus*, in which the nostrils are concealed, including seventeen species; and *Pteroglossus*, with the nostrils exposed, comprising forty-five species. They frequent lofty trees, feeding upon various fruits, especially the banana, but also live partly upon insects, and even reptiles, as well as young birds and eggs. The female makes her nest in holes in the trunks of trees, and generally deposits therein two eggs. See ARACARI.

The ariel toucan.

Revised by F. A. LUCAS.

Rhaph'ides, or **Raphides** [Mod. Lat., from Gr. *ῥαφίς*, plur. *ῥαφίδες*, needle]: the crystals, often needle-shaped, of salts found within certain plant-cells. The oxalates, carbonates, and sulphates, and other salts of lime are those most commonly found. See HISTOLOGY, VEGETABLE.

Rhapsodists [from Gr. *ῥαψῳδός*, a rhapsodist; *ῥάπτειν*, *ῥάψαι*, sew, stitch, patch together + *ᾠδή*, song]: a class of wandering minstrels in ancient Greece whose occupation was the recital of the Homeric and other poetry. After these poems were reduced to writing these rhapsodists ceased to be the honored singers of the early days of Greece.

Rhatany [from Span. *rataña* = Peruv.]: a drug, being the root of the *Krameria triandra* and *Krameria ixina*, small woody shrubs of a genus generally referred to the family *Polygalaceæ*, growing in the Bolivian and Peruvian Cordilleras. Rhatany-root is sold in pieces of various sizes, composed of a dark, reddish-brown bark and a central lighter-colored, woody portion. It has no smell, but a bitter, somewhat sweetish, and very astringent taste. The medicinal principle is a form of tannin, called rhatani-tannic acid. This is found only in the cortical part of the root, where it exists in the proportion of about 20 per cent. The physiological effects of rhatany are simply those of the tannin it contains, and preparations of the root are used in medicine almost exclusively as astringents in diarrhœal affections.

Revised by H. A. Hare.

Rhea, in ornithology: See Rheidæ.

Rhea, in Greek mythology: See Cybele.

Rhea Silvia: See Romulus.

Rhegium: See Reggio di Calabria.

Rhe'idæ [Mod. Lat., named from *Rhe'a*, the genus, from Lat. *Rhe'a* = Gr. Ῥέα, name of a goddess]: a family of birds of the order or sub-order *Ratitæ*, containing the South American ostriches, and differing externally from the African ostriches simply by the three-toed feet, the more slender bill, and the want of caudal plumes. The bill is comparatively short, depressed gradually, and narrowed toward the tip; the nostrils large, oval, and nearly in the middle of the bill; the wings are furnished with long, soft feathers; the tail is not apparent; the tarsi are long and covered in front with broad transverse scales; toes three, the lateral shorter than the middle; the claws compressed and curved. They are distinguished anatomically by a number of characters. The species of this group are confined to South America, where they inhabit the open plains and exhibit habits analogous to those of the ostriches of Africa. They are generally seen alone; they run with considerable fleetness, and generally against the wind, expanding their wings in starting to assist in making headway. They feed chiefly upon grass and roots. The females lay their eggs in combination, sometimes depositing together as many as eighty eggs. These are collected together by the male bird, who hatches them and attends for a short time to the young. Three species are known: (1) The *Rhea americana*, extending from Southern Brazil on the N. to the Straits of Magellan on the S.; (2) *R. darwinii*, from the Straits of Magellan to the Rio Negro, or the boundary between Patagonia and Buenos Ayres; and (3) *R. macrorhyncha*, whose habitat is uncertain.

Revised by F. A. Lucas.

Rheims, or **Reims**, reemz, Fr. pron. răñs [anc. *Durocortorum*; also called *Remi*, the name of the people]: a large old city of France, department of Marne, on the Vesle (see map of France, ref. 3–G). It is generally well built, has fine streets, squares, and public buildings, and is surrounded with walls and ramparts planted with trees and affording beautiful promenades. The cathedral, 466 feet long, 99 feet broad, and 144 feet high, built in the first part of the thirteenth century, is one of the finest Gothic edifices of Europe; its western front is especially magnificent. In this church all of the monarchs of France from Philippe Auguste (1180) to Charles X. (1824) were consecrated, excepting Henry IV., Napoleon I., and Louis XVIII. During the Revolution the people stormed the cathedral and broke the *sainte ampoule* containing the sacred oil, which was believed to be of miraculous origin. St. Remigius, the apostle of the Franks, is buried in one of the suburbs. Rheims has extensive manufactures of woolen fabrics, and a large trade in champagne wines. Pop. (1881) 93,823; (1896) 107,963.

Rheinberger, rīn'bār-ger, Joseph: composer; b. at Vaduz, principality of Liechtenstein, Mar. 17, 1839; learned to play the piano at the age of five, and at the age of seven was organist of the church in his native place. When twelve years of age he was sent to the Munich Conservatory, and remained there until he was nineteen. Subsequently he became Professor of Counterpoint and Organ in the conservatory. His compositions are numerous and mostly in the large forms, including several symphonies, two operas, several cantatas, much orchestral and chamber music, two Stabat Maters, a mass in eight parts, another mass, many organ pieces, much church music, and many works for chorus and for male voices. He is a Hofkapellmeister and professor, and a member of the Academy of Arts, Berlin.

D. E. Hervey.

Rhena'nus, Beatus (*Bilde von Rheinau*): classical scholar; b. at Schlettstadt, Alsace, in 1485; educated at the University of Paris; lived in Basel from 1511 to 1527. He spent the rest of life in scholarly leisure in his native town. Among the fruits of his labors were editions of Seneca's *Apocolocyntosis*, Quintus Curtius, Tertullian, Tacitus, and Livy. He was the first to question the authenticity of the *Dialogus* of Tacitus, and he issued the *editio princeps* of Velleius Paterculus, having discovered the single extant MS. of this historian in 1515, in an Alsatian monastery. Rhenanus's learning and critical talent were of a high order. D. May 18, 1547. See A. Horawitz, *Vienna Acad. Proceed. Philos. histor. Class.*, vol. lxx., pp. 189 ff.; lxxi., pp. 643 ff.; lxxii., pp. 323 ff.; lxxviii., pp. 313 ff. Alfred Gudeman.

Rhenish [from Lat. *Rhe'nus*, Rhine] **Confederation**: a confederation of German principalities under the protectorate of Napoleon. By the Peace of Presburg (Dec. 26, 1805) Bavaria and Würtemberg were erected into kingdoms, and their princes received sovereignty independent of the German emperor. Thus the dissolution of the German empire was prepared, and on Aug. 1, 1806, sixteen princes of Southern and Western Germany threw off their allegiance to the emperor and formed a confederacy, the Rheinbund, or Rhenish Confederation, under the protectorate of Napoleon. On Aug. 6 the emperor, Francis II., abdicated the imperial dignity and crown of Germany, and assumed the title of Emperor of Austria, and after the war between France and Prussia most of the princes of Central and Northern Germany entered the confederacy, which continued till the war of liberation in 1813.

Rhenish Wines, or **Rhine Wines**: wine produced on and near the banks of the Rhine. See Wine and Wine-making.

Rhetoric [via O. Fr. from Lat. *rheto'rica* = Gr. ῥητορική (sc. τέχνη, art), the art of speaking or oratory, liter., fem. of ῥητορικός, pertaining to an orator, deriv. of ῥήτωρ, orator]: according to Aristotle, the art of persuasion; according to Whately, the art of conviction; according to Campbell, the art of discourse. Campbell's definition is to be preferred, as more comprehensive than either of the others, although Aristotle justly emphasizes the highest end of all rhetorical study. All writers on the subject agree in regarding rhetoric as an art (that is, a body of practical precepts), rather than a science; but precepts imply underlying principles, and there has been much question with reference to the science or sciences on which rhetoric is founded. Some—notably, Whately—have said logic; others—of whom Blair may be taken as an example—would seem to say æsthetics; still others—following Theremin—would say ethics. If rhetoric is founded upon any single science, it is unquestionably logic; but in so far as rhetoric is founded upon logic it is only mediately, through grammar. Grammar receives the material of thought elaborated into concepts, judgments, and reasonings, expresses them with *correctness* (that is, with due regard to purity, propriety, concord, and precision), and turns them over to rhetoric to be woven into discourse with clearness, energy, and elegance, and in adaptation to the special ends that the writer or speaker has in view. Grammar has to do with the sentence, rhetoric with the discourse. Grammar regards correct expression as an end in itself; rhetoric regards expression as merely a means to an end. Instead of regarding rhetoric as founded on a single underlying science, it is perhaps preferable to recognize three departments of rhetoric, corresponding to the three nomological sciences recognized by Sir William Hamilton: 1. *Inventive rhetoric*, founded on logic, having to do with the matter of discourse, and helping us to attain to the true; 2. *Æsthetic rhetoric*, founded on æsthetics, having to do with the form of discourse, and helping us to attain to the pleasurable; 3. *Ethical rhetoric*, founded on ethics, having to do with the purpose of discourse, and helping us to attain to that which we esteem good. In this classification it will be seen that a department of rhetoric is recognized corresponding to each of the three divisions which are ordinarily made of the human faculties—the intellect, the sensibilities, and the will—while yet, as these faculties are but so many manifestations of the unit of consciousness, we have a sufficient basis of unity.

Rhetoric, taken as a whole, may be viewed either as constructive or critical. Critical rhetoric embraces the study of rhetorical precepts and the study of literary models. Constructive rhetoric consists in the practical application of rhetorical precepts and the imitation of literary models. Objections have been made to the study of either branch of the art, but they are trivial in themselves, and inconsistent

with the practice of the best writers and speakers. The precepts of rhetoric are not the arbitrary enactment of any man or any body of men, but simply deductions from the generalized experience and observation of generations of writers and speakers, with which all who propose to write or speak will do well to familiarize themselves.

Rhetoric recognizes three forms of discourse:

1. *Representative discourse*, in which the matter is presented for its own sake, without especial purpose or especial regard to form. Under this head are treated (1) things —description; (2) facts—narration; (3) truths—exposition. Clearness, accuracy, and completeness are the prime essentials of representative discourse.

2. *Poetry*, in which the matter and the purpose are subordinate to the form. Under poetry the following classification may be recognized: (1) The poetry of thought, or didactic poetry; (2) the poetry of feeling, or lyric poetry; (3) the poetry of action, or epic poetry, and dramatic poetry. The prime essentials to poetry are, first, a poetic thought; second, poetic diction—to characterize either of which would fall under the province of a special discussion.

3. *Oratory*, which proposes an end to be attained, to which the matter and form of discourse are merely ancillary. The ancients recognized three kinds of oratory—demonstrative, judicial, and deliberative. Blair proposes to recognize, instead, the eloquence of popular assemblies, the eloquence of the bar, and the eloquence of the pulpit. If a classification of oratory be attempted at all, it is better to make the basis of classification the purpose, rather than the occasion, of its exercise. Oratory is commonly regarded by rhetoricians as the normal type of discourse, embodying the fullest and loftiest ideal of the art. The orator generally seeks to bring something to pass; hence he appeals not to the intellect or to the feelings alone, but to the will. He must sway the whole man, or he must fail in the object he has in view. It is especially necessary for him to study adaptation, and his discourse, while not deficient in clearness and not offensive to the taste of his hearers, must excel in energy.

Inventive rhetoric has to do with the choice of themes, the accumulation of material, and the disposition of material. It was much more fully treated by the ancient rhetoricians than by those of the present day, many of whom ignore it altogether, regarding it as a mere department of ethical rhetoric, which does, in fact, greatly limit it.

Ethical rhetoric has especially reference to the purpose contemplated in discourse. This purpose may be either (1) *enlightenment*—i. e. to develop in the mind a new cognition; (2) *conviction*—i. e. to lead the mind to adopt a given opinion; (3) *excitation*—i. e. to move the feelings; or (4) *persuasion*—i. e. to determine the will to action. Excitation is not regarded as a distinct end of discourse by many rhetoricians, since, ordinarily, we seek to excite emotion only that through emotion we may influence the will. But the distinct recognition of excitation is essential to a complete analysis of ethical rhetoric; the methods of excitation may be separately studied; and excitation is sometimes (as in demonstrative oratory and in certain kinds of poetry and fiction) an end in itself. In all discourse—but especially in oratory—some one of the purposes mentioned above dominates. It is the function of rhetoric to show how discourse may, in matter and manner, be made subservient to that purpose.

Æsthetic rhetoric has reference to style, or the art of expressing clearly, energetically, and elegantly, the products of inventive rhetoric in adaptation to the ends of ethical rhetoric. Under the head of style the things of prime importance are (1) naturalness; (2) adaptation; (3) clearness; (4) energy; (5) elegance. These characteristics of style are discussed, with greater or less fullness, in all rhetorical treatises. Clearness, the most important attribute of a good style, is admirably treated in *How to Write Clearly*, by Prof. E. A. Abbott, of the City of London School.

Figurative language (or language which deviates from the plain and ordinary method of describing an object or stating a fact) may be included under the head of style, since it tends to promote clearness by associating the object or fact under discussion with more familiar objects or events; energy, by associating the object or fact under discussion with more exciting objects or facts; elegance, by associating the object or fact under discussion with more pleasing objects or facts. Figurative language embraces *figures of speech*, which consist in a mere modification of the form of expression, and *figures of thought*, which involve an essential modification of the conception. These figures depend on three principles—(1) the principle of similarity; (2) the principle of dissimilarity; (3) the principle of association. Under the head of figures of speech come (1) alliteration, or the repetition of similar sounds at the beginning of successive words; e. g.

Apt alliteration's artful aid.—*Churchill.*

(2) Paronomasia, or the use of words in the same connection which are similar in sound, but dissimilar in sense; e. g.

Not on thy *sole;* but on thy *soul*, harsh Jew.—*Shakspeare.*

(3) Meiosis or litotes, in which an affirmative is represented by the negative of its contrary; e. g. "A citizen of *no mean* city" (*Paul*). (4) Pleonasm, which consists in the use of more words to express one's meaning than are strictly necessary, and which should be sharply discriminated from tautology, or the meaningless reiteration of thought. (5) Hyperbole, which consists in representing an object as larger than it really is, or stating a fact more strongly than is consistent with literal truth; e. g. "The English gain two hours a day by clipping their words" (*Voltaire*). (6) Climax, which consists in gradually rising, by more and more emphatic statements, to the fullest and most expressive utterance of thought; e. g. "Jesus of Nazareth pours forth a doctrine beautiful as light, sublime as heaven, and true as God" (*Theodore Parker*). Figures of speech comprise also ellipsis, asyndeton, polysyndeton, aposiopesis, epizeuxis, epanalepsis, and interrogation, for the careful discrimination of which references must be made to special treatises.

Under the head of figures of thought that are *founded on the principle of similarity* there are—(1) The simile, which is an expressed comparison; e. g. "*Like as* a father pitieth his children, *so* the Lord pitieth them that fear him." (2) The metaphor, which is an implied comparison; e. g. "I am the Good Shepherd, and know my sheep." Similes are more conducive to clearness, metaphors to energy. Either may be made conducive to elegance. The metaphor may be tested by reducing it to an equation of ratios: e. g. "The ship plows the sea" equals "The ship is to the sea as the plow is to the land." Any metaphor which will not submit to this test is radically defective, introducing more than four terms or suggesting an unreal similarity. Under this head are recognized also (3) the allegory, which is an extended metaphor. Bunyan's *Pilgrim's Progress* is the best example. (4) The fable, which is essentially similar to the allegory, although briefer, more obviously didactic, and characterized by the free endowment of the brute (and even the inanimate) creation with the attributes of reason and speech. The fables of Æsop will at once suggest themselves. (5) The parable, which is a religious allegory. (6) Personification, which regards things inanimate as if they were animate; e. g. "The pyramids, doting with age, have forgotten the names of their founders" (*Fuller*). Under this head, too, are included prosopopœia, vision, and apostrophe.

Under the head of figures of thought that are *founded upon the principle of dissimilarity* there are contrast, antithesis, irony, which hardly require to be characterized or exemplified.

Founded on the principle of association is metonymy, or a transference of names (Gr. μετά and ὄνομα), involving the substitution of—(1) The cause for the effect and *vice versâ*; e. g. "The Lord is *my song*. He is become my salvation." (2) The container for the thing contained; e. g. "He is a slave to the *bottle*." (3) The sign for the thing signified; e. g. "*The scepter* shall not depart from Judah." (4) The instrument for the agent: e. g. "*The pen* is mightier than the sword" (*Bulwer*). (5) The author for his works; e. g. "They have *Moses and the prophets*." (6) The place of manufacture for the thing made; e. g. "I prefer *Axminster* to *Brussels*."

Synecdoche must be classed under the head of similarity and dissimilarity combined; it is concerned with objects that are similar in kind, but dissimilar in extent or degree. By synecdoche one puts a part for the whole, as a sail for a ship, or a blade for a sword, etc. More specifically, synecdoche consists in the substitution of—(1) the concrete for the abstract; (2) the species for the genus; (3) the individual for the species; (4) the member for the individual; (5) the material for the thing made. Its employment is highly conducive to energy.

It falls within the province of rhetoric accurately to discriminate between the figures of speech which have been mentioned, and to give rules which shall facilitate their effective use.

The great masters of rhetoric among the Greeks were Aristotle and Longinus. Aristotle indeed may fairly be regarded as the father of the art. The second book of his *Art of Rhetoric*—in which he embodies a subtle analysis of the mental and moral characteristics to which the orator must adapt his discourse—is still of capital significance. The best modern commentator on Aristotle is Cope. Among the Romans the most eminent names are those of Cicero, Quintilian, and Horace. Of all the ancient rhetoricians, Quintilian is the most useful, and Horace the most attractive. Horace's *Epistle to the Pisos* (the material of which is largely borrowed from Aristotle) has been imitated by Vida in his *Poetics*, by Boileau in *L'Art Poétique*, and by Pope in his *Essay on Criticism*, and has thus exerted a widespread influence on modern style. Volckmar's *Die Rhetorik der Griechen und Römer* is a valuable compend of the results attained by the ancient rhetoricians.

Of English authors, mention should be made of Whately (best on conviction and persuasion), Blair (best on style), Kames (best on figurative language), and Campbell (best on the grammatical properties of style). De Quincey (*Historical Essays*, vol. ii.) has valuable essays on rhetoric and style; and Herbert Spencer's essays on style must not be overlooked. W. G. T. Shedd's *Literary Essays* and the same author's translation of *Theremin* contain valuable material. Of recent treatises on critical rhetoric, J. F. Genung's *Practical Rhetoric* is certainly the most popular and perhaps the best. More attention is now given, however, to constructive rhetoric, and Barrett Wendell's *English Composition* (a book of wider scope than its title indicates) is very helpful in this direction. J. H. Gilmore.

Rhett, Robert Barnwell: politician; b. at Beaufort, S. C., Dec. 24, 1800; was originally named Smith; adopted in 1837, with the other members of his family, the name of Rhett, in memory of an ancestor; was liberally educated; studied law; was elected to the State Legislature 1826; became attorney-general of South Carolina 1832; was one of the most pronounced advocates of State rights, nullification, and secession; was a member of Congress 1837–49, and U. S. Senator 1851–52; expressed himself openly in favor of a dissolution of the Union both in Congress and in the columns of the Charleston *Mercury*, the organ of the so-called fire-eaters, which he owned and conducted; was a leader in the State convention of South Carolina which passed an ordinance of secession Dec. 20, 1860; was chairman of the committee which reported the constitution of the Confederate States to the Montgomery convention Feb., 1861, and subsequently a member of the Confederate Congress. D. in St. James parish, La., Sept. 14, 1876.

Rhe'um: a genus of herbs of the Buckwheat Family (*q. v.*), natives of Siberia, the Himalayas, and Western Asia. See also Rhubarb.

Rheumatism [from Lat. *rheumatis'mus* = Gr. *ῥευματισμός*, rheum, deriv. of *ῥευματίζεσθαι*, have the rheum, deriv. of *ῥεῦμα*, flow, flux, rheum, deriv. of *ῥεῖν*, flow]: an acute or chronic disease affecting the joints and other structures, and characterized by signs of inflammation and by great pain. Some modern authorities would include it among the infectious diseases, but no specific microbe has been discovered, and for the present it must be regarded as a disease resulting from disturbed metabolism—that is, disturbed chemical action in the tissues and the blood. There are three principal kinds of rheumatism: acute and chronic articular rheumatism, and abarticular rheumatism, the last named including all forms affecting parts other than the joints.

Acute articular rheumatism generally begins at early adult age, and is apt to recur through life. Exposure is a strong determining cause, and its occurrence in certain families proclaims the hereditary tendency. After a short period of indefinite disturbance of health the joints swell and become red and extremely painful; there are fever, a tendency to excessive perspiration, especially at night, and general symptoms indicative of fever. The joints affected are usually the larger ones, like the ankle and knee, and as a rule several are diseased at once. The inflammation may subside very quickly in one joint and appear in another, and thus before the termination of the disease all of the large joints may be involved. On examination they are seen to be greatly swollen and inflamed, and are boggy from liquid exudation in the capsule. Rarely, however, does suppuration ensue. Under suitable care and nursing the disease generally subsides in six or eight weeks, but with treatment the duration is shorter. Few diseases, however, are so treacherous and so liable to relapse. Complications are numerous. By far the most important is acute endocarditis, which goes on to chronic organic disease of the valves of the heart. In other instances the pericardium, the membranes of the brain, or the pleuræ may be inflamed, and serious symptoms result.

Chronic articular rheumatism is a disease of old age. It may result from repetition of acute attacks or may come on as a chronic disease from the first. The joints are enlarged and frequently deformed and stiffened by fibrous adhesions of the bones composing them. Persons suffering with this malady may be comfortable at most times, but with every change of weather present symptoms similar to those seen in acute rheumatism, although less severe. The joints are swollen slightly, are a little red, and are painful. There is little or no fever or disturbance of the general health. Chronic rheumatic subjects are very liable to chronic bronchitis, to throat troubles, such as chronic tonsilitis or pharyngitis, and to eczema and other skin diseases.

Among the forms of rheumatism not affecting the joints the most important is muscular rheumatism. This disease is probably in reality an affection of the connective tissues binding the muscles together. It receives various names, according to the location of the disease; thus it is called *lumbago* when the muscles of the back are affected; *torticollis* or *wryneck* when the disease is located in the neck; *pleurodynia* when the intercostal muscles are implicated. Other forms of abarticular rheumatism, so called, are more of the nature of complications, but all of these doubtless occur in rheumatic persons entirely unassociated with joint symptoms. Thus there are rheumatic skin affections, inflammatory disease of the heart and blood-vessels, and rheumatic inflammations of the eye and very frequently of the tonsils.

The treatment of rheumatism has undergone many changes. Formerly reliance was placed mainly upon alkalies, which are given to restore the normal alkalinity of the blood and fluids of the body. More recently salicylic acid and its various combinations have been found to possess remarkable power to control the pain of rheumatism, and possibly they shorten the duration. Rest in bed and warmth are essential. Local treatment of the joints is useful in relieving the distress of the patient. Bland, unirritating diet, especially milk, is required. In chronic rheumatism iodide of potash, arsenic, and tonics are valuable, but the disease is difficult to cure. William Pepper.

Rhianus of Crete: Greek poet; flourished in the latter half of the third century B. C., and composed, among other epic poems, *The Story of Messene* (Μεσσηνιακά), the great source of Pausanias (*q. v.*) in his fourth book. B. L. G.

Rhinas'ter: See Rhinocerotidæ.

Rhine (Germ. *Rhein*; Lat. *Rhenus*): an important river of Europe. It is formed at Reichenau, in the canton of Grisons, in the Swiss Alps, at an elevation of 1,922 feet, by the union of two small streams, the Vorder and Hinter Rhein, the former of which, rising on the northeastern side of the mountain group of St. Gothard, at an elevation of 7,600 feet, is generally considered as the principal source. Immediately after its formation the Rhine is navigable for rafts and small craft, but during its whole upper course, from Reichenau to Basel, through Switzerland, the Lake of Constance, and along the frontier between Switzerland, Bavaria, and Baden, its navigation is difficult, and in many places entirely interrupted by rapids and cataracts, of which that of Schaffhausen, where the water suddenly leaps from a rock 70 feet high, is the most remarkable. During its middle course, from Basel to Cologne, it winds its way through a broad and fertile valley between the Vosges and the Schwartzwald —the Rheinthal, often called the "garden of Germany"— thence it flows, by a narrow gorge, through the plateau of the lower Rhine. In this latter part the Rhine is not only an important route of traffic, but it also presents some of the most beautiful scenery in the world, flowing along between vineclad hills, which now and then hem it in between steep, towering rocks crowned with old castles, and then again open into long, beautiful valleys. Its course from Cologne to the North Sea leads through low and level ground, and is uninteresting; it branches off into the Waal, Yssel, Leck, and Vecht, and reaches the ocean as a small stream, almost disappearing among the sandbanks of the shore. The entire length of the Rhine is 960 miles; its breadth at Basel is 750 feet; at Mentz, 1,500 feet; at its entrance into the Netherlands, 2,150 feet; its depth varies

from 5 to 28 feet; its elevation is 814 feet at Basel, 121 feet at Cologne. Its principal affluents are the Aar in Switzerland, the Neckar and Main in the Rheinthal, and the Lahn and Moselle in the highlands of the lower Rhine.

Revised by M. W. Harrington.

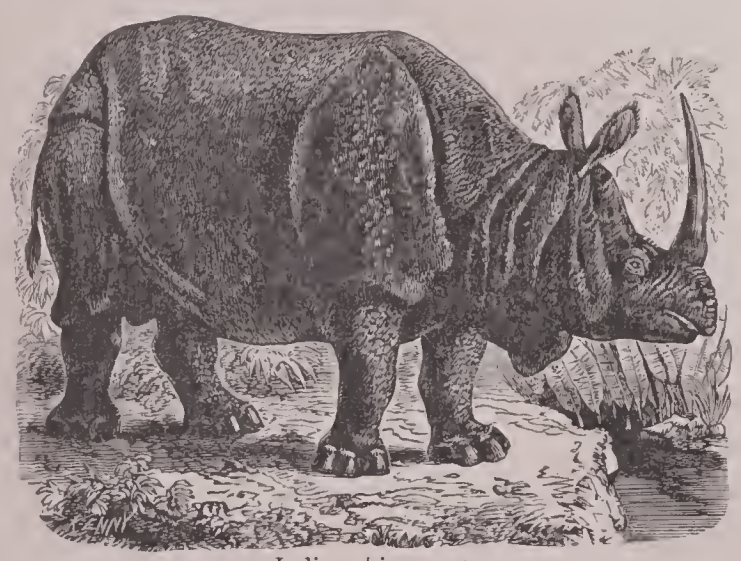
Rhinebeck: village; Rhinebeek town, Dntchess co., N. Y.; on the N. Y. Cent. and Hudson River (station name, Rhinecliff) and the Phila., Reading and New Eng. railways; 2 miles E. of the Hudson river, opposite Kingston, 15 miles N. of Poughkeepsie (for location, see map of New York, ref. 7–J). It is in an agricultural and stock-raising region, and is the chief shipping-point for the surrounding country. There are five churches, union free school with academic department, Starr Institute (founded in 1860), a national bank with capital of $125,000, a savings-bank, and a weekly newspaper. A part of the town was laid out for settlers from the Rhine palatinate in 1714, a precinct was organized in 1737, a hamlet named Rhinebeck Flats was laid out in 1792, and the hamlet was incorporated as a village in 1834. Pop. (1880) 1,569; (1890) 1,649; (1900) 1,494.

Editor of "Gazette."

Rhinelander: village; capital of Oneida co., Wis.; on the Wisconsin river, and the Chicago and N. W. and the Minn., St. P. and Sault Ste. Marie railways; 65 miles N. of Wausau, 255 miles N. by W. of Milwaukee (for location, see map of Wisconsin, ref. 3–D). It is in a lumbering region, has considerable milling and manufacturing interests, and contains a national bank with capital of $50,000, a State bank with capital of $50,000, and three weekly newspapers. Pop. (1890) 2,658; (1900) 4,998.

Rhinoceros: See Rhinocerotidæ.

Rhinocerot'idæ [Mod. Lat., named from *Rhino'ceros*, the typical genus, from Gr. *ῥινόκερως*, *ῥινοκέρωτος*, rhinoceros; *ῥίς*, *ῥινός*, nose + *κέρας*, horn]: a family of ungulate mammals embracing the various species combined under the popular name rhinoceros. They are distinguished by their massive form; short neck; long head: the presence in all the living forms of one or two horns on the middle of the nasal region, and the broad elavate feet, each of which has three toes. The teeth are M. $\frac{3}{3}$, P. M. $\frac{4}{4}$, C. $\frac{0}{0}$, I. variable—i. e. entirely wanting, $\frac{1}{2}$, or, in extinct forms, $\frac{2}{3}$; the upper molars have a continuous outer wall, are without complete transverse crests; the lower molars (P. M. 2, M. 3) have two curved transverse crests. The family embraces few recent species, which have been variously grouped, but appear to represent only two genera—(1) *Rhinoceros*, including the Asiatic species, which are distinguished by the elongate and free intermaxillary bones, the long upper incisor teeth, the produced nasal bones, and the skin corrugated by well-marked folds. To this genus belongs the Indian rhinoceros



Indian rhinoceros.

(*R. unicornis*), the largest of the group, having a single horn and the folds of skin unusually well developed. It is now restricted to a part of Nepal, Bhutan, and Assam, in Northeastern India. The genus also includes the smallest species, the Sumatran rhinoceros (*R. sumatrensis*), which has two horns. It ranges from Northeastern India to the Malay Peninsula, Sumatra, and Borneo. (2) *Rhinaster*, embracing the African species, in which the intermaxillary bones are very small and free, the upper incisor teeth wanting, the nasal bones broad and rounded, and the skin smooth and not corrugated. There are but two species, each having two horns. One of these, *R. simus*, improperly known as the white rhinoceros, is almost extinct, and the other, *R. bicornis*, is rapidly disappearing. In geological epochs other forms flourished, and one of these (*Cœlodonta*) survived long after the appearance of man on the globe; this form was distinguished by the union of the nasal and intermaxillary bones into one mass, and the ossification of the nasal septum. The existing species of the family are peculiar to Asia and Africa, but formerly the range of the family extended far northward into Europe and Siberia, and at a still earlier period the group was represented in North America.

Revised by F. A. Lucas.

Rhinthon of Tarentum: Greek poet; originator of the so-called *Hilarotragœdia* (*ἱλαροτραγῳδία*), a serio-comic treatment of tragic themes, drawn from Greek mythology. See Völker, *Rhinthonis fragmenta* (1887).

B. L. G.

Rhipæ'an Mountains (in Gr. *τὰ Ῥιπαῖα ὄρη*): in Grecian mythology, mountains lying in the extreme north (or west). Servius derived the word from *ῥίπτειν*, because the north wind came from these mountains. Ancient geographers identified them now with the Alps and now with the western outliers of the Ural range. See Hyperboreans, Hesperides, and Græ.

J. R. S. S.

Rhipidoglos'sa [Mod. Lat., from Gr. *ῥιπίς*, fan + *γλῶσσα*, tongue]: a term sometimes employed for the abalones, keyhole limpets, and allied molluscs, usually called *Zygobranchia*. See Gasteropoda.

Rhizocarps: See Plants, Fossil.

Rhizocephʹala: See Cirripedia.

Rhizome: See Morphology, Vegetable.

Rhizop'oda [Gr. *ῥίζα*, a root + *πούς*, *ποδός*, foot]: a class of Protozoa (*g. v.*) characterized by the ability of the individuals to extend temporary protoplasmic processes of the body by means of which locomotion is effected and food obtained (*pseudopodia*). There is no cell-wall, but the animals may secrete internal or external calcareous or siliceous skeletons, or they may form protective cases of horny matter or by cementing together solid particles found in the water in which they dwell. The Rhizopods (which live in the ocean, in fresh water, and in moist earth) are usually divided into the *Lobosa*, *Reticularia* (*Foraminifera*), *Heliozoa*, and *Radiolaria*; while the *Monera* of Haeckel differ from the *Lobosa* only in the fact that in them a nucleus has not yet been discovered. Here, too, may possibly belong those forms classed sometimes as *Mycetozoa* in the animal kingdom, sometimes as *Myxomycetes* or slime moulds in the vegetable kingdom. Reference should be made to the different divisions for descriptions of the forms included.

J. S. Kingsley.

Rhode Island: one of the U. S. of North America (North Atlantic group); the last of the thirteen original States that ratified the Federal Constitution; the smallest State in the Union, and the thirty-fourth in population in 1900.

Location and Area.—It lies between lat. 41° 18′ and 42° 3′ N., and lon. 71° 8′ and 71° 53′ W.; is bounded on the N. and E. by Massachusetts, on the S. by the Atlantic Ocean, and on the W. by Connecticut; extreme length from N. to S., 48 miles; extreme width from E. to W. about 37 miles; area, 1,250 sq. miles (800,000 acres), of which 165 sq. miles is water surface.

Rhode Island seal.

Physical Features. — Narragansett Bay, extending inland about 30 miles, divides Rhode Island into two unequal parts. The surface of the State is for the most part hilly, though the hills never rise to any great height, Durfee Hill, the highest point of land, rising only 805 feet above the sea-level. Extensive salt-marshes border the ocean. In Narragansett Bay are many islands. Of these the most widely known is Rhode

RHODE ISLAND

Scale of Miles
0 1 2 3 4 5 10
County Towns ⊙

Longitude West from Greenwich

island, from which the State derives its name, and upon which Newport is situated. This island was named Roodt Eylandt (the Red island) by Adrian Block, when early in the seventeenth century he cast anchor in the bay, because of the red clay along its shores. Its Indian name was Aquidneck. Other islands in the bay are Canonicut, Prudence, Patience, Hope, Perry, Dyer's, Dutch, and Starve Goat. Block island, so named from Adrian Block, is 10 miles from the mainland. The principal rivers are the Pawcatuck, the Pawtuxet, and the Pawtucket, which is navigable as far as Pawtucket, and above Pawtucket Falls becomes the Blackstone. The Pawcatuck forms part of the boundary between Rhode Island and Connecticut.

Geology.—The western half of the State and a small tract along the east shore of Narragansett Bay are Eozoic, belonging to the same formation as that of Eastern Connecticut and Central and part of Southeastern Massachusetts; but a tract covering all the islands of Narragansett Bay and part of its west shore, and extending N. E. into Bristol co., Mass., belongs to the Carboniferous era, and forms the extreme eastern bed of anthracite in the U. S. Block island belongs to the Tertiary era.

Soil and Productions.—Little attention is paid to agriculture. The soil is stony, and, as a rule, unfruitful. Farm production is steadily declining as manufactures increase. Some market-gardening is carried on profitably on a large scale, especially in Cranston. The gardeners depend upon irrigation to secure their crops.

The following summary of the census reports of 1880 and 1890 shows the extent of farm operations in the State:

FARMS, ETC.	1880.	1890.	Per cent.*
Total number of farms	6,216	5,500	11·5
Total acreage of farms	514,813	469,281	8·8
Total value of farms, including buildings and fences	$25,882,079	$21,873,479	15·3

* Decrease.

The following table shows the acreage, yield, and value of the principal crops in the calendar year 1900:

CROPS.	Acreage.	Yield.	Value.
Corn	8,197	262,304 bush.	$175,744
Oats	3,705	114,484 "	43,504
Barley	312	8,736 "	6,727
Potatoes	7,428	698,232 "	488,762
Hay	72,278	66,496 tons	1,243,475
Totals	91,920	.....	$1,958,212

The farm animals on Jan. 1, 1900, comprised 10,384 horses, value $896,906; 25,256 milch cows, value $1,008,977; 10,149 oxen and other cattle, value $302,788; 10,608 sheep, value $40,974; and about 10,000 swine, value $140,000—total head, 66,397; total value, $2,389,645.

The anthracite coal of this region is not regarded as equal in quality to that of the Pennsylvania field, and the coal lies so near the bottom of the bay that it can not be mined safely in most places. The deposit became known in 1809, and is estimated to contain 38,000,000 tons. For smelting iron and copper it is the best known. Until 1880, about 15,000 tons were mined annually. Since then the production has ceased. Graphitic coal, sold under the name of graphite, is mined in Cranston for blast furnaces. Iron Rock Hill, in Cumberland, is an immense mass of magnetic iron. More than 6,000,000 cubic feet of it is above natural drainage. In the town of Lincoln the business of lime-burning has been steadily carried on for more than 200 years. The lime burned at Lime Rock is the best in quality in the U. S. There are in the State about twenty granite quarries, the most noted of which are in Westerly, where the granite is specially valuable for monumental work.

Climate.—The climate, as a whole, is variable, yet not so much so as that of the other portions of New England, or indeed of the eastern parts of Massachusetts. The cold east winds that afflict Boston are here almost unknown. The presence of such a large body of salt water as Narragansett Bay has undoubtedly much to do with this. At Newport, and in the southern parts of the State generally, by reason of the proximity of the Gulf Stream the climate is warm and moist. The rainfall in the eastern part (average for forty-three years 40 inches) is less than that of the western part, which frequently reaches 44 inches. The average fall at Providence for forty-three years was 44·81 inches.

Divisions.—For administrative purposes the State is divided into five counties and has thirty-two towns, four cities, and one district. Providence is the capital. Until 1899 there were two capitals, Providence and Newport.

COUNTIES AND COUNTY-TOWNS, WITH POPULATION.

COUNTIES.	*Ref.	Pop. 1890.	Pop. 1900.	COUNTY-TOWNS.	Pop. 1900.
Bristol	8-O	11,428	13,144	Bristol	6,901
Kent	8-M	26,754	29,976	East Greenwich	2,775
Newport	9-O	28,552	32,599	Newport	22,034
Providence	7-N	255,123	328,683	Providence	175,597
Washington	10-M	23,649	24,154	Kingston	.....
Totals	.....	345,506	428,556		

* Reference for location of counties, see map of Rhode Island.

Principal Cities and Towns, with Population for 1900.—Providence, 175,597; Pawtucket, 39,231; Woonsocket, 28,204; Newport, 22,034; Warwick, 21,316; Central Falls, 18,167; Cranston, 13,343; East Providence, 12,138; Lincoln, 8,937; Cumberland, 8,925; Westerly, 7,541; Bristol, 6,901; Burrillville, 6,317; Coventry, 5,279; Johnston, 4,305.

Population and Races.—In 1880, 276,531; 1890, 345,506 (native, 239,201; foreign, 106,305; males, 168,025; females, 177,481; white, 337,859; colored, 7,647, of whom 7,393 were persons of African descent, 69 Chinese, 5 Japanese, and 180 civilized Indians). In 1895 the population was 384,758.

Industries and Business Interests.—The census returns of 1890 showed that 3,377 manufacturing establishments reported. These had a combined capital of $126,483,401, employed 85,976 persons, paid $37,927,921 for wages and $76,253,023 for materials, and had products valued at $142,500,625. In the assessed valuation of property *per capita* the State ranks second in the Union. Its valuation is $931.28. In the manufacture of cotton goods it is surpassed only by Massachusetts, having 94 establishments with a capital of $38,798,161. These mills contained 1,924,486 spindles and 43,106 looms, a greater number than in all the Southern States with their 239 establishments, or in the Middle States, also with 239 establishments. One firm in Providence manufactures more cotton than any other in the world; it operates more than 400,000 spindles. The business of cotton-manufacturing in the U. S. began in Rhode Island in 1790, when Samuel Slater set up his machines for spinning by water-power at Pawtucket. In dyeing and finishing textiles the State is third in the Union (Massachusetts and Pennsylvania surpassing it), with 22 establishments, and a capital of $6,318,480. In combined textiles there were 182 establishments with a capital of $64,959,778, the State ranking fourth. The State ranked also fourth in the wool industry, having 91 establishments with a capital of $28,886,337. There were also six idle mills. The manufacture of woolens began at Peacedale in 1804. The iron and steel business has almost ceased to exist; but in foundry and machine-shop products there were 57 establishments in Providence with a capital of $7,519,742. In the manufacture of jewelry Providence ranked first in the U. S., having 167 establishments with a capital of $7,104,161. Four silverware manufactories with a capital of $3,055,770 were also located there. Pawtucket, with its diversified industries, had an aggregate capital of $14,208,632 invested in manufacturing. Bristol is famous for the yachts constructed there.

Finance.—The official report on State finances for 1900 showed a balance on Jan. 1, 1900, of $52,557.28; receipts, $1,481,479.75; expenditures, $1,355,447.95; balance on Jan. 1, 1901, $178,589.08. On the latter date the total bonded debt was $2,300,000.

Banking.—On Sept. 5, 1900, there were 45 national banks, with a combined capital of $14,680,250; surplus and profits of $5,006,716.12, and deposits of $17,405,131.03; on June 30, 4 State banks, with capital of $495,000, surplus and profits of $147,923, and deposits of $720,580; 6 loan and trust companies, with capital of $2,940,741, surplus and profits of $2,834,792, and deposits of $40,582,389; and 29 mutual savings-banks with a surplus fund of $3,311,420, and $73,489,533 in savings-deposits from 142,096 depositors.

Post-offices and Periodicals.—In Jan., 1901, there were 146 post-offices, of which 20 were presidential (3 first-class, 4 second-class, 13 third-class) and 126 fourth-class, with 109 money-order offices, and 23 money-order stations. There were 58 periodicals—12 daily, 1 tri-weekly, 2 semi-weekly, 30 weekly, 1 bi-weekly, 11 monthly, and 1 quarterly.

Means of Communication.—According to the report of the railway commissioner in Jan., 1901, the capital stock of the steam roads owned and operated in the State is $105,582,475; total indebtedness, $71,855,919.04; total receipts, $43,858,-

651.32; net earnings, $6,614,602.44; miles of road in this State, 209 +; miles single track, 435. The capital stock of the electric roads is $16,582,000; total indebtedness, $4,410,-054.70; total receipts, $2,609,572.26; expenditures, $1,644,-029.26; net earnings, $965,543; miles of road in this State, 208 +; miles single track, 248. Various steamship lines connect Providence with the other towns upon the bay, and with New York, Philadelphia, Norfolk, and Baltimore.

Churches.—The census of 1890 gave the following statistics of the religious bodies having a membership of 500 and upward each in the State:

DENOMINATIONS.	Organizations.	Churches and halls.	Members.	Value of church property.
Roman Catholic	51	52	96,755	$2,295,700
Baptist, Regular	68	75	12,055	1,151,960
Protestant Episcopal	50	63	9,458	1,189,700
Congregational	34	42	7,192	905,800
Methodist Episcopal	39	40	6,064	495,000
Baptist, Free-will	26	28	3,252	226,757
Unitarian	6	7	1,595	393,500
Baptist, Seventh-day	7	7	1,271	55,700
Universalist	10	10	998	301,500
Christian	8	8	972	48,800
Advent Christian	12	12	950	27,450
Jews	5	5	910	45,000
Friends, Orthodox	11	11	617	58,800
Presb. in the U. S. of America	4	4	608	61,000
African Methodist Episcopal	4	4	595	95,000

Schools.—The principal educational institution of the State is BROWN UNIVERSITY (*q. v.*). Other superior institutions are the Rhode Island College of Agriculture and Mechanic Arts, with large agricultural experiment farm, in Kingston; the Rhode Island School of Design and the State Normal School, in Providence. In 1899 there were 64,537 children enrolled in the public schools, with an average attendance of 46,087. There were 534 schools, and 1,913 teachers, receiving an average monthly salary of $77.37. The value of school property was $5,175,045; expenditure for schools $1,570,895.

Libraries.—According to a U. S. Government report on public libraries of 1,000 volumes and upward each in 1891, Rhode Island had 73 libraries, which contained 481,729 bound volumes and 85,141 pamphlets. The libraries were classified as follows: General, 54; school, 5; college, 1; law, 1; medical, 1; public institution, 3; Y. M. C. A., 2; historical, 2; garrison, 2; society, 1; and unreported, 1. In the year ending June 30, 1900, 50 public libraries received aid from the State board of education.

Charitable, Reformatory, and Penal Institutions.—The charitable institutions comprise the Butler Asylum for the Insane, opened 1847; the Rhode Island Hospital, 1868; the State Home and School for Children, 1885; the Rhode Island Institute for the Deaf, 1893—all in Providence; and the State Soldiers' Home, 1891, in Bristol. The reformatory and penal institutions are located on the State farm of about 538 acres, in Cranston, and comprise the State Workhouse and House of Correction, the State Asylum for the Incurable Insane, the State Almshouse, the State Prison and Providence County Jail, the Sockanosset School for Boys, and the Oaklawn School for Girls, the two last being departments of the State Reform School.

Political Organization.—The Governor, general State officers, and members of the Legislature are elected annually. The Governor has no veto power. He exercises the pardoning power only "by and with the advice and consent of the Senate." The Lieutenant-Governor is a member-at-large of the State Senate, which numbers, besides thirty-six members, one from each of the thirty-two towns and four cities. The representation in the lower house is unequal. Its membership is limited to seventy-two. Each town and city must have one representative, but no town or city may have more than one-sixth of the whole number. Thus the city of Providence, with its population of almost 150,000 in 1894, had but twelve representatives. This principle of representation accounts for the peculiar existence of the district of Narragansett. In 1888 this district was taken from South Kingstown, and given all the powers of a town except representation in the General Assembly. Every male citizen of the age of twenty-one years, who has been a resident of the State two years and of the town or city six months, is entitled to vote in town and ward meetings and in the election of all civil officers, if registered on the last day of the preceding December. No person may vote in the election of city councils, or on any proposition involving the expenditure of money, unless he has paid a tax in the year preceding on property valued at least at $134. Every male citizen of the age of twenty-one, who has been a resident of the State one year and of the town or city six months, may vote on all questions and in all elections if he possesses in his own right real estate valued at $134. Until 1894 a majority of votes was necessary to an election by the people, but in that year a plurality amendment was adopted.

History.—The founder of the colony was ROGER WILLIAMS (*q. v.*). In the winter of 1635–36 he was ordered to leave the colony of Massachusetts Bay within six weeks, under penalty of being sent back to England. He fled to the Narragansett country, and in 1636 settled near the mouth of the "Moosh-ausick" river and gave his place of abode the name Providence, "because of God's merciful providence to him in his distress." The first written compact that has come down to us from the settlers of Providence sets forth the ideas which ever after governed the colony. In it the subscribers promise to subject themselves "in active or passive obedience to all such orders or agreements as shall be made for the public good . . . only in civil things." The utmost liberty was allowed in matters of religion. It was by request of the colonists that the patent obtained by Williams limited the authority to be exercised under it to civil matters. The colony originally consisted of four towns—Providence (1636), Portsmouth (1638), Newport (1639), and Warwick (1642). The executive heads of Portsmouth and Newport were called judges until 1640, when on the union of the towns the executive was called governor. Providence and Warwick had no executive head until 1647, when the four towns were united under a patent granted by Parliament in 1643. This was too feeble an instrument to answer the purposes of a charter. It produced a confederacy, not a union, and allowed the magistrates of the various towns to usurp dictatorial powers. In 1651 the two island towns separated from those on the mainland, and in 1654 they were reunited. In 1663 a charter was obtained from Charles II. This instrument was remarkably liberal. In its provision that no person should be "in anywise molested, punished, disquieted, or called in question for any differences in opinion that do not actually disturb the civil peace," it used almost the exact words of Charles's famous Declaration from Breda, which in 1660 had done so much to secure to him the throne of England. Under this charter the colony and State of Rhode Island and Providence Plantations were governed for 179 years. Rhode Island opposed the policy of the other colonies which led to King Philip's war, and yet suffered most severely from that war. King Philip was killed in what is now the town of Bristol. In the Narragansett country, in 1675, was fought the "great swamp fight," when more than a thousand Indians lost their lives. In 1686–87 Sir Edmund Andros suspended the charter, though he was not able to get possession of the document. On his deposition in 1690 the government was reorganized under it. Early in the nineteenth century it was seen that the charter had become too antiquated for the needs of the State, and repeated efforts were made to replace it with a constitution; but the General Assembly was supreme. It was dominated by the county-towns, which did not propose to surrender their power to the large seaport settlements. In 1841 a people's convention, not ordered by the General Assembly, met and framed a constitution. This illegal action precipitated a crisis. (See DORR REBELLION.) A new convention was soon called. The present constitution was prepared in Nov., 1842, ratified by the people, and put in operation 1843. The defect of the charter was its provision for a limited suffrage. In 1840, out of a population of 108,830, about 9,500 men composed the electorate. Not until 1888 were the present suffrage laws adopted.

With its privateers Rhode Island took a conspicuous part in all the wars waged upon the ocean in which Great Britain was engaged. When the news of the declaration of the war with Spain reached the colony in 1740 six vessels of war were at once placed in commission. In 1756 there were upon the ocean fifty Rhode Island privateers manned by 1,500 sailors. Privateering was ever a favorite pursuit, and in the Revolutionary war great wealth came into the colony from this source. In the war of 1812 the privateer Yankee of Bristol took more prizes than any other privateer hailing from the U. S., and sent into Bristol more than $1,000,000 as the profit from her six cruises. Commodore Oliver Hazard Perry, of Rhode Island, and his sailors made the naval renown of the State immortal in the battle of Lake Erie.

The colony first suggested to Congress the establishment of a navy. This was natural, as naval hostilities began in Rhode Island. In June, 1772, his Majesty's armed schooner

Gaspee was burned in Narragansett Bay by an expedition led by Abraham Whipple. Her commander was wounded in the fight. This was the first British blood shed in consequence of open organized rebellion before the Revolution began. The Gaspee had made herself particularly obnoxious by needless severity in enforcing the revenue laws. Of the thirteen frigates voted by Congress at the beginning of the war two were ordered to be built in Rhode Island. The colony contributed largely of men and money to the Revolutionary armies. Its most eminent soldier was Gen. Nathanael Greene (*q. v.*). It suffered greatly during the war, and but for this conflict Newport might have continued to be a great commercial center. In 1776–79 the city was held by British troops, and frequent expeditions were sent out from it against the other towns upon the bay. In one Bristol was bombarded, and in another burnt. In 1780 the French allies made Newport their headquarters.

Rhode Island was the last of the thirteen colonies to enter the Union. Its commerce was then very great. A greater number of vessels belonged to Providence than to New York, and many vessels were owned in Newport and Bristol. From early days trade was carried on not only with the West Indies and Europe, but also with the East Indies. For the first seventy-five years of its existence the colony had been engaged with its neighbors in a struggle for its life. For more than a century and a half it had enjoyed a degree of civil and religious freedom unknown in the other colonies. Now it stood forth as the champion of State's rights. As a whole, it saw danger to its commerce if it entered the Union, even though the seaports greatly desired it. The influence of the country towns was sufficient to postpone the adoption of the Constitution until 1790.

GOVERNORS OF RHODE ISLAND.

COLONIAL.

Presidents under the Patent.

John Coggeshall	1647–48
William Coddington	1648–49
John Smith	1649–50
Nicholas Easton	1650–51

The Division (1651–54).

(*a*) *Providence and Warwick.*

Pres. Samuel Gorton	1651–52
Pres. John Smith	1652–53
Pres. Gregory Dexter	1653–54

(*b*) *Portsmouth and Newport (1651–54).*

Pres. John Sanford, Sen.	1653–54

Reunion of Towns (1654–63). Presidents.

Nicholas Easton	1654
Roger Williams	1654–57
Benedict Arnold	1657–60
William Brenton	1660–62
Benedict Arnold	1662–63

Royal Charter Governors.

Benedict Arnold	1663–66
William Brenton	1666–69
Benedict Arnold	1669–72
Nicholas Easton	1672–74
William Coddington	1674–76
Walter Clarke	1676–77
Benedict Arnold*	1677–78
William Coddington,*	Aug. to Nov., 1678
John Cranston,*	Nov., 1678–Mar., 1680
Peleg Sanford	1680–83
William Coddington, 2d	1683–85
Henry Bull	1685–86
Walter Clarke,†	May to June, 1686
Henry Bull	Feb. to May, 1690
John Easton	1690–95
Caleb Carr*	May to Dec., 1695
Walter Clarke	1696–97
Samuel Cranston*	1698–1727
Joseph Jencks	1727–32
William Wanton*	1732–33
John Wanton*	1734–40
Richard Ward	1740–43
William Greene	1743–45
Gideon Wanton	1745–46
William Greene	1746–47
Gideon Wanton	1747–48
William Greene	1748–55
Stephen Hopkins	1755–57
William Greene*	1757–58
Stephen Hopkins,	1758–62, 1763–65, and 1767–68
Sam. Ward	1762–63, 1765–67
Josias Lyndon	1768–69
Joseph Wanton ‡	1769–75

STATE GOVERNORS UNDER THE CHARTER.

Nicholas Cooke	1775–78
William Greene, Jr	1778–86
John Collins	1786–90
Arthur Fenner*	1790–1805
Paul Mumford (acting)*	1805
Henry Smith (acting)	1805–06
Isaac Wilbour (acting)	1806–07
James Fenner	1807–11
William Jones	1811–17
Nehemiah R. Knight	1817–21
William C. Gibbs	1821–24
James Fenner	1824–31
Lemuel H. Arnold	1831–33
John B. Francis	1833–38
William Sprague	1838–39
Samuel W. King	1839–43

GOVERNORS UNDER THE CONSTITUTION.

James Fenner	1843–45
Charles Jackson	1845–46
Byron Diman	1846–47
Elisha Harris	1847–49
Henry B. Anthony	1849–51
Philip Allen	1851–53
Francis M. Dimond (act.)	1853–54
William W. Hoppin	1854–57
Elisha Dyer	1857–59
Thomas G. Turner	1859–60
William Sprague	1860–63
Wm. C. Cozzens (acting)	1863
James Y. Smith	1863–66
Ambrose E. Burnside	1866–69
Seth Padelford	1869–73
Henry Howard	1873–75
Henry Lippitt	1875–77
Charles C. Van Zandt	1877–80
Alfred H. Littlefield	1880–83
Augustus O. Bourn	1883–85
George P. Wetmore	1885–87
John W. Davis	1887–88
Royal C. Taft	1888–89
Herbert W. Ladd	1889–90
John W. Davis	1890–91
Herbert W. Ladd	1891–92
D. Russell Brown	1892–95
Charles W. Lippitt	1895–97
Elisha Dyer	1897–1900
William Gregory	1900–

* Died in office. † Charter suspended till 1689. ‡ Deposed.

Authorities.—*Rhode Island Colonial Records*, 10 vols.; Arnold's *History of Rhode Island* (2 vols., New York, 1860).

Wilfred H. Munro.

Rhodes [from Lat. *Rho'dus* = Gr. Ῥόδος, Rhodes]: a mountainous island between the Grecian Archipelago and Mediterranean; the largest and most S. E. of the Sporades; 9 miles S. of the nearest point in Asia Minor (see map of Greece, ref. 18–O). Area, 420 sq. miles. The climate is healthful and delightful, the soil fertile, producing figs, oranges, olives, and grapes. Sponges of the finest quality are found all along the coast, and constitute an important industry. Pop. of island 36,000, mainly Greeks, with a few Jews and Ottomans. Famous in mythology, Rhodes was during the classic period by turns a great independent maritime power and the ally or victim of the Persians, Lacedemonians, and Athenians. It was famous for its artists, poets, and philosophers, and for its Colossus, one of the Seven Wonders of the world, thrown down by earthquake 224 B. C. Overrun by Moaviah, general of Omar, in the seventh century, it subsequently belonged to the Byzantine empire, and repelled invasions of the Arabs, Genoese, and Seldjuk Turks. In 1309 Foulques de Villaret, grand-master of the Knights of St. John of Jerusalem, made it the headquarters of his order. During 214 years it was the southern bulwark of Christendom against the Mussulmans. The capital, Rhodes, endured a forty-four days' siege by the Egyptians in 1444, and repulsed Mohammed II. after a siege of three months in 1480. In 1522 the grand-master, Villiers de l'Isle-Adam, with 4,500 soldiers and 600 knights, withstood during five months the Ottoman fleet of 300 ships and 100,000 soldiers commanded by Suleïman I. himself. This resistance is one of the most glorious exploits of martial Christianity. When unable to hold out longer the knights were granted an honorable capitulation. On Jan. 1, 1523, accompanied by 400 of the inhabitants, they abandoned the island, which since that time has belonged to the Ottomans. The capital, situated on a splendid harbor at the northern extremity of the island, presents an imposing appearance with its lines of maritime fortifications. The streets are for the most part narrow and winding. Armorial remains and historic monuments of all sorts, together with its natural features, render the city one of the most interesting in the Archipelago. It is the seat of a Greek archbishopric. Pop. of city (1889) 14,000.

E. A. Grosvenor.

Rhodes, Cecil, D. C. L.: statesman: b. in Hertfordshire, England, July 5, 1853; went to South Africa and became interested in the Kimberley mines, amassing a great fortune. Entering into Cape politics, he represented West Barkly for a short time, and afterward held a position in the ministry of Sir T. Scanlon. In 1890 he became prime minister, but resigned Jan. 6, 1895, on account of his supposed connection with Jameson's raid into the Transvaal. To his energy was due the acquisition of mining rights over Mashonaland. As chairman of the British South Africa Company, he was prominent in the difficulty with Lobengula. His policy aimed at the removal of race prejudices, and the establishment, under the British flag, of a federal dominion composed of Cape Colony, Natal, the South African Republic, and other countries of South Africa. He received the degree of doctor of civil law from Oxford University in 1899.

Rhodes, Inner and **Outer**: See Appenzell.

Rhodesia: See the Appendix.

Rho'dium [Mod. Lat., from Gr. ῥόδον, rose. So called from the color of some of its compounds]: a metal found in 1804 by Wollaston associated in small quantity with native platinum. The process of obtaining it from the platinum residues is complex, and will be found described in the chemical text-books. Rhodium is whitish gray and very hard; highest density when fused, 12·1; atomic weight, about 104. It is one of the most infusible metals, but may be fused in the oxyhydrogen quicklime furnace of Deville. When pure, it is not acted on by the most powerful acids, but in alloy with some of the other metals it may be dissolved in aqua regia. Fusion with saltpeter oxidizes it easily, and even fusion with sulphate of potash converts it into a soluble double salt. Chlorine combines with it at a red heat, forming a soluble chloride. It forms four oxides (RdO, Rd_2O_3, RdO_2, and RdO_3). The first two are insoluble in the strongest acids, and the third almost so.

Revised by Ira Remsen.

Rhodium, Oil of: a balsamic volatile oil obtained from Canary island rosewood, the woody root of two convolvulaceous plants, *Rhodoriza scoparia* and *R. florida*. The oil is employed as a perfume, and to attract fishes and game to traps of various kinds. Horses are very fond of the odor.

Rhododen'dron [Mod. Lat., from Gr. *ῥοδόδενδρον*, oleander; *ῥόδον*, rose + *δένδρον*, tree]: a large genus of plants of the heath family (*Ericaceæ*), comprising trees, shrubs, and rootlet-climbing epiphytes, with entire, alternate evergreen, or rarely deciduous leaves, and showy flowers in terminal clusters; these with funnel-form five-lobed corollas and usually ten declining stamens. Passing S. of the equator only into Java and the neighboring islands, the rhododendron is found throughout the mountainous districts of the northern hemisphere. The greatest number of species occurs in the high mountain regions extending from Java and Borneo on the S. to Yun-nan and the Sikkim Himalaya in the N. Several are found in China and Japan, two reach Kamtchatka, and one Alaska. The arctic *R. lapponicum* of Lapland and Greenland occurs in the alpine region of the White Mountains of New Hampshire. The only two other European species are *R. ferrugineum* and *R. hirsutum*, the *Alpenrosen* of the Swiss Alps. The species peculiar to North America are, on the Atlantic side, *R. maximum*, which occurs sparingly as far N. as Canada, and abundantly throughout the whole length of the Alleghany Mountains; *R. catawbiense*, a lower and earlier-flowered species on the higher mountains from Virginia southward; and *R. punctatum*, a graceful but less showy species of the middle country of the Southern States E. of the mountains. In the higher Northern Rocky Mountains there is a peculiar deciduous-leaved species, *R. albiflorum*; in Oregon, *R. macrophyllum*, apparently near *R. maximum*; in California, *R. californicum*, nearer *R. catawbiense*, but taller, and with more showy blossoms. The contrast in the size attained by the different species of this genus is as remarkable as its geographical range is extensive. The arctic *R. lapponicum* is but a few inches high, while *R. rollissonii* of Ceylon attains a height of 30 feet, with a stem over a foot in diameter. The useful properties of this genus are few and unimportant; the Siberian *R. chrysanthum*, however, supplies a narcotic sometimes used medicinally. Horticulturally, rhododendrons play a more important part. Several of the South Asiatic species are conspicuous inhabitants of conservatories, the best suited for such cultivation being *R. arboreum*, *R. dalhousiæ*, *R. argentium*, *R. hodgsoni*, *R. javanicum*, and *R. jasminiflorum*. Of hardy species, the most so in the northern parts of the U. S. is the Siberian *R. dauricum*, with small deciduous leaves and rose-colored flowers, appearing very early in the spring; but to the patient skill of the hybridizer we owe a race of hardy rhododendrons with showy flowers and foliage, and of greater horticultural value than any of the original types. These hybrids, the result of crossing the Alleghany *R. catawbiense* with the Eastern *R. ponticum* or with the Indian *R. arboreum*, are deservedly more generally planted than any other rhododendrons. Loving moisture and unable to withstand the severe summer droughts so common in many parts of the U. S., and not thriving in soils strongly impregnated with lime, the rhododendron as a garden-plant can be successfully cultivated only in the Atlantic States from Massachusetts to Virginia. To develop its greatest beauty the rhododendron should be planted in well-drained peat or in soil largely composed of decaying leaf-mould, and situations should be selected for it somewhat protected from the winter sun, the greatest enemy, with the summer droughts, to all evergreens in the U. S.

C. S. Sargent.

Rhodope, rod'ō-pē̆ (in Gr. *Ῥοδόπη*): a lofty mountain range in Thrace, noted in poetry as the scene of the revels of the Bacchantes, or female followers of Dionysus.

Rhône, rōn: a department of France, bordering E. on the Saône and Rhône, and comprising an area of 1,077 sq. miles. It is mountainous, covered with offshoots of the Cévennes, but with the exception of some fertile valleys the soil is mediocre. Copper, iron, and lead are found; excellent wine is produced, and the manufactures of silk and muslin are of great importance. Pop. (1896) 839,329.

Rhône (anc. *Rho'danus*): a river of France which rises in Switzerland, in the Alps, on the western side of the St. Gothard, flows through the Lake of Geneva, crosses the Jura Mountains, turns at Lyons, where it receives the Saône, to the S., and falls, 644 miles distant, into the Mediterranean, through two branches which form the island of Camargue. Its lower course is through swampy and unhealthful districts, but its whole middle course leads through beautiful and fertile regions producing some of the finest wines of France. It is everywhere very rapid, and the difficulty of navigation caused by the rapidity of the current is increased by the suddenly shifting sandbanks and other obstructions, especially near the mouth. An extensive system of canals connects the river with the Mediterranean, and with the Seine, Loire, Garonne, and (by the Saône) the Rhine.

Rhopaloc'era [from Gr. *ῥόπαλον*, club + *κέρας*, horn]: the group of butterflies, the name being given in allusion to the club-shaped antennæ. See Lepidoptera.

Rhotacism: the change of an *s* (*z*) to *r*; a technical term in historical grammar. The voiced form of *s*, i. e. *z*, shows a tendency in many different languages to become *r*. The sound of *r* as it appears, for instance, in English differs from *z* only in a slight retraction and elevation of the tip of the tongue. Rhotacism appears, e. g., in the Teutonic languages (except Gothic) where a medial *s* is preserved, but a medial *z* becomes *r*; thus Eng. *was* : *were*; *lose* : *forlorn* (Germ. *verloren*); also in Lat. between vowels; thus *generis* for **genesis*, cf. *genus*; *dirimo* for **dis-imo*, cf. *dissilio*; in certain Greek dialects as Laconian and Elean; cf. Laconian, *σιός* = *θεός*, Elean, *τίρ* = *τίς*.

Benj. Ide Wheeler.

Rhubarb [viâ O. Fr. from Late Lat. *rheubar'barum*, from Gr. *ῥῆον βάρβαρον*; *ῥῆον*, rhubarb, liter., the plant from the Rha or Volga (Gr. *Ῥᾶ*) + neut. of *βάρβαρος*, foreign]: a plant of the genus *Rheum*, or its root employed in pharmacy. The botanical source of the drug is not definitely known, the *United States Pharmacopœia* defining it as the root of *Rheum officinale* and other undetermined species of *Rheum*, the *British* as the sliced and dried root of *Rheum palmatum*, *R. officinale*, and probably other species collected and preserved in China and Tibet. A specimen of *Rheum* was obtained through French missionaries in 1867 and sent to France, where it flowered at Montmorenci in 1871. It seemed to correspond in all respects with the descriptions of the true rhubarb-plant, such as they are, and the root was apparently identical with the Asiatic rhubarb of commerce. This species has been described by Baillon under the name of *R. officinale*. Rhubarb has been known as a drug from a remote period. It was first brought to Europe by land from China to the Levant ports, whence the name Turkey rhubarb, or was shipped directly from China or by way of India, whence the variety called China, Canton, or East India rhubarb. Later, a direct trade between Russia and China was established, and under supervision of the Russian Government rhubarb was transported overland through Central Asia to Russia. For a long time, owing to the rigid inspection of Russian officials, this Russian or Turkey rhubarb was of unvarying good quality. Chinese rhubarb is now shipped direct from China. Chinese rhubarb is a rusty brown in color, and the texture is finely veined and marbled. Rhubarb has a peculiar smell, a disagreeable, bitter, and astringent taste, and a complex composition. A bit of the root if chewed feels gritty, from the presence of crystals of calcium oxalate. In small dose rhubarb behaves as a stomachic bitter, but in larger quantities is an active purge, producing liquid mucous evacuations. By reason of the tannin it contains it is also secondarily astringent. It is used in medicine as a stomachic and a laxative or purge, and is especially useful in summer diarrhœas from relaxation of the bowels or improper diet. The pharmacentical preparations are very numerous. Among the most commonly used is the spiced or aromatic sirup, which is a tincture of rhubarb, cloves, cinnamon, and nutmeg diluted with six times its measure of sirup. The proportion of rhubarb is small, the preparation being intended as an aromatic astringent stomachic in the bowel complaints of children. *R. rhaponticum*, *R. undulatum*, and *R. palmatum*, or hybrids between them, are cultivated for their leaf-stalks, and to some extent for their roots.

Revised by H. A. Hare.

Rhumb [from O. Fr. *rumb*, from Span. *rumbo*, appar. from Gr. *ῥόμβος*, magic wheel, whirling motion, deriv. of *ῥέμβειν*, turn]: in navigation, the track of a ship sailing on a certain course. A rhumb-line cuts all the meridians at the same angle, and when this angle is acute the rhumb is a species of spherical spiral, continually approaching the pole, but reaching it only after an infinite number of turns. The angle under which a rhumb-line cuts any meridian is called the angle of the rhumb, and the angle that it makes with the prime vertical at any point is called the complement of the rhumb. The projection of a rhumb on the plane of the equator is a logarithmic spiral.

Rhus [Mod. Lat., from Lat. *rhus* = Gr. *ῥοῦς*, sumach]: a genus of shrubs or trees of the *Anacardiaceæ* or cashew

family, including about 120 species, mostly natives of warm or hot climates. The flowers have from four to ten stamens and from four to six imbricated petals, and are small, in axillary or terminal panicles; the leaves are usually primate, with from three to five leaflets, though sometimes simple, as in the smoke-tree (*Rhus cotinus*); the fruit is a compressed drupe. The poison oak or ivy (*Rhus toxicodendron*), found from Canada to Georgia, mostly creeping or climbing along rocks, fences, etc., though sometimes erect, has alternate leaves with three leaflets, flowers in loose slender panicles, and a smooth pale-brown fruit. The whole plant, especially the root and leaves, contains a poisonous caustic milky juice which on contact with the human skin in most cases produces redness, itching, swelling, and vesication. An inhalation from the leaves will produce in some an erysipelatoid affection. The poison-sumach or poisonous dogwood (*R. venenata*) of swamps, with from seven to thirteen leaflets, is even more poisonous. See SUMACH FAMILY.

Rhyme, or (less commonly) **Rime** [*rhyme* (with spelling adapted to *rhythm*, etc.) is < M. Eng. *ryme* < O. Eng. *rīm*, number, and from O. Fr. *rime*, rhyme (from O. H. Germ. *rīm*, number)]: formerly the systematic alliteration of Anglo-Saxon poetry; now usually the similarity between the endings of verses and sometimes of cola. The degree of resemblance between the endings varies with different poets, but strict rhyme requires that the last stress-vowel and what follows it should be exactly alike in the rhyming lines, while what precedes the vowel must be in some respect different. Hence "rain" and "reign" do not rhyme, but "rain," "train," and "strain" rhyme with each other. Sometimes, however, words identical in sound but different in sense, such as "rain" and "reign," are allowed to rhyme. Mere spelling has nothing to do with rhyme. Thus "again" rhymes with "men," but not with "complain." As the rhyme begins with the stress-syllable, lines ending in a trochee (´˘) or a dactyl (´˘˘) require the similarity to cover respectively two and three syllables, as "revealing," "unfeeling," "charity," "rarity." Sometimes, however, the secondary word-accent is used as stress, so that "charity," for instance, may be read ´˘´, and then only the last syllable is covered by the rhyme. When the stress is on the last syllable the rhyme is masculine, and when the stress is followed by one or more syllables the rhyme is feminine. The gradation from the perfect rhyme to mere assonance (similarity of vowels only) or other remote resemblance is by such small steps that no definite line can be drawn for legitimate practice; but no case should be admitted where the consonants following the stress-syllable are totally different.

Sometimes poets of the first rank indulge in bad rhymes, as in Milton's

> Untwisting all the chains that tie
> The hidden soul of harmony.

This treatment of secondary stress on final *y* is not rare, but is not as correct as that seen in

> My country, 'tis of thee,
> Sweet land of liberty, . . .

Rhyme is chiefly at the ends of lines, sometimes at the ends of cola (Leonine rhyme), rarely between almost consecutive words. This last is rather jingle than rhyme, as in Southey's *Cataract of Lodore*. Comic or humorous poetry allows many liberties, and even oddities, in both the distribution and the character of rhymes.

Rhyming lines may have almost any conceivable combination, as the couplet *a a*; the triplet *a a a*, the double distich with the first and third, and second and fourth, rhyming *a b a b*; the same with only the second and fourth, rhyming *a b c b*; the quatrain *a b b a*, and so on. The following schemes are taken from existing poems: *a b a b a b a b*, *a a b a*, *a b a*, *a b c d a b c d*, *a a b c c c b*, *a a b c c b*, *a a b b a*, *a b a a b b*, *a b a a b*, *a a a b c c a b*, *a a b a b*, *a b a b c c d d e d e* (the Chant Royal), *a b a a a b a b* (the triolets), *a b a a a a a b c c c*, *a b b a a b b a + c d d c d c*, and the sonnet-schemes, *a b b a a b b a c d e c d e*, *a b b a a b b a c d c d c d*, *a b b a a b b a c d e d c e*. Many more schemes might be cited. For a good elementary treatment, see Parson's *English Versification*.

Though several important contributions to the subject have appeared, the history of rhyme is yet to be written. In ancient Greek, rhyme seems to have been occasionally employed, but its use was never systematic, and it bore about the same relation to modern rhyme that our occasional alliteration bears to the systematic alliteration of Anglo-Saxon. The ancient Roman usage was about the same as the Greek; but systematic rhyme seems to have begun in the times of Augustine (A. D. 400), and with it begins the use of accent as ictus and the neglect of the classical quantity of syllables. Sometimes, however, rhyming poetry still preserved the ancient quantity. The Arabians employed systematic rhyme, and some believe that the Romans derived it from that source; but it seems more probable that it developed in Latin and Greek from the early occasional and accidental rhymes. Even the Leonine rhyme frequently occurs in ancient hexameters, as Hom. *Il.*, v., 544,

> ἀφνειὸς βιότοιο, γένος δ' ἦν ἐκ ποταμοῖο,

and still more frequently in pentameters, as Prop. II., i., 82,

> Et breve in exiguo marmore nomen ero.

Rhyme is not at all indispensable to English poetry, the greatest works of our age and perhaps of all ages being composed in blank or rhymeless verse.

MILTON W. HUMPHREYS.

Rhymer, or **Rymour**, THOMAS, THE: the name by which an early poet of Scotland is usually mentioned. There is reason to believe that his real name was Thomas Learmount of Ereildoune (modern Earlston), Berwickshire, who flourished under the reign of Alexander III. (*circa* 1283), whose death he is said to have foretold. He was popularly believed to be possessed of prophetic powers derived from the queen of the fairies, who had carried him away and kept him in fairy-land three years, after which he was permitted to come back to earth. The prophecies of Thomas the Rhymer were long preserved by memory, the earliest edition bearing date 1603. He is mentioned by Bower, Mair, Harry the Minstrel, Barbour, Robert of Bourne, and other ancient chroniclers, Scottish and English. The ballad relating his adventures and prophecies is found in MSS. of about the year 1400. It has been printed by Scott, Jamieson, and other ballad-collectors, and Scott attributed to Thomas Rhymer the metrical romance of Sir Tristram. See his edition of *Sir Tristram* (1806) and *Minstrelsy of the Scottish Border* (1806); also *The Romance and Prophecies of Thomas of Erceldoune*, by J. A. H. Murray, publications of the Early English Text Society (London, 1875).

Revised by H. A. BEERS.

Rhynchocepha'lia [Mod. Lat.; Gr. ῥύγχος, snout, beak + κεφαλή, head]: an order of reptiles of the genus HATTERIA (*q. v.*).

Rhynchoph'ora [Mod. Lat., from Gr. ῥύγχος, snout, beak + root of φέρειν, to bear]: a group or sub-order of beetles (see COLEOPTERA), embracing the weevils, in which the anterior part of the head is drawn out into a beak which bears the antennæ and mouth-parts. Of these latter the labrum of normal insects is usually absent and the palpi are short and rigid. Of the weevils some ten families and 10,000 species are recognized, all of which are injurious to human interests, since they bore into and feed upon wood, nuts, grain, etc. See Leconte and Horn, *Rhynchophora of North America*, in the *Proceedings* of the American Philosophical Society (1876).

J. S. KINGSLEY.

Rhynchota: See HEMIPTERA.

Rhyolite [Gr. ῥεῖν, to flow + λίθος, stone]: a mineral generally consisting of a groundmass and porphyritical crystals (phenocrysts) in variable proportions. At one extreme the phenocrysts exceed the groundmass in amount; at the other they are few and scattered, or are entirely absent. According to their prominence they give character or habit to the rock. While their chemical composition corresponds to that of more acid granites (see GRANITE), their mineral components do not necessarily correspond to those of chemically similar granites, partly because not all of the molten magma may have crystallized in rhyolites, and partly because the minerals in each case may have formed under different physical conditions. Quartz is usually prominent in rhyolite, but may not have crystallized in some cases; the same is true for potash-feldspar, which is generally the variety sanidine. Biotite may be present in small amounts. Muscovite never occurs as a pyrogenetic mineral in rhyolite, and potash-microcline is almost unknown in these rocks. On the other hand, pyroxene is oftener present in small amounts. The presence of alkali-feldspars rich in soda (soda microcline, anorthoclase) constitutes a variety of rhyolite called *quartz-pantellerite*. The presence of considerable lime-soda-feldspar (oligoclase, andesine) constitutes the greater part of what are called *dacite*, chemically equiva-

lent to the less acid granites. The groundmass may be lithoidal or porcelain-like, earthy, porous, or cavernous; or it may be dense glass or pumiecous glass. Its color varies from white and shades of gray to black. The lithoidal forms generally exhibit lighter colors, the glassy ones the darker colors, except in the case of pumice. The colors are white, blue-gray, greenish and purplish gray, pink to red, yellow, orange, brown, and black. The color may be uniform through the mass, or variegated in patches and streaks (*eutaxitic*), or in bands and layers (*flow-structure*). The rock may be massive and compact, or split into layers or laminæ parallel to planes of flow. It may be cracked into prisms or columns like those often seen in basalt. It may carry spheroidal stony bodies (*spherulites*) of various sizes, and hollow ones called *lithophysæ*. These spheroidal bodies are special forms of crystallization of the magma.

Varieties of rhyolites based on textural features are nevadite, having relatively many phenocrysts; liparite, relatively few; lithoidal rhyolite; hyaline rhyolite, when glassy. The most glassy forms are perlite, pitchstone, obsidian, and pumice. When the groundmass is more crystalline, it grades into porphyry. With increasing calcium, magnesium, and iron, it grades through dacite into andesite. With increasing alkalies and decreasing silica, it grades into quartz-trachyte and trachyte.

The name *rhyolite* was introduced by von Richthofen in 1860. Liparite (Lipari islands) was introduced by J. Roth in 1861 for essentially the same rocks, and is in quite general use in Germany for the whole rock-group. Rhyolite forms lava-sheets of great size and extent throughout the western part of the U. S., where it was erupted during Tertiary times. Its most notable occurrence is in the Yellowstone National Park. It is well known in Wyoming, Idaho, Nevada, Utah, Colorado, New Mexico, and Arizona. It also occurs in Mexico, Iceland, Hungary, Lipari, and elsewhere. As a building-stone its delicate color adds greatly to its value.

J. P. Iddings.

Rhys, rees, John: Celtic philologist; b. at Abercaero, Cardiganshire, Wales, June 21, 1840; educated at Jesus College, Oxford; studied at the Sorbonne and at Heidelberg and Leipzig 1868–71. Professor of Celtic in Oxford since 1877. He is the author of *Lectures on Welsh Philology* (1877; 2d. ed. 1879); *Celtic Britain* (1882; 2d ed. 1884); *Hibbert Lectures on Celtic Heathendom* (1888); *Studies in the Arthurian Legends* (1891); *Rhind Lectures on the Early Ethnology of the British Isles* (1890–91); joint editor of various Welsh texts.

B. I. W.

Rhythm [via O. Fr. from Lat. *ryth'mus* = Gr. *ῥυθμός*, flow, measured motion, rhythm, deriv. of *ῥεῖν* (fut. *ῥυήσομαι*), flow]: the division of time into small approximately equal units by corresponding units of sound, or less sensibly by muscular movement or visible motion. Rhythm bears the same relation to time that symmetry bears to space. The arts of space and rest, or completion—statuary, architecture, and painting—are based on symmetry, while the arts of time and motion, or execution—dance, music, and poetry—are based on rhythm. Symmetry and rhythm are often confounded, as when it is stated that the windings of a valley form an instance of rhythm. One of the most common perversions of the term is its application to accentual as distinguished from quantitative verse. In English the accent, which is chiefly stress, marks the rhythmical unit, while in Latin and Greek, where the accent was chiefly pitch, the unit was marked, not by the accent, but by stress, usually that of long syllables as compared with short; but in both kinds of verse, if there is rhythm, the units, whether marked by accent or by stress, must be virtually equal. The fact that the quantity of syllables is more unsettled in English than in the ancient classics does not prevent us from making the feet equivalent.

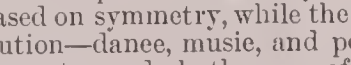
Rhythm may be felt in movements of the body, as in marching or dancing (for even the deaf enjoy the dance), but it will be sufficient to treat of the rhythm whose substance (*ἐκμαγεῖον* or *ῥυθμιζόμενον*) is sound.

Just as a vast expanse of uniform color, however pleasant to the eye, does not show symmetry, so one continuous uniform sound, however agreeable to the ear, does not present rhythm. Any kind of sound may be made rhythmical, but here only music and speech need be recognized. Again, poor music and bad poetry may have faultless rhythm, so that rhythm may be treated independently of the other characteristics of music and poetry.

The quantitative relation of syllables to each other is much more delicately perceived in singing than in reciting. Rhythm of the former kind is indicated by musical notes, of the latter by metrical marks. Recited poetry may be rendered more exact by the accompaniment of some time-measuring device, such as the metronome or *κλεψίαμβος*; but even that often regulates the feet rather than the individual syllables.

The ancient musical notes did not indicate quantity, but when the latter had to be marked, as in instrumental music, it was done by writing metrical marks (the same that we use) over the notes. Even the modern system of notation is faulty, being based on the fiction of the "whole note." The whole note has no fixed length, and is not the unit of rhythm (though it may happen to be). The true unit is the bar or measure; hence in $\frac{3}{4}$-time, for instance, the so-called $\frac{1}{4}$-note is really one-third of the unit. The tempo or time-rate of performance is, in any case, fixed by the composer, and approximately indicated by the words andante, allegro, etc., or more exactly by indicating how the metronome is to be set.

Each unit of rhythm contains a loud or strong part and a weak part. In beating time the hand or bâton descends and remains down during the strong part, then rises and remains up during the weak part (except when the bar calls for more than two movements). The foot, in marching, performs analogous functions. Hence the strong part is called thesis (*θέσις*, putting down; also *βάσις*, step, and *ὁ κάτω χρόνος*, the down time), and the weak part arsis (*ἄρσις*, lifting up; also *ὁ ἄνω χρόνος*, the up time); but in meter many follow the Roman grammarians and interchange the terms arsis and thesis. Each movement of the hand was called ictus (beat) by the Romans, but we apply this term only to the down beat or the accompanying stress.

Bars or measures are to music what feet or measures are to verse; but bars always begin with the stress or musical accent, whereas feet may begin with the weak part. The anapæstic dimeter (tetrapody), for instance, has the metrical form ⏑ ⏑ – | ⏑ ⏑ – | ⏑ ⏑ – | ⏑ ⏑ – ‖; but if sung in $\frac{2}{4}$-time it becomes  the first and last bars being supplementary. In verse of this kind the weak part or arsis of the first foot is sometimes called anacrusis (*ἀνάκρουσις*, up beat—a modern use of the word), and the scheme written ⏑ ⏑ ; – ⏑ ⏑ | – ⏑ ⏑ |, etc.

The ancient rhythmists recognized a great variety of compound bars, some of them containing several simple bars or feet, so that a rhythmical bar (*ποὺς ῥυθμικός*) was often really a colon or musical sentence. In modern music the bars or measures most used are: $\frac{2}{2}$  , $\frac{2}{4}$  , $\frac{4}{4}$  , $\frac{3}{2}$  , $\frac{3}{4}$  , $\frac{3}{8}$  , $\frac{6}{4}$  , $\frac{6}{8}$  , and analogously $\frac{9}{4}$, $\frac{9}{8}$, and $\frac{12}{8}$. In $\frac{4}{4}$-time the third note receives secondary stress, and in all the bars consisting of multiples of three the first note of each triplet receives stress. It really makes no difference what note is taken as the unit of the measure, so that $\frac{6}{4}$-time and $\frac{6}{8}$-time, for instance, are practically the same. There are other bars (for instance, the very rare $\frac{5}{8}$), but a full discussion of this subject belongs to technical works on music. For the application of rhythm to speech and for the metrical feet of poetry, see Metres, Prosody, and Quantity.

The equalization of seemingly different bars or feet in ancient poetry is the subject of endless controversy, some denying that they were in any way modified from their apparent form, others maintaining that an approximation to equality was made, while still others assert that absolute equality was established. It is certain that in trochaic and iambic meter the seeming spondee, by a partial shortening of one syllable so that it became irrational (*ἄλογος*) with respect to the other, the foot was made to approximate a pure foot, and there is no proof that it was not by change of tempo made virtually equal to such foot—that is, the trochaic measure – ⏑ – – is really – ⏑ – >, in which > is irrational and – > is equivalent to – ⏑. So the light dactyl, – ⏑ ⏑, analogous to  , and the cyclic anapæst were probably made respectively equivalent to the trochee and iambus. (See Prosody.) It must be granted, however, that there were changes of the rhythm in the same composition; but that a change could take place in the same colon seems incredible.

Milton W. Humphreys.

Rhythm, in music: such an arrangement or grouping of notes and measures as gives to the ear a sense of relative proportion and conduces to the development of sentiment and beauty. Musical notes when thus grouped into form and measure may possess a certain degree of meaning and connection; but neither melody nor harmony can give adequate expression to musical sentiment and feeling without a further grouping into portions equal to each other and marked by accent. This constitutes a higher kind of rhythm, to which the name of compound rhythm is sometimes given. Almost any succession of musical sounds will win attention and interest when the ear recognizes at certain intervals the pulsations of accent and the indications of a regular rhythmical division. A series of sounds without these periodical divisions, with their necessary cadences, would be as difficult to comprehend as a series of words without clauses, sentences, periods, and grammatical connection. In all regular compositions, therefore, we find an orderly succession of periods, formed of groups of two, four, eight, or more measures, as the case may be, with subdivisions into phrases, strains, or clauses. Of these periods, those consisting of four or eight bars are the most simple and natural to the ear. Periods of three, six, or nine bars are also in use, but those consisting of five or seven are irregular and less satisfactory, unless it may happen that the composer's purpose is to create a disturbing effect for dramatic or emotional reasons whereby the exception may be justified. In the use of terms to designate these divisions there is great diversity among musical theorists, and much obscurity in their definitions. In the present article the term period is used as denoting one of those larger symmetrical divisions which contains within itself the full expression of some musical sentiment. Such periods may terminate with cadences of various kinds, but the closing period must always end with the perfect final cadence. A period, as already said, is susceptible of division into several parts or members. Thus a period of eight bars is readily divisible into two phrases or strains, and each of these phrases also admits of division into two clauses. A period of six bars may be similarly divided either into two or three portions, and each of these portions may be regarded as a phrase or a clause. The chief difference between a phrase and a period lies in the cadence. This should be less conclusive in the phrase than in the period, even though formed of the same chords. The term section is applied to those still larger divisions which comprehend several periods. In many cases it is not easy to define the boundaries of these several divisions of section, period, and phrase. Sometimes a shortened or lengthened period occurs which breaks in upon the uniformity of the movement; sometimes also periods overlap each other, as when a new one commences before the former one has terminated; and in numerous cases periods and phrases are broken up into irregular forms for the production of special effects, thereby suspending for a time all regard to rhythmical symmetry. Notwithstanding these irregularities, which occur even in the highest works of art, the study of rhythm is of essential importance as the foundation of all regularity and excellence in musical composition.

Revised by DUDLEY BUCK.

Riazan', or **Ryazan**: government of European Russia, bounded N. W. by the government of Moscow. Area, 16,255 sq. miles. N. of the Oka the country is low and flat, and the soil generally sandy and little productive; the southern part is higher, more diversified and fertile. Wheat, rye, hops, hemp, and fruits are produced. Cattle and a fine breed of horses are reared. Iron ore abounds, but agriculture is the only industry carried on with energy. Pop. (1897) 1,827,537.

Riazan, or **Ryazan**: town of European Russia, capital of the government of Riazan; on the Trubesh, an affluent of the Oka (see map of Russia, ref. 8–E). It is the see of an archbishop, has many educational institutions, and carries on an important trade in grain. The city received its present name in 1777 from Catherine II. In its vicinity is the village of Grishina, with a large factory in which knives, scissors, surgical instruments, and mechanics' tools are produced. Pop. (1897) 33,110.

Ribal'ta, FRANCISCO: painter; b. at Castellon de la Plana, Spain, in 1551. At a very early age he went to Valencia, where he studied painting with a master with whose daughter he fell in love. On being refused as a son-in-law Ribalta went to Rome, where he studied the works of Raphael, the Caracci, and especially of Sebastiano del Piombo. Four years later he returned to his master's house, where he found a sketch on the easel, and, the artist being absent, set to work to finish it. When the painter saw the masterpiece he said to his daughter, "I would allow you to marry such an artist, but not the miserable Ribalta." The daughter replied that it was his work, and so the marriage was happily concluded. The first work Ribalta executed for his native country was a *Cena* for the College of Corpus Christi. His fame became so great that most of the churches of Valencia possessed some of his paintings, as also those of Castellon, Toledo, Segovia, S. Ildefonso, Madrid, and other cities. Ribalta was a severe draughtsman, knew anatomy thoroughly, and had studied the nude. His coloring is rather harsh. He died at Madrid, Jan. 12, 1628. W. J. STILLMAN.

Ribault, or **Ribaut**, rē̆'bō', JEAN: soldier and colonist; b. at Dieppe, France, about 1520. He was a Protestant, and was employed by Coligny to establish a French Protestant colony in North America. Leaving Dieppe Feb. 18, 1562, he explored the St. Johns river, Florida, thence sailed northward, and established twenty-six colonists in a blockhouse called Fort Charles on Port Royal harbor. Ribault then returned to France. Owing to the distracted state of affairs no aid was sent to the colonists, and after enduring great sufferings they abandoned the fort. In 1564 Ribault was commissioned governor of a contemplated colony in Florida. He sent René de Laudonnière, who built Fort Caroline on the St. Johns river. In May, 1565, Ribault sailed for this colony with seven vessels and 300 men. In September of that year the French were attacked by Spaniards under Menendez de Avilés; the fort was taken and its garrison massacred; Ribault's ships were wrecked in a hurricane, and he and his companions after wandering for some time on the coast capitulated to Menendez. Though promise of quarter had been given, they were immediately butchered, "not as Frenchmen, but as heretics." H. H. S.

Ribbeck, JOHANN KARL OTTO: classical scholar; b. at Erfurt, Germany, July 23, 1827; studied under Ritschl at Bonn, and was called successively to Berne, Basel, Kiel, Heidelberg, and finally to Leipzig as the successor of his teacher. Ribbeck's work, confined chiefly to Latin poetry, is characterized by profound learning, subtle ingenuity, and a brilliant style. His most noted works are *Tragicorum Latinorum reliquiæ* (1862), *Comicorum Latinorum reliquiæ* (1855), the standard editions on the subject; *Vergilii Opera*, with exhaustive prolegomena and complete critical notes (5 vols., 1859–69); *Der echte und unechte Juvenal* (1865, a highly ingenious but hypercritical attempt to prove the spuriousness of a number of Juvenal's *Satires*); Horace's *Epistles* (1869), an edition containing valuable exegetical material, but marred by a radical disregard of MS. tradition leading to a wanton readjustment of the poems; *Die römische Tragödie im Zeitalter der Republik* (1875); *Zur Lehre von den latein. Partikeln* (1869); an edition of Plautus's *Miles Gloriosus* (1881); biography of *Friedrich Ritschl* (2 vols., 1879–81, one of the best biographies in any language). Finally, omitting numerous short treatises (such as the *Alazon* and the *Kolax*) partly published in the *Rheinische Museum*, of which Ribbeck is one of the editors, there is the *Geschichte der römischen Dichtkunst*, in 3 vols., unquestionably the ablest exposition of the subject that has appeared. ALFRED GUDEMAN.

Ribbon [from O. Fr. *riban* > Fr. *ruban*, probably from Germ. *ringband*]: a narrow band of woven silk, used chiefly as an ornament of female attire. Though used in many nations from remote antiquity, the manufacture of ribbons as an important article of commerce dates only from the seventeenth century, and has flourished chiefly in France, the cities of Tours, Lyons, and Avignon being largely engaged therein. The chief seats of ribbon manufacture are St.-Étienne, France, Basel, Switzerland, Crefeld in Rhenish Prussia, and Coventry in England. The French ribbons have an admitted superiority, owing to the employment of hand-looms instead of power-looms. See WEAVING.

Ribbon-fish: a name given to various fishes, chiefly belonging to the family *Trachypteridæ*. They are so called on account of their much compressed, elongated, and band-like bodies. See TRACHYPTERIDÆ.

Ribbon-worms: a name sometimes given to worms of the group NEMERTINES and the order *Turbellaria*: so called from their ribbon-shaped form and great length.

Ribeiro, rē̆e-bā'ē̆e-rō, BERNARDIM: poet; b. at Torrão, in the province of Alemtejo, Portugal, about 1486 (?). There is

little precise information about him, and the difficulty in this regard has increased by the appearance at the same period of several persons of the same name. At the age of twenty-one he had to leave his home for the court, because of a plague that was devastating his native province. He became the friend of the best poets in Lisbon, Falcão, Sâ de Miranda, and Montemayor. He had also a tragic love-adventure, the object of his passion being possibly a certain Donha Joana de Vilhena, cousin of the king, Dom Manuel, and wife after 1516 of Dom Francisco de Portugal, Count of Vimioso. After the failure of his suit he seems to have gone to Spain, and probably to Italy. D. about 1550. He is a noteworthy figure in Portuguese literature, as having been one of the introducers of the Italian pastoral style that has ever since held such sway in Portugal. There are extant five idyls, or *eglogas*, in which experiences of his own and of his poet friends are idealized; and also a pastoral romance in prose, interspersed with verse, in which the main theme is his own love, under the name Bimnarder, for a lady disguised as "Aonia." This romance is commonly called *Menina e Moça*, but the author probably knew it as *Tristezas*, or *Saudades*. Two parts of it have come down to us, but it is uncertain what share, if any, Ribeiro had in the second. The work's chief defect is that so many matters besides the main theme are interwoven as to make the whole extremely confused; yet it had a very great influence in both Portugal and Spain, and to some extent outside the Peninsula. Besides the above Ribeiro wrote a number of lyrics in the style of the older Portuguese poets, some of which are printed in the so-called *Cancioneiro de Resende*. The first edition of the *Menina e Moça* was published at Ferrara in 1554; the second, better known, at Evora in 1557. In 1559 it was again printed with the addition of the lyrics. The *Obras de Bernardim Ribeiro* appeared in 1645, 1785, 1852. An excellent edition of the *Menina e Moça* is that of D. José Pessanha (with *Prefacio*, 1891).

A. R. Marsh.

Ribera, rĕe-bā'răă, José, called *Lo Spagnoletto* (the little Spaniard): painter; b. at Játiva, near Valencia, Jan. 12, 1588. He studied art with Ribalta, and then went to Italy, where in extreme poverty he worked at painting, depending on the charity of his fellow students in Rome. Later he went to Naples, where he married the daughter of a rich picture-dealer, and was employed by the Spanish viceroy, the Count de Monterey, for Philip IV. of Spain. In 1630 the Academy of St. Luke at Rome elected him as one of its members. The pope decorated him with the insignia of the Abito di Cristo in 1644. Some biographers assert that he died in Naples, rich and honored, in 1656, while Dominici, the Italian historian, says that Lo Spagnoletto disappeared in 1648, and was no more heard of. Luca Giordano and Salvator Rosa were his most eminent pupils.

W. J. Stillman.

Ribot, rĕe'bō', Alexander Félix Joseph: statesman; b. at St.-Omer, France, Feb. 7, 1842; was educated for the bar; received an official appointment in 1870, but afterward returned to the practice of his profession in Paris, and in 1878 was elected to the Chamber of Deputies as a representative of the moderate republican party. In 1890 he became Minister of Foreign Affairs, and was Prime Minister from Dec., 1892, to Mar., 1893. In Jan., 1895, he again became Prime Minister after the election of Faure as president, but resigned with his cabinet Oct. 28 of the same year, having been defeated on a railway question. He is the author of several works.

Ribot, Augustin Théodule: genre and portrait painter; b. at Breteuil, Eure, France, Aug. 8, 1823; pupil of Glaize; medals, Salons, 1864 and 1865; third-class medal, Paris Exposition, 1878; Legion of Honor 1878. His work is robust in style and notable for strong modeling. His charcoal drawings are exceedingly good. *St. Sebastian* (1865), *Christ and the Doctors* (1866), and *The Good Samaritan* (1870) are in the Luxembourg Gallery, Paris. D. at Colombes, Seine, Sept. 12, 1891. W. A. C.

Ribot, Théodule Armand: psychologist; b. at Guingamp, France, Dec. 18, 1839; educated at the Lycée de St.-Brieuc and at the École Normale in Paris; was professor in different lycées 1869–71; engaged in laboratories and clinics in Paris until 1876; founder and editor of *La Revue Philosophique* 1876–94; lecturer at the Sorbonne 1885–88; professor in the Collège de France since 1888. His principal works are *La Psychologie anglaise contemporaine* (1870); *L'Hérédité psychologique* (1873; 4th ed. 1892); *La Psychologie allemande contemporaine* (1879; Eng. trans. 1886); *Les Maladies de la Mémoire* (1881; 9th ed. 1894); *Les Maladies de la Volonté* (1883; 10th ed. 1894); *Les Maladies de la Personnalité* (1885); and *La Psychologie de l'Attention* (1889).

J. Mark Baldwin.

Ribs [O. Eng. *rib*: O. H. Ger. *rippa* (> Mod. Ger. *rippe*): Icel. *rif* < Indo-Europ. *rebhyo-*; cf. O. Bulg. *rebro*, rib]: the curved bones which form the lateral framework of the thorax or chest. They serve as substantial points of attachment for the thoracic muscles, which perform the respiratory motions, and by their resistance and elasticity protect the lungs, heart, and great vessels from external violence and injury. The ribs, in man, are usually twenty-four in number, twelve on each side, but may be one or two more or less in exceptional cases. They are articulated to the spine behind, but in front only the upper seven are connected with the sternum or breast-bone by intervening costal cartilages. Of the remaining five, three connect with the cartilage of the seventh, while the lower two are unattached and termed free or floating ribs. The ribs are elastic, and being articulated in front and behind move freely upward and outward in inspiration, and reversely downward and inward in expiration. The ribs, like other bones, may be inflamed and thickened from contusion or from blood-disease; they are often distorted by collapse of a part or whole of a lung and external atmospheric pressure. The chief injuries to the ribs are separation from their attachments to the spine or sternum, and fracture. The fractured rib is detected by local crepitation of the fragments in respiratory movement, and by the severe local stitch or pain it gives the patient. The treatment consists in application of a firm bandage or broad adhesive band around the body to suspend thoracic movement until the rib is united; respiration meanwhile is conducted chiefly by motion of the diaphragm. Revised by W. Pepper.

Ricar'do, David: political economist; b. in London, Apr. 19, 1772. His father, who was a Jew and a native of Holland, settled in London, and as a member of the Stock Exchange gained a fortune. David Ricardo was a partner with his father till in 1793 he embraced the Christian faith and formed a marriage connection contrary to his father's wishes, which caused the partnership to be dissolved. Through the aid of other members of the Stock Exchange the younger Ricardo started in business by himself, and succeeded in a few years in securing a fortune. He then gave his time to the study of mathematics, chemistry, mineralogy, and geology, and was active in securing the organization of the London Geological Society. In 1809 he published a tract entitled *The High Price of Bullion, a Proof of the Depreciation of Bank-notes*; in 1817 published his most important work on *The Principles of Political Economy and Taxation*. Its leading feature was a theory of rent, which, though embodying ideas before announced by others, was received by the public as a new and important theory, especially in connection with the theory of Malthus on population, then much discussed. He subsequently became a member of Parliament, where he took a prominent part in the discussion of economic questions. D. at Gatscomb Park, Gloucestershire, Sept. 11, 1823. Ricardo stands next to Adam Smith in the British free-trade school of political economists, and his writings have exerted a powerful influence upon subsequent students of the science. A collection of his works, edited by J. R. McCulloch, was published in 1846, and his *Letters to Malthus* appeared in 1887.

Revised by F. M. Colby.

Ricasoli, rĕe-kaa'sō-lĕe, Bettino, Baron: statesman; b. in Florence, Mar. 9, 1809, of an old noble Florentine family. In 1848 he was a prominent advocate of the unity of Italy; was elected to the Tuscan parliament, and was offered a place in the ministry, which he declined, as the grand duke had turned against the democratic movement. After the defeat of Novara, hoping to prevent the entrance of the Austrians into Tuscany, he took the initiative in recalling the grand duke, but retired from the court when the latter withdrew the constitution. In 1859 he again put himself at the head of the Tusean liberal movement, and aided in the expulsion of the grand duke, and, as provisional dictator, in the union of Tuscany with Piedmont. This being accomplished, he was appointed governor-general of Tuscany, an office which he held till Mar., 1861. The city of Florence elected him deputy to the Italian parliament, and after the death of Cavour he became president of the council in the new ministry which was afterward overthrown by the opposition of Rattazzi. In June, 1866, Baron Ricasoli returned to power and resumed the direction of public affairs, but

was again obliged to retire in Apr., 1867. After this he took no active part in politics. D. in Rome Oct. 23, 1880. Ricasoli wrote several works on the cultivation of the olive, the vine, and the mulberry. His *Letters and Papers* were published at Florence (1886–89).

Riccio, David: See Rizzio.

Rice [from O. Fr. *ris* < Lat. *ory'za* (Later *ory'sum*) = Gr. ὄρυζα, from O. Pers. Cf. Pushtu (Afghan) *wrijzey*, *wrijey*, and Sanskr. *vrīha*, rice]: the *Oryza sativa*, a cereal of the grass family. The tribe *Oryzeæ* is characterized by a one-flowered spikelet with small glumes, less than one-fourth the length of the palets, which completely envelop the grain when mature; six stamens; stigmas with branching hairs; oblong, free, smooth grain; flowers in a somewhat erect panicle, which droops as the grain matures; it is an annual, 2 to 5 feet high at maturity.

Rice is indigenous in some parts of India and in tropical Australia. There is no trace of it as a native plant in Egypt, Persia, Greece, or Rome. In India it has been cultivated from the earliest times, and was introduced into China about 2822 B. C. It was cultivated in the Euphrates valley at least 400 years before Christ. The Arabs carried it into Spain under the name *Aruz*. It was first cultivated near Pisa in Italy, in the year 1468. At what period it was introduced into the U. S. is not well settled, but one account states that it was grown in Virginia by Sir William Berkley as early as 1647. Another account claims a later date, and traces it to some seeds from the island of Madagascar, sown in a garden in Charleston, S. C., near the close of the seventeenth century. It is extensively cultivated in India, Siam, China, Japan, and portions of South Africa, in which countries it constitutes the principal article of food for their dense population. In many of the marshy districts of those countries it is almost the only object of agricultural labor. There is also a variety grown successfully upon the high lands, yielding upon an average about one-fourth less per acre than the low land rice. It is also extensively cultivated in Southern Europe, and in the tropical and semi-tropical portions of North and South America.

In Oriental countries, where rice is the most important cereal, the several processes of cultivation and harvesting are still carried on in a primitive way. In Japan, the plow is rarely used. The soil is dug up and worked over with a mattock; then an implement similar to a harrow is occasionally used to pulverize it. This may be drawn by a horse or ox, but most of the work is manual. The rice is sown in beds, which are watered and carefully tended till the plants are 6 to 10 inches high, when they are taken up and set in rows, the field having been previously prepared and flooded with about 2 inches of water. The rice is cut with an implement similar to a sickle, bound in small bundles, and hung upon poles to dry; the threshing and the winnowing are mainly done by hand. The average product per acre is 40 bush. on marsh-land and 30 bush. on high land. Four or five acres of marsh-land form quite a respectable holding for a farmer in Japan. The average value of such land is $200 per acre, and the annual tax upon it for government and local purposes is $6, or 3 per cent. The wages of an able-bodied farm-hand are about $35 per year, with board, and $50 per year without board; and women can be hired for much less. In the shops, rice is sold at 2 or 3 cents per pound. Importers in the U. S. prefer Japan rice, because the quality is uniform, and, on account of the short, plump berry, it is less liable to be broken in milling, though the flavor is inferior to that of the U. S.

In the U. S. the Carolina methods of rice-culture have mainly prevailed. Alluvial lands are selected along the rivers, above salt water, and low enough to be subject to overflow by the tide. The tract selected is thoroughly ditched, so as to be easily drained, and is protected by a strong levee next the river. Occasionally a ditch is made broad enough to float a small flat-boat, used in transporting the grain. The fields are from 4 to 20 acres in size, and are usually intersected by small parallel drains, about 200 feet apart. Late in the fall or early in the winter the fields are plowed and afterward flooded with water, admitted through the levee. The object of flooding is to prevent the growth of grass, and to loosen and fertilize the soil. In the latter part of February the water is drawn off, and in a few weeks the land becomes dry enough for cultivation, when the clods are pulverized by a harrow and the soil brought into the requisite tilth. When ready for planting, at any time in April or the fore part of May, trenches are made with a hoe, or a small cultivator, 12 to 15 inches apart and 3 or 4 inches deep, at right angles with the drains. The seed is then sown at the rate of 2 to 3 bush. per acre, and covered lightly with soil. On large plantations, where the soil has been well prepared, a horse-drill can be used. As soon as a field is planted, which should be done in one day, sufficient water is let in to saturate the soil thoroughly, and this condition of perfect saturation is continued for four or six days, till the grain begins to sprout. Water is again applied when the sprout is 2 or 3 inches above the ground. This second water is removed after about six days, and the earth is stirred with the hoe once or twice, till the plant is about six weeks old, when the field is again irrigated for two weeks. If the field is free from water-weeds the water may remain on permanently; if not, it should be drawn off, and as soon as the soil is dry it should be hoed, then flooded till the grain begins to ripen. When mature the rice is cut with a sickle, bound in small bundles, and shocked in the field like wheat, or upon some dry place. As soon as dry it is put into stacks, about 6 feet in diameter, till cured, and afterward transferred to large stacks. If put into large stacks from the shock, there is some danger of discoloring the grain by stack-burning.

Along the Mississippi bottoms in Louisiana the conditions of rice-culture are quite similar to the Carolina method. Behind the great levees, necessary to restrain the waters of the Mississippi, the broad alluvial lands are ditched at right angles to the embankment, to give good drainage. The land is plowed in February, March, and April just prior to planting. When ready for the seed the fields are divided into plats of a few acres by back-furrowing (or this may be delayed till after the planting). One object of this is to maintain an even depth of water on each plat; the even ripening of the grain depends upon it. This could not be secured without the small cross-levees, as the surface of the land gradually falls from the river. About 2 bush. of seed per acre is used, and may be sown broadcast and harrowed in or drilled. Formerly irrigation was secured by flumes through the levee, but this is prohibited by law, and the pump is used as a substitute, or in high water a siphon. The crop is cut and harvested as in the Carolinas. The average product per acre is from 10 to 12 barrels of 162 lb. each.

In the prairies of Southwestern Louisiana an entirely different method of management prevails. The rice-lands lie along small creeks and streams, where flooding is secured by pumping or by damming the stream. The levees are constructed mainly by a plow with the land-side and mould-board greatly lengthened by wood attachments, so as to push the furrow 4 or 5 feet on to an embankment. The fields are plowed with gang-plows and thoroughly harrowed; then the seed is sown broadcast, and the land again harrowed, or the seed may be put in with horse-drills. Many farmers fertilize with bone phosphate at a cost of $1 per acre. This quickens and strengthens the young plants, and increases the yield of grain from one to two barrels per acre. The firm subsoil of these prairies allows the use of the binder and header in cutting the grain. The shocks of grain are allowed to stand in the field till dry enough to be transferred to large stacks. Steam-threshers are in universal use. The product per acre is from 8 to 18 barrels. The cost of production is from $1 to $1.50 per barrel, according to management and yield per acre. The labor is almost entirely performed by white men. The prairie rice-marshes are not considered unhealthful for the laborers or for near residents.

The most favorable conditions for rice-growing are much vegetable matter in the soil, and such a depth of water as to irrigate without cooling or heating the roots too much. When the water is very shallow it sometimes becomes too warm for the plant, and by turning on a large body of river-water, just after a heavy rain, the water may become too cool. It requires an atmospheric temperature of from 70° to 80° to ripen the grain properly, and for this reason rice should be grown near large bodies of water. In the interior great changes of temperature are sudden and frequent, to which the rice-plant is very sensitive. A temperature higher than 85° during the hardening of the grain tends to shrink the kernel and renders it too brittle for profitable milling; a lower temperature than 60° prevents perfect development.

Rice as it comes from the thresher is known as rough rice, or paddy. For handling and storing it is better to leave it in this condition, as the hull is a great protection to the

grain. The primitive method of removing the hull was by hand, using a pestle and mortar. The mortar was a large block of wood set on end; the pestle was about 2½ inches in diameter, and 2 feet long. By light pounding and then winnowing the hull and the cuticle were removed and the grain was fitted for use.

In a modern rice-mill the rice is emptied from a sack into a hopper at the storehouse; it passes from the hopper into a large fanning-mill or separator, where it is freed from all foreign substances; it is then transferred to the mill by a belt-conveyor; the hull is removed by passing the grain between heavy millstones (about 5 feet in diameter) which revolve rapidly, but are not close enough together to break the kernel; it then goes to the mortar and is pounded for two hours, or in some mills the Engleburg huller is used in place of the pounding process; by these processes the hull and cuticle are removed and the grain is scoured. The hulls are disposed of as worthless refuse; the cuticle and undercoating scoured off are the rice-bran. The rice then passes through an inclined cylindrical wire revolving screen, with the meshes becoming coarser toward the lower end, thus assorting the rice into three or four grades; the finest is the brewers' rice, the second—a middling rice—includes the larger broken rice, and the third is the whole rice or head rice; the head rice passes from the screen into the polisher, where it is brushed and finished. Rice-bran and rice-polish are excellent food for cattle and hogs, rating higher than wheat-bran and wheat-middlings; brewers' rice is used for the production of light beer, and usually brings about one-half the price of head rice; middling rice sells for nearly one cent per pound less than head rice.

Rice as a food (see Food) is deficient in the flesh-forming principles, but its almost perfect digestibility increases its food-value 20 or 25 per cent., and makes it exceedingly valuable for the sick or people inclined to dyspepsia. Physicians quite generally prescribe a rice diet in some form where there is any inflammation of the mucous membrane, whether of the lungs, stomach, or bowels. Two precautions should be observed: the rice should be more than three months old, and should be thoroughly cooked. With beef, fish, milk, cheese, or beans it makes a well-balanced nutritive ration. In warm countries rice is extensively used in meat soups and as a substitute for the potato. No meal is considered complete without it in some form. It is made into bread, puddings, biscuits, griddle-cakes, and other food. It makes an effective paste, and in Oriental countries it is used in the production of a spirituous liquor known as arraek.

Rice-straw is more palatable to animals than oat-straw, and preferred as a coarse fodder; it is largely used for wintering stock. It makes an excellent quality of paper.

Rice production in the U. S. attained considerable proportion in the colonial times. In 1707 seventeen ships left South Carolina with cargoes of rice. In 1730 the product was 21,153,054 lb.; in 1755 it reached 50,747,090 lb.; and in 1770, 75,264,500 lb. This was raised with slave-labor, and mostly exported to Europe and the West Indies. For the next seventy years there was practically no increase. The product of 1840 was 84,145,800 lb. In 1860 it was 117,885,000 lb. During the civil war little rice was raised, and in 1865 the total amount was only 4,740,580 lb. In 1880 it had increased to 85,596,800 lb.; in 1890 to 131,722,000 lb.; and in 1899 to 136,990,720 lb., of which amount Louisiana produced 107,792,000 lb., North Carolina 2,560,000 lb., South Carolina 23,054,720 lb., and Georgia 3,584,000 lb. In 1893 Louisiana produced 182,400,000 lb., and the U. S. 237,546,900 lb. Drought in Louisiana and floods in other States reduced the crop to less than one-half the following year.

S. A. Knapp.

Rice, Allen Thorndike: See the Appendix.

Rice, Edwin Wilbur: See the Appendix.

Rice, James: novelist; b. in Northampton, England, in 1844; was educated at Queen's College, Cambridge; called to the bar in 1871; edited *Once a Week* 1868–72; and for eight years was London correspondent of the Toronto *Globe*. D. in London, Apr. 25, 1882. He was joint author with Walter Besant of many novels. See Besant, Walter.

Rice-bird, or **Rice-bunting**: the Bobolink (*q. v.*); the Java Sparrow (*q. v.*) is also called rice-bird.

Rice, Indian, Water-rice, or **Water-oats**: an annual aquatic grass (*Zizania aquatica*) belonging to the true rice tribe, though of inferior value, from 5 to 10 feet high, which abounds in marshy regions of the U. S., especially in Minnesota. Its grain was formerly much used by the Dakota and Chippewa Indians, and forms an important portion of the food of the game-birds of the Northwest. Its stem is employed as a paper-stock.

Rice Lake: city; Barron co., Wis.; on the Red Cedar river, Rice Lake, and the Chi., St. P., Minn., and Omaha Railway; 48 miles N. of Menomonie, 56 miles N. of Eau Claire (for location, see map of Wisconsin, ref. 3–B). It is in an agricultural and lumbering region, is engaged in manufacturing, and has a State bank with capital of $50,000, a private bank, and a weekly newspaper. Pop. (1880) 362; (1890) 2,130; (1900) 3,002.

Rice-paper: See Paper.

Rich, Edmund (*Saint Edmund*): Archbishop of Canterbury; b. at Abingdon, England, about 1170; educated at Oxford, where he "wedded the Virgin Mary," as he called his vow of special service, and at Paris; became an instructor at Oxford, where the university was then developing a revival of scholarship; was prebendary of Calne and treasurer of Salisbury Cathedral 1219–22; was a famous preacher; at the pope's command preached the crusade over a considerable part of England, probably in 1227; was appointed Archbishop of Canterbury 1233, and was consecrated Apr. 2, 1234; exhibited energy as a reformer in the face of opposition from the clergy and from the Roman hierarchy; went to Rome in 1238 and again in 1240 to settle various difficulties with his monks, but finding that the pope demanded more and more unreasonable concessions he resigned his see and retired to the monastery of Pontigny, in France, in the summer of 1240; thence a little later he went for his health to the priory of Soissy, where he died, Nov. 16, 1240. His remains were taken to Pontigny, and having been canonized by Innocent IV. in 1247, his shrine (known in France as that of St. Edme) became a place of pilgrimage. Cardinal (then Archbishop) Manning and Lord Edmund Howard, with 500 British pilgrims, went thither to invoke his intercession in behalf of the Roman Catholic Church Sept. 3, 1874. He wrote a volume of *Constitutions* in thirty-six canons (1236), *Speculum Ecclesiæ*, and left MS. treatises, now in the Bodleian Library. There is a MS. biography by his brother Robert in the Cottonian collection. Another, written by Bertrand, prior of Pontigny, was published in Martène's *Thesaurus Anecdotorum*. iii., 1774–1826; cf. Hook's *Lives of the Archbishops of Canterbury*, s. v.

Richard, Édouard: See the Appendix.

Richard I. (Plantagenet), surnamed Cœur de Lion (lion-hearted): King of England; third son of Henry II. and Eleanor of Aquitaine; b. at Oxford, Sept. 13, 1157; was noted from youth for rash valor and a turbulent disposition; received the duchy of Aquitaine by the treaty of Montmirail (Jan. 6, 1169), under the feudal supremacy of King Louis VII. of France, to whose youngest daughter, Adelaide, he was at the same time betrothed; joined his mother and his two brothers in rebellion against his father 1173; was reconciled to him Sept., 1174; became involved in wars with his brothers, but was reconciled to them in London in 1184. He also made war upon the Count of Toulouse, aided his father against Philip Augustus, and later, in alliance with Philip Augustus, waged successful war on his father. Succeeding to the throne in July, 1189, he spent a few months in arranging the affairs of the kingdom, and then set out on the third crusade, July, 1190, with the King of France. On his way to the Holy Land he captured Messina and conquered the island of Cyprus. Arriving before Acre June 8, he took part in the capture of the city, but soon quarreled with the French king, who returned to France. Richard advanced immediately toward Jerusalem; defeated the Saracens at Arsuf in September; took and fortified Jaffa; advanced on Askalon, which he took Jan., 1192; set out twice for Jerusalem, but was called back each time by hostilities in his rear; lost and regained Jaffa; performed many brilliant exploits of personal valor, but, being obliged by the state of affairs in England to return, made a truce with Sultan Saladin, and sailed from Acre in October. On his way home he was shipwrecked at the head of the Adriatic; endeavored to make his way by land through Austria; was seized and imprisoned by Leopold, Duke of Austria, with whom he had quarreled in the Holy Land; was handed over to the Emperor of Germany, by whom he was detained more than a year; was liberated on pledge of a heavy ransom in Feb., 1194; found his brother John assuming the functions of king, but soon forgave him; engaged in a war with Philip Augustus of France, whom he defeated and forced to sign a disadvantageous truce, and renewed the war three years

later with a similar result, but was mortally wounded Mar. 26 by an arrow shot from the petty castle of Chalus-Chabrol, which he was besieging, and died Apr. 6, 1199, leaving no legitimate children. His fame as a soldier was magnified by tradition, by poetry, and by romance, which attributed to him incredible feats of valor, and he was reputed to be highly accomplished as a troubadour. On the other hand, he was cruel and unscrupulous, and as a ruler regarded his kingdom as a mere source of supplies for carrying on his costly and fruitless wars. He was a representative Provençal prince of the age of chivalry, having, beyond the accidents of birth and inheritance, little connection with England. The chief characteristic of his reign in England was the exorbitant taxation rendered necessary by his foreign wars. To meet these demands the king's officers improved the financial system in order that the greatest possible revenue might be secured with the least pressure upon the people, and this side of the administration was brought to a high degree of efficiency. Revised by F. M. Colby.

Richard II.: King of England; son of Edward the Black Prince and Joanna of Kent; b. at Bordeaux, France, Apr. 13, 1366; succeeded to the throne on the death of his grandfather, Edward III., June 21, 1377; was under the tutelage of a council of twelve nobles, but was really controlled by his uncle, John of Gaunt, Duke of Lancaster; maintained a feeble warfare with France; encountered a vigorous opposition from Parliament and from the common people in the imposition and collection of a poll-tax, which gave rise to the insurrection of Wat Tyler, June, 1381; married Anne of Bohemia, daughter of the Emperor Charles IV., in Jan., 1382; invaded Scotland with slight result beyond the burning of Edinburgh, Aug., 1385; attempted to emancipate himself from the council of regency, which was reorganized under the Duke of Gloucester in Nov., 1386, but without success, his leading supporters being defeated and put to death with the sanction of Parliament 1387–88; succeeded by a sudden display of vigor in assuming the government in May, 1389. From this time he was really king, and for the next few years ruled constitutionally, but in 1397, calling a new Parliament, he took vengeance on Gloucester and his adherents. The former was carried to Calais, where he died under suspicious circumstances. Quarreling with his cousin, Henry of Bolingbroke, Duke of Hereford, Richard banished him for ten years, 1398, and in the following year seized the Lancaster estates, John of Gaunt having died. Bolingbroke prepared to recover his estates, and when Richard returned from a short visit to Ireland he found his rival already in possession of the kingdom. Richard was taken prisoner and deposed by Parliament in favor of Bolingbroke, who ascended the throne under the title of Henry IV., to the exclusion of the legitimate heir, Roger Mortimer, Earl of March. The dethroned king was kept a prisoner at Pontefract Castle, but soon disappeared, having been murdered, as was believed, by his keeper about 1400. The reign of Richard is a remarkable period in the constitutional history of England, and still more so in religion and literature, from the eminent names of Wycliffe, Chaucer, and Gower, who were patronized by him.
Revised by F. M. Colby.

Richard III.: last King of England of the Plantagenet line; b. at Fotheringay Castle, Oct. 2, 1452; third son of Richard, Duke of York, and Cicely Neville. On his father's defeat and death in 1460 he was sent for safety to Holland, but was recalled in the following year by his brother, Edward IV., who created him Duke of Gloucester and lord high admiral. He was faithful to his brother throughout the reign, sharing in his flight in 1470 and commanding the van of the Yorkist army at the battles of Barnet and Tewksbury in 1471. In recognition of his services he was placed in possession of numerous forfeited estates, especially those which had belonged to Warwick, the king-maker, whose daughter, Anne Neville (his own cousin, previously betrothed to Prince Edward), he married in 1474. He was made lieutenant-general of the kingdom upon the breaking out of war with Scotland 1480; took possession of Berwick; penetrated to Edinburgh, and dictated terms of peace 1482. Hearing of the death of Edward IV. while still in Scotland in 1483, he took the oath of allegiance to his nephew, Edward V., and required his generals to do the same; but soon afterward he forcibly assumed the guardianship of the young king, imprisoning Lord Rivers, Lord Grey, and other nobles of the queen's party. Appointed protector and defender of the realm early in May, he ordered the seizure and instant execution of Lord Chamberlain Hastings on a charge of conspiracy June 13; asserted his own title to the throne on the ground of illegitimacy of his nephews June 22–24; obtained from Parliament a favorable decision, and was crowned king July 6. He was soon suspected of having caused the princes to be murdered in the Tower. (See Edward V.) Having repressed a conspiracy in behalf of the Earl of Richmond as head of the Lancastrian party, and put to death the Duke of Buckingham (his own former partisan) he convoked a parliament which declared him lawful king Jan., 1484. On the death of his only son, Edward, Prince of Wales, Apr. 9, he named as his heir Edward, Earl of Warwick, but soon substituted for him John de la Pole, Earl of Lincoln. The queen died in 1485. Richard sought to strengthen his throne by treaties with Scotland and Brittany, but was unable to prevent the invasion of the Earl of Richmond, who landed at Milford Haven Aug. 7, 1485, and was defeated and killed at Bosworth Aug. 22, 1485, the victor becoming king under the title of Henry VII. See H. Walpole, *Historic Doubts on Richard III.* (1768), and Gairdner, *Life and Reign of Richard III.* (1878). Revised by F. M. Colby.

Richard Plantagenet: Earl of Cornwall and titular Emperor of Germany; b. at Winchester, England, Jan. 5, 1209; was a younger son of King John; commanded an expedition to Guienne 1225; went on a crusade 1240; returned to England Jan., 1242; accompanied his brother, Henry III., in his French campaign of that year, but soon lost the province of Guienne and escaped to England; married a princess of Provence 1243; was chosen Emperor of Germany by a faction 1256, and crowned King of the Romans at Aix-la-Chapelle May 17, 1257, but was unable to obtain general recognition, and was driven to take refuge in England; was taken prisoner by Simon de Montfort at the battle of Lewes, May 13, 1264; held a diet at Worms 1269; returned to England 1269. D. at Kirkham, England, 1272.

Richards, Henry Charles: See the Appendix.

Richards, Matthias Henry, D. D.: educator; b. at Germantown, Pa., June 17, 1841. His father, Rev. Dr. J. W. Richards, was grandson of Rev. Henry Melchior Muhlenberg. He graduated at Pennsylvania College and Theological Seminary, Gettysburg; was pastor at Phillipsburg, N. J., 1865–68, and Indianapolis, Ind., 1874–77; Professor of English Language and Literature in Muhlenberg College 1868–74; and from 1877 to the present; in 1877 became editor of *Church Lesson Leaves* and *The Helper*; since 1883 has also been on the editorial staff of *The Lutheran*, Philadelphia.

Richards, Theodore W.: See the Appendix.

Richards, Thomas Addison: landscape-painter; b. in London, England, Dec. 3, 1820; was taken to the U. S. when a child by his parents, who settled in Georgia; removed to New York in 1845; studied at the National Academy, New York; National Academician 1851; Professor of Art in the University of the City of New York; first director of the Cooper Union School of Design for Women; corresponding secretary National Academy 1852–92. W. A. C.

Richards, William Trost: landscape and marine painter; b. in Philadelphia, Pa., Nov. 14, 1833. Pupil of Paul Weber in Philadelphia; traveled and painted in Europe in 1855, 1866–67, and in 1878–80; honorary member Pennsylvania Academy of Fine Arts; medal Centennial Exhibition, Philadelphia, 1876. *On the Coast of New Jersey* (1883) is in the Corcoran Gallery, Washington. W. A. C.

Richardson, Sir Benjamin Ward, F. R. S.: hygienist; b. at Somerby, Leicestershire, England, Oct. 31, 1828; educated at Anderson's University and at St. Andrews Hospital, both in Glasgow; graduated in medicine 1854, M. A. hon. in 1859, and LL. D. in 1877; practiced in Saffron Walden and at Narborough; settled in London 1849; physician to the Royal Hospital for Diseases of the Chest 1854 to 1867, to the Royal Literary Fund from 1871, and to the Newspaper Press Fund from 1874 to the present time; was chosen a member of the Royal College of Physicians and Surgeons 1856, and fellow in 1861; founded and edited *The Journal of Health and Sanitary Review* (1855, *seq.*); gained the Astley Cooper prize of £300 by his treatise *On the Cause of the Coagulation of the Blood* (1856), and the Fothergillian gold medal by a disquisition *On the Diseases of the Fœtus* (1856); originated the use of ether spray for the local relief of pain in surgical operations (1866); introduced methylene bichloride as a general anæsthetic (1867); was president of the Medical Society of London; and gained a high position by original experiment. He was knighted in 1893. D. in London, Nov. 21, 1896. From 1854 Sir Benjamin was an earnest

advocate of advance in national sanitation, and was a zealous partisan of the temperance movement. For some years (1884–92) he edited and published a quarterly journal, *The Asclepiad*. Among his works are *The Health of Nations* (London, 1887); *National Health* (London, 1890).

Revised by S. T. Armstrong.

Richardson, Charles: philologist; b. in England in July, 1775; studied but never practiced law: devoted himself to literature in London; published *Illustrations of English Philology* (1815); undertook the lexicographical articles in *The Encyclopædia Metropolitana*, for which he also prepared his great work, a *New Dictionary of the English Language*, which (the first part appearing in 1818) was suspended soon afterward by the failure of the proprietors, and completed (as a separate work) in 1837. The complete work appeared in new editions in 1837, 1838, and 1839. Richardson also published a *Supplement* to his dictionary (1855), a work *On the Study of Language* (1854), and an *Historical Essay on English Grammar and English Grammarians*, several philological papers in the *Gentleman's Magazine*, and some comments on Shakspeare; was a contributor to *Notes and Queries*; received a pension from 1852 until his death at Feltham, Middlesex, Oct. 6, 1865.

Richardson, Charles Francis: scholar; b. at Hallowell, Me., May 29, 1851. He graduated at Dartmouth College 1871, was connected with the New York *Independent* 1872–78, and in 1882 was appointed Professor of English at Dartmouth. He has published *A Primer of American Literature* (1876); *The Cross*, poems (1879); *The Choice of Books* (1881); and *American Literature* (2 vols., 1887–89).

Richardson, Ernest Cushing: See the Appendix.

Richardson, Hugh: See the Appendix.

Richardson, Samuel: novelist; b. in Derbyshire, England, about 1689; learned the printing-trade; became a publisher in London, printer of the journals of the House of Commons, master of the Stationer's Company, and purchased in 1760 a half-interest in the office of king's printer. D. in London, July 4, 1761. His novels *Pamela* (1740, with a continuation in 1741), *Clarissa Harlowe* (1748), *Sir Charles Grandison* (1754) enjoyed an unbounded success, and had numerous imitators not only in England, but in Germany and France, where they profoundly influenced the whole development of prose fiction. Richardson is the first English novelist. His novels are all in the form of letters, and are long and sentimental. They show little acquaintance with men on the part of their author, but an intense and sympathetic absorption in the feelings of the female heart, and they had their strongest popularity among women. See English Literature.

Richardson, William Adams, LL. D.: jurist and financier; b. at Tyngsborough, Mass., Nov. 2, 1821; graduated at Harvard 1843; admitted to the bar at Boston 1846; practiced law at Lowell; was one of the revisers of the *General Statutes of Massachusetts* (1860), and of the *Supplement* to the same (1863–64); became judge of probate 1856, Assistant Secretary of the Treasury 1869–73, and was secretary 1873–74; judge of U. S. court of claims 1874, and chief justice of same 1885–96. D. Oct. 19, 1896. Author of *The Banking Laws of Massachusetts* (1855); *Practical Information concerning the Public Debt of the United States*, with the *National Banking Laws* (1872); *History of the Court of Claims* (1882–85), etc.

Richardt, Christian Ernst: poet; b. in Copenhagen, Denmark, May 25, 1831. After studying theology he accepted a call to a country church, and continued to be a parish priest until his death. During the last years of his life he was chaplain of Vemmetofte Cloister in Zealand. His first work was a comedy, *Deklarationen* (1851), which was later produced at the Royal theater. In 1861 appeared *Smaadigte*, consisting of a number of delicate lyrics; in 1874 *Billeder og Sange* (Pictures and Songs); in 1878 *Halvhundrede Digte* (Fifty Poems); in 1884 *Vaar og Höst* (Spring and Autumn); and in 1891 *Blandede Digte* (Miscellaneous Poems). His tragic music-drama *Drot og Marsk* (King and Constable, 1878), with music by P. Heise, is one of the most popular pieces in the repertory of the Royal theater. In his religious depth, his patriotic enthusiasm, and his sincere love of nature, he stands first in later Danish lyrical poetry. D. 1893. His collected poems were published in Copenhagen in 1894. D. K. Dodge.

Richelieu, rĕĕ-she-loo′, also called **Sorel**, or **Chambly**: an historic and beautiful river of Quebec, Canada; right-hand affluent of the St. Lawrence, discharging Lake Champlain; length, 80 miles. Its course is northerly and very straight; the width, at first 1 or 2 miles, becomes gradually contracted to 1,000 or 1,200 feet. It is navigable, except for rapids between St. John and Chambly, and this gap is supplied by a canal. Navigation closes between Nov. 16 and Dec. 13, and opens between Mar. 20 and May 1. The valley is fertile and attractive, and in it were made some of the earliest settlements in the province. It also served as a battle-ground for over two centuries, beginning with Champlain's Iroquois campaign in 1609. M. W. H.

Richelieu (Fr. pron. rĕĕsh′li-ö′), Armand Jean Duplessis, de, Duke and Cardinal: statesman; b. in Paris, France, Sept. 5, 1585; was educated for the military profession in the Collège de Navarre, but, having a prospect of succeeding to the bishopric of Luçon, did not enter the army, but studied theology, and was consecrated bishop Apr. 16, 1607. Elected a deputy of the clergy to the States-General in 1614, he allied himself with the queen-mother and regent, Marie de Médicis; was appointed her almoner, and became a member of the council of state. When, shortly after, dissensions broke out between the king (Louis XIII.) and his mother, Richelieu accompanied the latter to Blois, and retired subsequently to his diocese, but succeeded, nevertheless, in bringing about a reconciliation between mother and son; was rewarded with the cardinal's hat in 1622; re-entered the council of state, and was soon after made prime minister, which office he filled uninterruptedly to his death, exercising a most decisive influence on the history of France, externally and internally. His foreign policy centered in the idea of humiliating Austria. For this purpose he encouraged the rising of the Protestant princes in Germany, the revolution of the provinces in the Netherlands, and even the revolt in Catalonia. He subsidized Gustavus Adolphus, and after the death of the latter he took the Duke of Saxe-Weimar and his army into the French service, and carried on the war against the emperor with great vigor. He also declared war against Spain, and although his plans in the Netherlands failed, he succeeded in separating Portugal from Spain in 1640, and conquered Perpignan in 1642. The final results of these wars he did not live to see, but by the Peace of Westphalia (1648) the progress of the house of Austria was effectually checked and its dream of establishing a world-empire was destroyed. By his internal policy he finished what Louis XI. had begun—the overthrow of the feudal power of the nobility. His government was marked by an almost uninterrupted series of conspiracies among the feudal nobility of the realm, headed by the queen-mother (whose favor had turned into a deadly hatred), by the queen herself, Anne of Austria, by Gaston of Orleans, the brother of the king, and by the royal princes. A master in intrigue and the very genius of detective police superintendence, he was always well informed and fully prepared, and punished the conspirators with merciless severity. The king felt a deep antipathy against him, and on this circumstance the first conspirators based their hope of overthrowing him. With the king, however, this almost physical aversion was wholly overawed by a mixture of admiration and fear of the towering spirit of his minister, and on Nov. 11, 1630 (*la journée des dupes*), when the king had consented to his dismissal and the whole court exulted, Richelieu forced himself into the presence of Louis, turned him around in a moment, and reappeared with great dramatic effect among his enemies, stronger than ever. Afterward the conspirators sought and found support in foreign countries, especially in Spain, and Richelieu needed armies to maintain himself, but he proved unconquerable. Marie de Médicis fled from place to place in foreign countries; Gaston of Orleans was made utterly contemptible by his cowardly submission: Montmorency, Marillac, Cinq-Mars, and many others were beheaded. The scaffold, the dungeon, and exile were the end of all resistance to him who wielded the royal power. Besides the feudal nobility, there was another political power in France at the time when Richelieu took the reins—namely, the Huguenots—and to crush this young but steadily increasing influence was one of the three great objects of his policy. He laid siege to their principal stronghold, La Rochelle, and this siege is one of the most memorable events in the history of France. On Oct. 28, 1628, the city surrendered, four-fifths of its inhabitants having perished by the sword and by famine. By the fall of La Rochelle the political power of the Huguenots was wholly broken, but Richelieu's further measures concerning them were moderate and even magnanimous. The cardinal

built the Palais Cardinal, afterward the Palais Royal, which entirely outshone the royal residence. He showed great interest in literature and art. He founded the Jardin des Plantes, enlarged the Sorbonne and the royal library, and gave substantial encouragement to many scholars, poets, and artists. His interest in literature, however, was not only a merit, but also a foible with him. He wrote *Mirame* and *La Grande Pastorale*. His *Lettres, Instructions diplomatiques, etc.*, were edited by Avenel (6 vols., Paris, 1853–68). Of the *Mémoires du Cardinal de Richelieu*, *Testament politique du Cardinal de Richelieu*, and *Journal du Cardinal de Richelieu*, the last is spurious, and the first two of doubtful authenticity. D. in his palace in Paris, Dec. 4, 1642. The best authorities are Caillet, *L'Administration en France sous le Ministère du Cardinal de Richetieu* (2 vols.), and Bazin, *Histoire de France sous Louis XIII.* (4 vols.)

Revised by C. K. Adams.

Richepin, rēesh'păn', Jean: poet, dramatist, and novelist; b. at Médéah, Algiers, Feb. 4, 1849. After studying in Paris at the Lycée Napoléon and the Lycée Charlemagne, he began to study medicine, and in 1868 entered the École Normale. After some newspaper work in 1870–71, he produced a novel, *Jules Valtès* (1872), and, in company with André Gill, a play, *L'Étoile*. He first attracted attention by the volume of poems, *La Chanson des Gueux* (1876), for which he was condemned to a fine of 500 francs and imprisonment for a month. In prison he wrote *Les Morts Bizarres* (1887). He went next to sea, but soon returned to Paris, and has since been a prolific author of poetry, novels, and plays. A partial list is *Les Caresses* (1877), *Les Btasphèmes* (1884), *La Mer* (1886), *Mes Paradis* (1893), in verse; *Madame André* (1874), *La Glu* (1881), *Braves Gens* (1888), novels; *Nana Sahib* (1882), *Monsieur Scapin* (1886), *Le Flibustier* (1888), *Par le Glaive* (1892), plays. A. G. Canfield.

Richer, rēe'shā', Edmund: a learned champion of Gallican Church rights against the papacy; b., of humble parentage, at Chaource, France, Sept. 30, 1560; was made doctor of the Sorbonne 1590; director of the college of Cardinal Lemoine 1594; later a syndic of the Sorbonne. In 1595 he played a prominent part in the expulsion of the Jesuits. His famous *De Ecctesiastica et Politica Potestate* was written in 1611, and in it he gave vigorous expression to his Gallicanism. The Jesuits had their revenge when the Sorbonne deposed him as syndic 1613, and the daggers of Richelieu compelled him to recant 1629. D. Nov. 28, 1631. See his *Life*, by A. Baillet (Liège, 1714; n. e. Amsterdam, 1715) and by G. L. Calabre-Perau (Paris, 1748).

Revised by S. M. Jackson.

Richer, Paul, M. D.: neurologist; b. at Chartres, department of Eure-et-Loir, France, Jan. 17, 1849; received his scholastic education at the Institution des Pères Maristes in Montençon, and his medical education at the Paris School of Medicine, graduating M. D. in 1879; in 1882 was made chief of the laboratory of the clinic of diseases of the nervous system at the Salpêtrière. Besides numerous monographs on neurological topics, he is the author of *Étude descriptive de la grande attaque hystérique ou attaque hystéro-épileptique et de ses principales variétés* (Paris, 1879); *Études cliniques sur l'hystéro-épilepsie ou grande hystérie* (Paris, 1881); *Anatomie artistique* (Paris, 1890); *Paralysies et contractures hystériques* (Paris, 1892); *Canon des proportions du corps humain* (Paris, 1893); *Physiotogie artistique de l'homme en mouvement* (Paris, 1894). S. T. A.

Richet, rēe'shā', Alfred Louis, M. D.: surgeon; b. at Dijon, France, Mar. 16, 1816; began the study of medicine in Paris in 1835; became assistant in anatomy in 1841 and prosector in 1843; graduated M. D. in 1844, his thesis being a valuable monograph, *Études d'anatomie, de physiotogie et de pathologie pour servir à l'histoire des tumeurs blanches*; in 1847 passed the *concours* for associate professor in the faculty of Paris; was successively surgeon to the Lourcine, St.-Antoine, Pitié, and Hôtel-Dieu hospitals; was president of the Société de Chirurgie in 1864, and of the Academy of Medicine in 1879; was appointed professor of clinical surgery in 1864; became a member of the Institute in 1883; in 1848 was made a chevalier, in 1873 a commander of the Legion of Honor. He was the author of a number of important papers on surgical topics. His most important work was *Traité pratique d'anatomie médico-chirurgicate* (Paris, 1857). D. at Hyères, Dec. 3, 1891. S. T. Armstrong.

Richet, Charles: physiologist; b. in Paris, France, Aug. 26, 1850; educated in Paris; has been Professor of Physiology in the Faculty of Medicine at Paris since 1887; editor of the *Revue Scientifique* since 1878. His principal works are *L'homme et l'intettigence* (2d ed. 1891); *Psychologie générate* (2d ed. 1891); *Physiotogie générate des muscles et des nerfs* (1883); *Travaux du Laboratoire de physiologie* (3 vols., 1890–94); and *La chaleur animate* (1889). J. M. B.

Richey, Matthew Henry: See the Appendix.

Richfield: city; capital of Sevier co., Utah; on the Sevier river; 42 miles S. W. of Manti (for location, see map of Utah, ref. 5–M). It is in an agricultural region, and has a weekly newspaper and a private bank. Pop. (1900) 1,969.

Richfield Springs: village; Otsego co., N. Y.; at the head of Canadarago (formerly Schuyler) Lake, and on the Del., Lack. and W. Railroad; 16 miles N. of Cooperstown, the county-seat, 35 miles S. E. of Utica (for location, see map of New York, ref. 5–H). In and near the village are seventeen mineral springs, one of which, of sulphur, is widely known for its curative properties in cases of rheumatism and cutaneous disorders. There are eleven summer hotels, fine drives to Cooperstown, Otsego Lake, and other interesting points, and many attractions for the summer tourist and boarder. The village has several manufactories, including a Scotch-cap factory, knitting-mill, and glove-factory, a national bank with capital of $100,000, and a weekly newspaper. Pop. (1880) 1,307; (1890) 1,623; (1900) 1,537. Editor of "Mercury."

Richford: village; Franklin co., Vt.; on the Missisquoi river; and the Cent. Vt. and the Canadian Pac. railways; 28 miles E. N. E. of St. Albans (for location, see map of Vermont, ref. 2–B). It is a noted lumber-manufacturing center, has a number of mills run by steam and water power, and contains a savings-bank and trust company with capital of $50,000, and two weekly newspapers. Pop. (1880) 789; (1890) 1,162; (1900) 1,513.

Rich Hill: city; Bates co., Mo.; on the Osage river, and the Kan. City, Fort Scott and Memphis and the Mo. Pac. railways; 20 miles N. E. of Fort Scott, 85 miles S. by E. of Kansas City (for location, see map of Missouri, ref. 5–E). It has an elevation of 800 feet above sea-level, and is the center of the largest coal-area in the State. There are 12 churches, 3 large public-school buildings, water, gas, electric-light and electric street-railway plants, 2 ten-acre public parks, 2 State banks with combined capital of $100.000, and 5 newspapers. Besides the coal-mines in operation, there are vitrified brick-works, zinc-smelters, flour-mills, distillery, foundry, machine-shops, and factories for cigars and for canning. Pop. (1880) 36; (1890) 4,008; (1900) 4,053.

Editor of "Daily Review."

Richibucto, rish-i-bŭk'tō, formerly Liverpool: a port of entry and capital of Kent co., New Brunswick; eastern terminus of the Kent Northern Railway, connecting with the Intercolonial at Kent Junction; at the mouth of Richibucto river, which is navigable for 15 miles; latitude of entrance, 46° 43′ N., lon. 64° 50′ W. (see map of Quebec, etc., ref. 4–I). Lumber and fish are largely exported, and shipbuilding is a leading pursuit. Pop. (1891) 3,986.

Richland Centre: city; capital of Richland co., Wis.; on the Pine river, and the Chi., Mil. and St. Paul Railway; 12 miles N. of the Wisconsin river, 59 miles W. by N. of Madison (for location, see map of Wisconsin, ref. 7–C). It is in an agricultural, dairying, stock-raising, and lumbering region, has a large trade in cheese, flour, railway-ties, and stoves, and contains a high school and three weekly newspapers. Pop. (1880) 1,227; (1890) 1,819; (1900) 2,321.

Richmond (anc. *Syenes* and *Sheen*): town; in the county of Surrey, England; on the summit and slope of Richmond Hill and on the level right bank of the Thames, 10 miles S. W. of St. Paul's, London (see map of England, ref. 12–J). Only a gateway remains of the royal palace of Sheen, rebuilt by Edward III., who died there. In 1499 the palace was burned down, but was rebuilt by Henry VII., who changed the name to Richmond. Elizabeth was imprisoned here for a short time by Mary; she afterward often resided here, and died here in 1603. Under the Commonwealth the palace was partially destroyed, and in the eighteenth century was pulled down. In the neighborhood is Richmond Park, formed by Charles I. in 1634; it covers 2,253 acres, and is surrounded by a brick wall nearly 8 miles in length. From Richmond Hill and Richmond bridge (1774–77) striking views of the surrounding beautiful scenery can be obtained. Market-gardening and nursery-gardening is the principal industry. Pop. (1891) 22,684.

Richmond: city of Victoria, Australia; 2 miles E. of Melbourne (see map of Australia, ref. 8–H). Pop. (1889) 37,550. It has a distinct municipality and the rank of a city, but is really only a suburb of Melbourne.

Richmond: *chef-lieu* of the counties of Richmond and Wolfe, Canada; on the St. Francis, a tributary of the St. Lawrence; 76 miles E. of Montreal (see map of Quebec, ref. 5–C). It is an important center of the Grand Trunk Railway, the Portland section extending from it 221 miles, the Montreal section 76 miles, and the Quebec branch 96 miles. The river is spanned by a passenger-bridge connecting the picturesque village of Melbourne with Richmond. St. Francis College, an institution affiliated to McGill University, is situated on a commanding site at the upper end of the town. Two newspapers are published in the place. The chief industry is connected with the railway-works and machine-shops. Pop. (1890) 2,056. J. M. Harper.

Richmond: city; capital of Wayne co., Ind.; on the Whitewater river, and the Grand Rapids and Ind. and the Pitts., Cin., Chi. and St. L. railways; 68 miles E. of Indianapolis, 92 miles S. by E. of Fort Wayne (for location, see map of Indiana, ref. 6–G). It is in an agricultural region, has an elevation of 700 feet above tide-water, and is engaged in manufacturing and in general trade. The city has gas and electric-light plants, an abundant supply of natural gas for fuel, excellent water and drainage systems, and electric street-railways. There are 21 churches, 9 public-school buildings, a high school, public-school property valued at about $300,000, Earlham College (Orthodox Friends, opened in 1847), 5 libraries (Earlham College 3, Morrison Public, and County Law) containing over 27,000 volumes, 3 national banks with combined capital of $450,000, 4 building and loan associations, and a semi-monthly, a quarterly, 4 daily, 7 weekly, and 3 monthly periodicals. In 1890 there were 293 manufacturing establishments, which had a combined capital of $4,000,000, employed about 3,000 persons, and had products valued at about $6,000,000. The public buildings include a new county court-house, a new State asylum for the insane, two orphans' homes, a Home for Friendless Women, and a city hospital. Pop. (1880) 12,742; (1890) 16,608; (1900) 18,226.

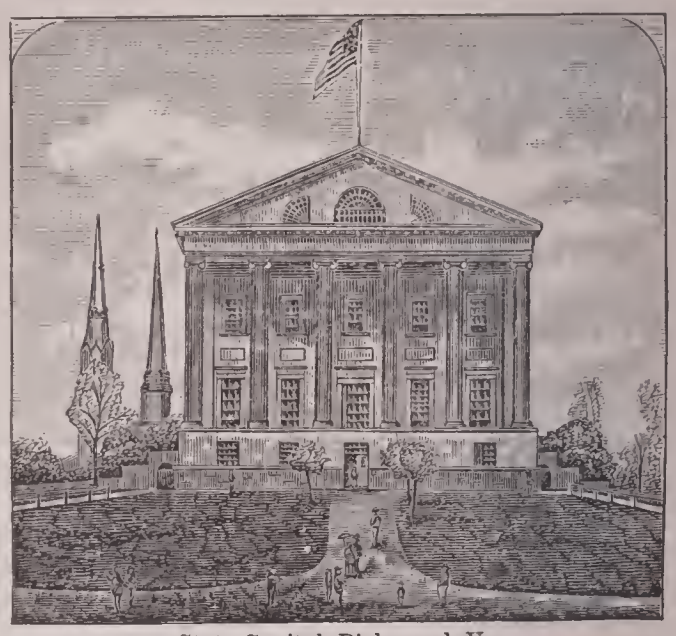
Richmond: town; capital of Madison co., Ky.; on the Louis. and Nash. and the Rich., Nicholasville, Irvine and Beattyville railways; 25 miles S. S. E. of Lexington, 54 miles S. E. of Frankfort, the State capital (for location, see map of Kentucky, ref. 3–I). It is in an agricultural region; is noted for breeding horses, mules, and cattle; and contains the Central University (Southern Presbyterian, chartered in 1873), 4 national banks with capital of $750,000, and 2 weekly periodicals. Pop. (1890) 5,073; (1900) 4,653.

Richmond: town; Sagadahoc co., Me.; on the Kennebec river, and the Maine Central Railroad; 17 miles S. of Augusta, and 44 miles N. E. of Portland (for location, see map of Maine, ref. 10–C). It is principally engaged in the manufacture of boots and shoes, has sawmills and planing-mills, and contains a public high school, public library (founded in 1868), two national banks with combined capital of $170,000, and a weekly and a monthly periodical. Pop. (1880) 2,658; (1890) 3,082; (1900) 2,049.

Richmond: city; capital of Ray co., Mo.; on the Atch., Top. and S. Fé Railroad; 40 miles E. of Kansas City, 68 miles S. E. of St. Louis (for location, see map of Missouri, ref. 3–E). It is in an agricultural and coal-mining region, and contains several flour-mills, foundry, public high school, Woodson Institute, new water-works plant, electric lights, 3 State banks with combined capital of $200,000, and a daily and 3 weekly newspapers. Pop. (1890) 2,895; (1900) 3,478.

Richmond, Borough of: See the Appendix.

Richmond: city (named after Richmond, Surrey, England): port of entry; capital of Virginia and of Henrico County; on the north branch of the James river, and the Ches. and Ohio, the Richmond and Petersburg, the Rich., Fredericksburg and Potomac, and the Southern railways; 116 miles S. by W. of Washington, D. C., 127 miles N. W. of the Atlantic Ocean (for location, see map of Virginia, ref. 6–H). It has an area within incorporated limits of 4·85 sq. miles, and with suburbs of about 16 sq. miles; is built on a series of hills, and ranges in altitude above sea-level from 172 to 249 feet. The river is here crossed by five bridges, connecting the city with Manchester, Spring Hill, and other suburban places. There are 106 miles of streets, generally wide, of which 36 miles are sewered and 23 miles paved; sidewalks are chiefly of brick. Main Street is the principal business thoroughfare; Broad Street is the widest; West Franklin and Grace contain the most fashionable residences. The streets are lighted by gas and electricity. The supply of water for domestic and fire purposes is obtained from two points on the river above the city, where it is pumped into two large reservoirs for distribution. Both the gas and water-works plants are owned by the city.



State Capitol, Richmond, Va.

Parks and Public Buildings.—The most noted of the parks and squares, which comprise 357 acres in all, is Capitol Square, a tract of 12 acres on the summit of Shockoe Hill. It contains the State Capitol, a Græco-composite building with a portico of Ionic columns, erected in 1796 after the plans of the Maison Carrée of Nîmes, France, built according to the suggestions of Thomas Jefferson. The building contains Houdon's marble statue of Washington, and many portraits of governors, military officers, and other distinguished Virginians; and the two legislative halls. The State Library building, in which are preserved the parole signed by Lord Cornwallis at Yorktown, the original Virginia bill of rights, and the Virginia ordinance of secession, is located in the same square. The park surrounding the Capitol has three fountains; Crawford's equestrian statue of Washington surrounded by bronze statues of Patrick Henry, John Marshall, Andrew Lewis, George Mason, Thomas Jefferson, and Thomas Nelson, by Crawford and Rogers; Foley's bronze statue of "Stonewall" Jackson; and Hart's marble statue of Henry Clay. Other public buildings on the square are the Governor's mansion, the new Public Library, and the old bell-house. The largest park, of 300 acres, contains the new reservoir, a beautiful lake, and a fine boulevard, and is a favorite resort. Libby Park, on Libby Hill, is terraced from the summit to Main Street, and on its highest point has a Confederate Soldiers' and Sailors' Monument. Monroe Park contains a statue of Gen. W. C. Wickham. Chimborazo Hill Park has an area of 36 acres, and an elevation of 200 feet. Howitzer Place has a monument in memory of the Richmond Howitzer battalion. Gamble's Hill Park is on the James river and Kanawha Canal, and Jefferson Park is between Marshall and Pleasant Streets. Lee Circle, in the west of the city, contains a bronze equestrian statue of Gen. Robert E. Lee. In Hollywood Cemetery, where 12,000 Confederate soldiers lie, is a memorial of rough blocks of granite, forming a pyramid 90 feet high, erected by the women of Richmond. Other notable buildings are St. John's Protestant Episcopal church, on Church Hill, in which Patrick Henry made his famous declaration for liberty or death; the Colonial Stone House on Main Street, believed to have been occupied by Washington; the "White House of the Confederacy," the home of Jefferson Davis during the civil war, and now a museum for Confederate relics; the Masonic Temple, the first erected in the U. S. (corner-stone laid 1785); Monumental church (Protestant Episcopal), erected on the site of the theater burned in 1811, when sixty lives were lost; two armories; St. Luke's Hospital; Retreat for the Sick; Lee Camp Soldiers' Home; the Male and Female Orphan asylums; the Virginia Medical College; the Colored Baptist church, in which the constitutional convention of 1850–51 was held; and the penitentiary, to which a farm is now attached.

Churches and Schools.—Richmond has 128 religious organizations and 88 church edifices, 63 for white people and 25 for colored. The Baptists have 14 churches for white members; Episcopalians, 12; Methodists, 10; Presbyterians, 8; Roman Catholics, 4; Lutherans, 4; Jews, 4; Christians, 2; and Friends, 1. The public-school system has been developed since the civil war. In 1894 there were 17 public-school buildings, including high and normal schools for whites and colored, and public-school property valued at $500,000. For evening instruction there are the Virginia Mechanics' Institute and 6 other night-schools. There are 10 private and numerous parochial schools. The institutions for advanced instruction include the Virginia Medical College (founded in 1837); University College of Medicine (established in 1893); Richmond Female Institute (Baptist, founded in 1854); Monte Marie Institute (Roman Catholic, established in 1860); St. Mary's Benedictine Institute; Richmond Female Seminary (Protestant Episcopal); Hartshorne Memorial College for the Education of Colored Girls (Baptist, opened in 1883); Richmond Theological Seminary (Baptist, opened in 1867); and Richmond College (Baptist, opened in 1832). There are 5 public libraries, with an aggregate of 50,000 volumes, and in Jan., 1894, there were 6 daily, 21 weekly, 14 monthly, and 2 quarterly periodicals.

Business Interests.—In the 1890 census 966 manufacturing establishments (representing 103 industries) reported. These had a combined capital of $16,785,242, employed 18,512 persons, paid $7,192,646 for wages and $14,014,214 for materials, and had products valued at $27,792,672. The principal industry is the manufacture of tobacco. In 1893 there were 120 establishments engaged in this industry, having a capital of $5,058,000, employing 8,820 persons, and yielding products valued at $12,538,000. The establishments comprised 64 cigarette and cheroot factories, 31 smoking and chewing tobacco factories, and 25 stemmeries and other works. The internal revenue collections average $1,500,000 per annum. Iron manufactures rank next to tobacco, and, including carriages and agricultural implements, average in value $7,095,000 per annum. Flour and grist mill products have an annual value of $2,735,000; fertilizers, $1,075,000; and lumber, $770,000. In 1893 Richmond had 20 banking institutions, of which 4 were national and 10 had State charters. There were 7 savings-banks, 5 private banks, and several loan and deposit companies. The incorporated banks had an aggregate capital of $6,040,056; deposits, $11,150,000; loans and discounts, $12,520,000; and total resources, $17,900,000. In the fiscal year ending June 30, 1894, the transactions at the custom-house showed imports of foreign merchandise, $43,989; exports of domestic products and merchandise, $3,971,837. The assessed valuations of the city in 1893 were, personal, $18,958,368; real, $40,255,919—total, $59,214,288; the bonded debt was $6,609,237; the annual receipts were $2,256,000; and the municipal assets included the city-hall, gas and water plants, parks, railway stock, and other items, aggregating $6,000,000.

History.—As early as 1609 a settlement was made by the English on what is now the lower portion of the city. Col. William Byrd built a mill near the falls in 1679, and afterward a warehouse. The place was known as Byrd's Warehouse till May, 1742, when it was incorporated as a town, and laid off into squares with wide streets. In 1779 the seat of government of the commonwealth was removed from Williamsburg to Richmond. In 1781 the city was taken and burned by the traitor Arnold. In June, 1861, it was made the capital of the Confederate States, and there the Confederate Congress met on July 20 following. During the civil war the city was the objective point of the principal operations of the Union army in Virginia, and it was evacuated in Apr., 1865; the main business portion of the city was then burned. On Apr. 27, 1870, over sixty persons were killed or mortally wounded by the yielding of the floor of the court-room of the court of appeals beneath the weight of the multitude gathered to hear the decision in the contested election for mayor; and the great flood in James river in Sept., 1870, inundated a large portion of the city. Pop. (1880) 63,600; (1890) 81,388. MALCOLM A. COLES.

Richmond, LEGH: religious writer; b. in Liverpool, England, Jan. 29, 1772; graduated at Cambridge, 1794; took orders in the Church of England 1797; became curate of Brading and Yaverland in the Isle of Wight 1798, chaplain to the Lock Hospital, London, 1805, and was presented in the same year to the rectory of Turvey, Bedfordshire, which he held until his death May 8, 1827. He was the author of several popular tracts, which have been circulated by millions in many languages; especially *The Dairyman's Daughter*, *The Negro Servant*, and *The Young Cottager*. He also edited *The Fathers of the English Church, or a Selection from the Writings of the Reformers and Early Protestant Divines of the Church of England* (8 vols., 1807–11). See his *Life*, by T. S. Grimshawe (London, 1826; ed. G. T. Bedell, Philadelphia, 1846).

Richmond, MARGARET BEAUFORT, Countess of: daughter of Edmund Beaufort, Duke of Somerset; b. at Bletsoe, Bedfordshire, England, about 1441; married Edmund Tudor, Earl of Richmond, to whom she bore a son, Henry Tudor (afterward King Henry VII.); after the death of her first husband she married Sir Henry Stafford 1459, and left a second time a widow in 1481, married Thomas, Lord Stanley, in the following year. She was known as Countess of Derby during the reign of her son, her husband having been created Earl of Derby as a reward for his defection from Richard III. on Bosworth Field. She was noted for her charity and devotion, and also for her patronage of letters and her own literary taste; translated *The Mirroure of Gold for the Sinfull Soule*, from a French version of the *Speculum Aureum Peccatorum* (printed by Pynson), and the fourth book of the *Imitation of Christ* (1504); endowed Christ's College 1505, and St. John's College, Cambridge, by bequest 1511, founding the Lady Margaret professorship of divinity, still maintained. D. in 1509. The principal title of the Tudor, Stuart, and Brunswick dynasties to the English throne was derived through this lady's descent from Edward III. through John of Gaunt. Revised by F. M. COLBY.

Richmond College: an institution at Richmond, Va. It began in 1830 as a Baptist seminary for the education of ministerial candidates. In 1840 it was chartered as a college. The civil war shut its doors and destroyed its endowment. In 1866 it was reorganized on the system of independent schools, of which there are eight, and elective studies. Each professor is responsible for the efficient control of his own school, and admits to graduation therein only upon rigid written examination. The chief executive officer was chairman of the faculty, chosen annually, but in 1894 Prof. F. W. Boatwright was elected president for an indefinite period. The degree of B. A. is conferred upon such students as have graduated in a prescribed course, about equal to six schools; the degree of M. A., upon such as have graduated in all the eight schools. Attendance on religious exercises is voluntary. Two free courses of subsidiary lectures are given every session. There are large dormitories, ample lecture-rooms, spacious halls for library and museum, and a campus of 13 acres. There were 16 professors and 225 students in 1900. Revised by W. H. WHITSITT.

Richter, *rich'ter*, GUSTAV KARL LUDWIG: historical and portrait painter; b. in Berlin, Germany, Aug. 31, 1823; studied at the Berlin Academy and under Léon Cogniet in Paris; professor in Berlin Academy; member of Munich and Vienna Academies; medals at the exhibitions in Brussels and Vienna 1873, Philadelphia 1876, and Munich 1883; second-class medals, Paris Salons, 1857 and 1859, and Paris Exposition 1855. D. in Berlin, Apr. 3, 1884. One of his most celebrated works is *Portrait of Queen Louise* (1879) in the Cologne Museum. He was the most famous portrait-painter in Germany in his time. Works by him are in the National Gallery, Berlin; Maximilianeum, Munich; and the museum at Dantzic. WILLIAM A. COFFIN.

Richter, JEAN PAUL FRIEDRICH, generally called **Jean Paul**: author; b. at Wunsiedel, Bavaria, Mar. 21, 1763. His father was a poor country minister, and when he died, in 1779, he left to his family nothing but debt. The son, nevertheless, went to Leipzig in 1781 to study at the university, and he contrived to stay there four years, though he lived in the most pinching poverty. In 1784 he fled from Leipzig in order to escape imprisonment for debt, and for three years lived with his mother at Hof. From 1787 to 1789 he was private tutor in a family at Leipzig, and from 1790 to 1794 a schoolmaster at Schwarzenbach. Compared with his life in Leipzig and at Hof, these positions offered him affluence, and in the meantime he had become a celebrated author. He had originally gone to Leipzig to study theology, and had read much of this science, as of everything else; but having been poorly taught in his youth, he was incapable of systematic and exhaustive study. There was something roving and diffuse in his intellect, as in his talent. Thus by his studies at Leipzig he had only prepared himself for a miscellaneous literary activity, and his first at-

tempts were not successful. His *Grönländische Processe* (Lawsuits in Greenland, 2 vols., 1784) and *Auswahl aus des Teufels Papieren* (Selections from the Papers of the Devil, 1789) were not read; their satire is narrow, their humor forced, their form unripe. In 1793 his romance, *Die Unsichtbare Loge* (The Invisible Lodge, 2 vols.), turned the scales of fortune, and now followed in rapid succession, and with decided success, *Hesperus* (4 vols., 1795), *Biographische Belustigungen unter der Gehirnschale einer Riesin* (Biographical Recreations under the Cranium of a Giantess, 1796), *Leben des Quintus Fixlein* (1796), *Blumen-, Frucht- und Dornenstücke, oder Ehestand, Tod und Hochzeit des Armenadvocaten Siebenkäs* (Flower, Fruit, and Thorn Pieces, or Marriage, Death, and Wedding of Lawyer Siebenkäs, 4 vols., 1797), *Der Jubelsenior* (1797), *Das Kampaner Thal* (1797). These writings made Richter the literary favorite of Germany. In 1794 he gave up his position as a schoolmaster, and began a life of visits to the different literary centers—Leipzig, Weimar, Dresden, and Berlin. He was everywhere well received, and made many intimate friends, among whom, however, Goethe and Schiller were not. It was especially the fair sex which was enthusiastic about him. In 1801 he married in Berlin the beautiful and spirited Caroline Mayer, and removed first to Meiningen, then to Bayreuth. From the prince-primate Dalberg he received an annual pension of 1,000 florins, which was continued afterward by the King of Bavaria, and the University of Heidelberg made him a doctor. In 1803 he published his *Titan*, and in 1804 *Die Flegeljahre* (Wild Oats, 4 vols.), which two romances, together with his first philosophical attempt, *Vorschule der Æsthetik* (Introduction to Æsthetics, 3 vols., 1805), may be considered as indicating the culmination of his talent. In 1807 he wrote another philosophical book on education, *Levana oder Erziehungslehre*, and in the following years he published a great number of political and satirical pamphlets, sermons, humorous sketches, etc. D. at Bayreuth, Nov. 14, 1825. Richter is without doubt the greatest humorist of modern German literature, but his utter disregard for literary form, the lack of artistic composition, and his barbarous style make it a laborious task to read and enjoy him. Having, however, penetrated the hard shell of the imperfect form of his writings, one finds him a poet of divine inspirations, lofty sentiments, and irresistible humor. In order to do him justice it is necessary not only to consider him in his literary relations to the earlier English and German humorists, like Swift, Sterne, Hippel, Lichtenberg, and others, but also to keep in mind the miserable political and social conditions of Germany in his time and the strong current of sentimentality which had not been checked by the classic productions of Goethe and Schiller. While these latter poets and their followers had created in their works an ideal poetic world unconcerned about the miserable conditions around them in which they really lived, Richter makes the very contrast between the German idealism and the prosaic reality of his time the subject-matter of his humorous representations. With a loving spirit he embraces the lowest and most humble in this prosaic reality, and thus he produces idyls like *Quintus Fixlein*, *Leben Fibels*, etc., in which his contemporaries found a picture of their own life, and which we could call classic but for their poor literary form. He is especially great in his descriptions of nature, while in the delineation of human characters he is frequently less successful. As defective as his style was, it found a great many imitators. The tendency which prompts authors like Börne, Heine, and their literary offspring to parade their vain subjectivity is due to the example of Richter, to whom Heine especially owes more than he might have been willing to acknowledge.

See R. O. Spazier, *Jean Paul Fr. Richter, ein biographischer Commentar zu dessen Werken* (1833); E. Förster, *Denkwürdigkeiten aus dem Leben J. P. F. Richters* (1863); Fr. Th. Vischer, *Kritische Gänge*; G. Nerrlich, *Jean Paul und seine Zeitgenossen* (1889); Carlyle, *Essays*.

Revised by JULIUS GOEBEL.

Richthofen, richt'hō-fen, Baron FERDINAND, von, Ph. D.: geologist and geographer; member of a distinguished Silesian family; b. at Carlsruhe, Germany, May 5, 1833; studied at Breslau and Berlin 1850–56. During 1856–60 he was in Austria studying the geology of the Tyrol, Siebenbürgen, and Northeastern Hungary. He then accompanied, as geologist, Count Eulenberg on the Prussian expedition to the far East, and remained twelve years in China, Indo-China, Java, Celebes, the Philippine islands, Formosa, Japan, California and Nevada, returning to Europe in 1872. The last four years of his sojourn abroad were spent in traveling all over Northern and Central China in the interests of the Shanghai Chamber of Commerce. Was Professor of Geography at Bonn 1879, Leipzig 1883, and Berlin 1886. D. May 8, 1888. His publications, which were numerous, include *The Comstock* [Nev.] *Lode* (1865); *Principles of the Natural System of Volcanic Rocks* (1867); *Letters to the Shanghai Chamber of Commerce* (1869–72). The most noteworthy of his works is *China, Ergebnisse eigner Reisen und darauf gegründeter Studien* (vol. i., 1877; vol. ii., 1882; vol. iv., 1883). MARK W. HARRINGTON.

Richwood: village; Union co., O.; on the Erie Railroad; 15 miles S. W. of Marion (for location, see map of Ohio, ref. 4–E). It is in an agricultural region, and has 2 large flour-mills, 2 steam tile-mills, several large grain elevators, a planing-mill, 2 private banks, and 2 weekly newspapers. Pop. (1890) 1,415; (1900) 1,640. PUBLISHER OF "GAZETTE."

Ric'inus: See CASTOR-OIL PLANT.

Rickets: a disease characterized by deformities of the bones and various visceral disturbances. It occurs as a rule in infants from twelve to eighteen months of age. The predisposing causes are the influence of bad hygienic surroundings, and improper food and clothing. The symptoms develop gradually and almost imperceptibly. The little patient seems to lose spirit, and indigestion sets in, accompanied by swelling of the abdomen and colic. There is early a tendency to sweating about the head and restlessness during sleep. The muscles become soft and flabby, the face sallow, and the skin dry, and there is scanty and turbid urine and thin fetid evacuations. The fontanelles and sutures remain open until a late period. The teeth are very late in making their appearance, and decay rapidly after doing so. As the disease advances the bones grow softer, and become distorted by the superincumbent weight and muscular contraction. Various deformities of the head, limbs, chest, and pelvis are brought about. (See ORTHOPÆDIC SURGERY.) As a disease of the bones, rickets is never dangerous. It is from the deformities resulting, and their interference with the action of the lungs and other viscera, that the danger arises. The treatment can be summed up in a few words—fresh air, sunlight, good food, bathing, and cod-liver oil. It is remarkable that rachitic children frequently develop and become unusually strong, though deformed, in adult years. Many, too, are brilliant mentally, as the records of great names in literature and science show.

Revised by W. PEPPER.

Ricketts, JAMES BREWERTON: soldier; b. in New York, June 21, 1817; graduated at U. S. Military Academy, and entered the artillery July, 1839; served in the Mexican war and on frontier duty up to 1861, when as captain he commanded a battery in the capture of Alexandria May 24, as in the battle of Bull Run July 21, 1861, where he was severely wounded, and from which date he was breveted lieutenant colonel and made brigadier-general of volunteers. He was engaged in the battle of Cedar Mountain, at the second battle of Bull Run, and at Chantilly commanded a division, as at South Mountain and Antietam; major First U. S. Artillery June, 1863; participated in the final Richmond campaign in command of a division from the battles of the Wilderness to the investment of Petersburg; recalled to Washington July, 1864, to aid in the defense against Early's threatened attack, and engaged in the subsequent pursuit of Early's army, participating in the battles of Monocacy, Opequan, Fisher's Hill, and Cedar Creek, where he was severely wounded; breveted major-general for gallantry; in Jan., 1867, was retired on the full rank of major-general. D. at Washington, D. C., Sept. 22, 1887. JAMES MERCUR.

Ricketts, PALMER CHAMBERLAINE, C. E.: civil engineer and educator; b. at Elkton, Md., Jan. 17, 1856; educated at the Rensselaer Polytechnic Institute, Troy, N. Y., where he graduated in 1875. During 1875–84 he was Assistant Professor of Mathematics; since 1884 has been Professor of Mechanics, and since 1892 director of the Rensselaer Polytechnic Institute. He has been consulting bridge-engineer for two railways, and since 1891 engineer of the public improvement commission of Troy, N. Y. In 1891 he was appointed brigadier-general and chief of engineers of the State of New York. He is the author of reports and technical discussions in engineering periodicals.

Rico, ree'ko: town; capital of Dolores co., Col.; on the Dolores river, and the Rio Grande Southern Railroad; 66

miles S. W. of Ridgway, 95 miles N. by W. of Durango (for location, see map of Colorado, ref. 5–B). The completion of the railway between Ridgway and Durango in 1892 added much to the importance of the town and quickened the development of gold, silver, copper, iron, and coal in its immediate vicinity. Rico has a national bank with capital of $50,000, a State bank with capital of $50,000, and two weekly newspapers. Pop. (1880) 894; (1890) 1,134; (1900) 811.

Rico, Martin: landscape-painter; b. in Madrid, Spain; pupil in Madrid of Federico de Madrazo and afterward studied in Paris and Rome; third-class medal, Paris Exposition, 1878; second-class medal, Paris Exposition, 1889; Legion of Honor 1878. His subjects are chiefly architectural, and for the most part consist of views in Venice. His pictures are painted with great cleverness, and are remarkable for delicacy of color and brilliancy of effect. Two works, *Grand Canal, Venice* and *Italian Garden*, are in the Metropolitan Museum, New York. W. A. C.

Ricord, rē̆e′kōr′, Philippe, M. D.: surgeon; b. in Baltimore, Md., of French parentage, Dec. 10, 1800; went to Paris 1820; received his medical degree 1826; practiced in the provinces for two years; returned to Paris, passed the Concours examination, and was attached to the Pitié Hospital as surgeon; in 1831 was surgeon-in-chief of the Hôpital du Midi at Paris; acquired a wide reputation by his treatment of venereal diseases; obtained the Monthyon prize 1842, and was appointed consulting surgeon to the Emperor Napoleon III. Oct., 1869. In 1860 he was made commander, and in 1871 (for his services in the ambulance-corps during the siege of Paris) grand officer of the Legion of Honor. He received more than 200 decorations from foreign governments throughout the world, and was president of the French Academy of Medicine, and author of numerous surgical works in his special department. D. Oct. 22, 1889.

Revised by S. T. Armstrong.

Ricot'ti, Ercole: author; b. at Voghera, Oct. 12, 1816; graduated at the University of Turin, and at the age of twenty-one presented to the Academy of Sciences of that city his *chef-d'œuvre, Storia delle Compagnie di Ventura*. For this he was honored with a prize, although the work only appeared completed in 1843–44, when it was published in Turin in four volumes. This was followed by other works —*Corso di Lezioni sopra la Storia d'Italia dal Basso Impero ai Comuni* (Turin, 1848); *Breve Storia d'Europa e specialmente d'Italia* (2 vols., Turin, 1850–51); *Storia della Monarchia Piemontese* (6 vols., 1861–69); *Della Vita e degli Scritti di Cesare Balbo* (1856); *Storia della Costituzione Inglese* (Turin). At first a civil engineer, then a lieutenant in the army, he was in 1846 appointed Professor of Modern History in the University of Turin; was a deputy of the Subalpine Parliament 1848–53; rector of the University of Turin 1862–65, and senator of Italy 1862, *seq.* D. at Turin, Feb. 24, 1883. See Manni, *Ricordi di E. Ricotti* (Turin, 1886); Ferrero, *Della vita e degli scritti di E. Ricotti* (Florence, 1888). Revised by A. R. Marsh.

Ridderstad, Karl Fredrik: novelist and poet; b. in Södermannland, Sweden, 1807; was a member of the Riksdag, where his eloquence and patriotism gained him a prominent position. He was the author of several historical romances from the time of Gustavus, the best of which are *Drabanten* (The Halberdier) and *Fürsten* (The Prince), and a number of novels of contemporary life in imitation of Eugene Sue, including *Stockholms Mysterier*, and *Den svarta handen* (The Black Hand, etc.), which show less force and originality. His dramas, among them *Drottning Kristina i Italien* (Queen Christina in Italy), are rhetorical and lack power of characterization. As a lyrical poet of the Tegnér school he was more successful. D. 1886. D. K. Dodge.

Riddle: See Enigma.

Riddle, Albert Gallatin: lawyer and author; b. at Monson, Mass., May 28, 1816; was taken in infancy to Northern Ohio; educated at Painesville Academy and at Western Reserve College; studied law; was prosecuting attorney for his county 1840–46, and again 1854–56; served in the Ohio Legislature 1848–50, and in Congress 1861–63; was for some time consul at Matanzas, and afterward settled as a lawyer at Washington, D. C. Author of *Students and Lawyers* (1873); *Bart. Ridgley* (1873); *The Portrait* (1874); *Alice Brand* (1875); *The House of Ross* (1887); *The Tory's Daughter* (1888), and other works. Revised by H. A. Beers.

Riddle, Joseph Esmond: classical scholar; b. in England about 1804; was educated at St. Edmund Hall, Oxford; took orders in the Church of England 1832; was for some years curate of Harrow; was Bampton lecturer 1852. D. at Cheltenham, Aug. 27, 1859. He was the author of a valuable *Latin-English Dictionary* (1836); an *English-Latin Dictionary* (1838); a *Manual of Christian Antiquities* (1839); *Natural History of Infidelity* (Bampton lectures, 1852); and many other works, theological and educational.

Revised by Benj. Ide Wheeler.

Riddle, Matthew Brown, D. D.: educator and author; b. at Pittsburg, Pa., Oct. 17, 1836; educated at Jefferson College, Pennsylvania, Western and New Brunswick Theological Seminaries, and Heidelberg; was Adjunct Professor of Greek in Jefferson College 1857–58; chaplain in the army 1861; pastor of the Reformed Dutch church, Hoboken, N. J., 1861–65; of the Second Reformed church, Newark, N. J., 1865–69; engaged in literary work in Europe 1869–71; was Professor of New Testament Literature and Exegesis in Hartford Seminary 1871–87; since 1887 has held the same chair in Western Theological Seminary. He was one of the revisers of the New Testament, and a member of the committee for revising the Confession of Faith. Of Lange's *Commentaries* he translated and edited Ephesians and Colossians, and edited the latter half of Romans and Galatians; prepared for the *International Commentary* Ephesians and Colossians, and Matthew, Mark, Luke, and Romans with Dr. Schaff; for the *International Revision Commentary*, Mark, Luke, and Romans; edited for the American edition of Meyer's *Commentary* Mark and Luke; revised and edited Robinson's *Greek Harmony of the Gospels* (1885) and his *English Harmony* (1886); edited for the *Library of the Ante-Nicene Fathers* in vol. vii. *The Teachings of the Twelve Apostles, The Second Epistle of Clement, The Apostolic Constitutions*, and in vol. viii. *The Clementine Recognitions and Homilies* and *The Apocrypha of the New Testament*; for the *Nicene and Post-Nicene Library* Chrysostom's *Homilies on Matthew* (first series, vol. x.) and Augustine's *Harmony* (vol. vi.); with Dr. J. E. Todd, prepared *Notes on the Sunday-school Lessons* (1878–81); and for the *American Supplement of the Encyclopædia Britannica* a number of articles covering most of the New Testament. C. K. Hoyt.

Rideau, rē̆e′dō′: lake, river, and canal of Ontario, Canada. The canal connects Ottawa on the Ottawa river with Kingston on the St. Lawrence, passing from Lake Rideau along Rideau river to the N., and through Mud Lake and along the Cataraqui to the S.; length, 126 miles. Projected in 1812, it formed an important means of internal communication, now rendered relatively unimportant by railways.

Rideing, William Henry: See the Appendix.

Ridgaway, Henry Bascom, D. D., LL. D.: clergyman and educator; b. in Talbot co., Maryland, Sept. 7, 1830; graduated at Dickinson College, Carlisle, Pa., in 1849; entered the ministry of the Methodist Episcopal Church; served as pastor in the Baltimore, Maine, New York, and Cincinnati conferences from 1851 to 1882. From 1882 he was professor in and president of Garrett Biblical Institute, Evanston, Ill. D. Mar. 30, 1895. He published *Life of Alfred Cookman* (1871); *The Lord's Land, a Narrative of Travels in Sinai, Arabia Petræa, and Palestine* (1876); and *Life of Edmund S. Janes, Senior Bishop of the Methodist Episcopal Church* (1882). A. Osborn.

Ridgefield: town; Fairfield co., Conn.; on the N. Y., N. H. and Hartford Railroad; 10 miles S. by W. of Danbury, 17 miles N. by W. of Norwalk (for location, see map of Connecticut, ref. 11–D). It is in an agricultural region, is a popular summer resort, and contains a public library, a savings-bank, a weekly newspaper, several manufactories, and many country residences of New York business men. Pop. (1880) 2,028; (1890) 2,235; (1900) 2,626.

Ridgetown: town of County Kent, Ontario, Canada; half way between the Thames river and the north shore of Lake Erie; a station on the Michigan Central Railroad (see map of Ontario, ref. 6–B). Pop. (1891) 2,254.

Ridgeville: town; Randolph co., Ind.; on the Mississinewa river, and the Grand Rapids and Ind., and the Pitts., Cin., Chi. and St. L. railways; 10 miles N. of Winchester, the county-seat, 59 miles S. of Fort Wayne (for location, see map of Indiana, ref. 5–G). It is in an agricultural region, has a private bank and a weekly newspaper, and is the seat of Ridgeville College (Congregational, organized as Free-will Baptist in 1867), which in 1894–95 had 7 instructors, 100 students, and $40,000 invested in grounds, buildings, and productive securities. Pop. (1890) 922; (1900) 1,098.

Ridgway: borough; capital of Elk co., Pa.; on the Clarion river and the Penn. and the Buffalo, Rochester and Pitts. railways; 118 miles S. E. of Erie, and 156 miles N. E. of Pittsburg (for location, see map of Pennsylvania, ref. 3–D). It is in a lumbering region, and contains tanneries, foundry, machine-shop, a private bank, and two weekly newspapers. Pop. (1880) 1,100; (1890) 1,903; (1900) 3,515.

Ridgway, Robert: ornithologist; b. at Mt. Carmel, Ill., July 2, 1850; educated in the common schools of that place. He was appointed zoölogist to the U. S. geological exploration of the 40th parallel, under Clarence King (1867–69), and is curator of the department of birds of the U. S. National Museum. He assisted Prof. Baird in the preparation of the technical portion of the *History of North American Birds* (1871–74). The three volumes were upon land-birds, and in 1884 two more volumes, upon water-birds, were issued. Although published as the works of Baird, Brewer, and Ridgway, the technical parts were entirely written by Ridgway. He is also author of *Report on Ornithology of the 40th Parallel*, an elaborate treatise on 262 species, and a work of 367 Government quarto pages; *A Nomenclature of Colors for Naturalists* (Boston, 1886); and *A Manual of North American Birds* (Philadelphia, 1887). Besides this, he is author of about 200 separate papers, some of considerable extent. Revised by F. A. Lucas.

Ridley, Nicholas, D. D.: bishop and martyr; b. at Unthank, Northumberland, England, about 1500; educated in the grammar school at Newcastle-upon-Tyne; graduated at Cambridge, 1522; obtained a fellowship at Pembroke College and was ordained priest 1524; studied theology at the Sorbonne, Paris, and at the University of Louvain 1527–29; became on his return to Cambridge under-treasurer to the university, and soon afterward senior proctor (1533) and public orator, in which capacities he protested against the usurpations of ecclesiastical jurisdiction by the papacy, procuring a decree of the university to the same effect; was appointed domestic chaplain to Archbishop Cranmer 1537, vicar of Herne, Kent, 1538, master of Pembroke College and chaplain to the king 1540; was accused of heresy, at the instigation of Bishop Gardiner, on account of having preached against the Six Articles, but acquitted by Cranmer 1541; became prebendary of Westminster 1545, Bishop of Rochester Aug. 14, 1547; bore an important part in all the ecclesiastical measures of the reign of Edward VI.; assisted Cranmer in compiling the Liturgy (1548) and framing the forty-one Articles of Religion; induced the king to change Greyfriars and St. Bartholomew's priories into charitable institutions; converted his own house at Bridewell into a workhouse; was instrumental in founding Christ's, St. Thomas's, and Bethlehem Hospitals in London; was a member of the commission which deposed Bonner, and was his successor as Bishop of London Apr., 1550; aided in the deposition of Gardiner, Bishop of Winchester; visited the Princess Mary at Hunsdon, desiring to gain her acquiescence in his views of Church reform, but was unsuccessful, 1552; concurred in the proclamation of Lady Jane Grey as queen, and was induced by the Duke of Northumberland to preach a sermon at Paul's Cross in defense of her title July 16, 1553; was committed to the Tower on the accession of Mary a few days later; was taken to Oxford Apr., 1554, to participate in a discussion with the court theologians on the Real Presence; was formally tried for heresy with Cranmer and Latimer by a commission named by Cardinal Pole, and condemned to death as an obstinate heretic Oct. 1, 1555, and, having refused to recant, was burned at the stake with Latimer in front of Baliol College, Oxford, Oct. 16, 1555. His *Life* was published by his descendant, Dr. Gloucester Ridley (1763), and his *Works*, chiefly tracts in favor of the Reformation, were edited, with a *Life*, by Rev. Henry Christmas for the Parker Society (London, 1841). Revised by S. M. Jackson.

Ridolfo, Zeno: See Schadow, Rudolph.

Ridpath, John Clark, A. M., LL. D.: historian and educator; b. in Putnam co., Ind., Apr. 26, 1840; educated at Indiana Asbury (now De Pauw) University; served as principal of Thorntown Academy, superintendent of Lawrenceburg schools, Professor of English Literature, Professor of Belles-lettres and History, and vice-president of De Pauw University. He published *Academic History of the United States* (1875); *Grammar School History of the United States* (1876); *Popular History of the United States* (1877); *Inductive Grammar of the English Language* (1879); *Life and Work of Garfield*, in English and German (1881); *History of the World* (3 vols., 1885; rev. ed. 4 vols., 1889); *Life of Washington Charles De Pauw* (1887); *Christopher Columbus: the Epoch, the Man, and the Work* (1890); *Columbia: a Quadricentennial Story* (1891); *Great Races of Mankind* (3 vols., 1892); *Epic of Life*, a poem (1894); and many monographs. D. July 31, 1900.

Rie'desel, Friedrich Adolph, Baron von: soldier; b. at Lauterbach, Hesse, June 3, 1738; studied at the College of Marburg; was an officer of a Hessian regiment in the British service during the Seven Years' war, distinguishing himself at the battle of Minden. In 1776 he was sent to America in command of the division of 4,000 Brunswickers hired by Great Britain. Arriving at Quebec, he spent a year in Canada exercising his troops in the Indian methods of warfare; joined Burgoyne in his campaign against Albany 1777; surrendered with Burgoyne Oct. 17, and was held a prisoner for over two years. After his exchange he was placed by Sir Henry Clinton in command of Long Island; was transferred to Canada, and returned to Germany, Aug., 1783. D. at Brunswick, Jan. 6, 1800. His *Memoirs, Letters, and Journals*, edited by Max von Eelking, were translated by William L. Stone (2 vols., Albany, 1868).—His wife, Friedrike Charlotte Luise (1746–1808), wrote an interesting series of letters descriptive of life in Canada, of the incidents of Burgoyne's campaign, and of her residence as a prisoner at Cambridge and elsewhere. They were translated by William L. Stone, and published under the title of *Letters and Journals relating to the War of the American Revolution* (Albany, 1867).

Riehl, Alois: philosopher; b. at Bozen, Tyrol, Apr. 27, 1844; educated in Vienna, Munich, and Gratz universities; became Professor of Philosophy at Gratz 1873, and at Freiburg in 1883. He has published *Der philosophische Kriticismus und seine Bedeutung für die positive Wissenschaft* (Leipzig and Tübingen, 1876–87: *Ueber wissenschaftliche und nicht wissenschaftliche Philosophie* (Freiburg im Breisgau, 1883); *Beiträge zur Logik* (Leipzig, 1892). J. M. B.

Riehl, Wilhelm Heinrich: historian and novelist; b. at Biberich on the Rhine, May 6, 1823; studied theology at Marburg, Göttingen, and Giessen; was for a number of years editor of various newspapers, and was finally appointed Professor of Kulturgeschichte at the University of Munich. He is the author of a number of excellent historical and ethnological works, the most prominent of which are *Naturgeschichte des Volks als Grundlage einer deutschen Nationalpolitik* (1851–69); *Die Pfälzer* (1857); *Culturstudien aus drei Jahrhunderten* (1859). He also published a series of well-written stories and novels, based on his historical and ethnological studies. D. in Munich, Nov. 16, 1897. J. G.

Rienzi, or **Rienze**, Cola, di: political reformer; b. in Rome about 1313; the son of a tavern-keeper; was an enthusiastic student of the old Latin poets and historians, and early conceived the purpose of restoring the ancient greatness of Rome. The city was in a condition of anarchy, distracted by the feuds among the lords and violence and cruelties against the people. One of the nobles assassinated Rienzi's brother, and the impossibility of bringing the murderer to punishment gave his visions at once a practical bearing; from a dreamer he became a reformer. After a vain attempt to induce the pope at Avignon to return to Rome and protect the people against the oppression of the nobles, Rienzi began the work of reform himself, well knowing that he could not carry it through without a revolution. On May 19, 1347, he proposed the establishment of a better form of government, recalling to the minds of his hearers the greatness of the ancient republic. Proclaimed tribune of the "holy Roman republic," he straightway forced the nobles to render him allegiance, and restored order in the city. So successful were his reforms that not only other Italian cities, but foreign monarchs, sent deputations and embassies to congratulate the tribune; but not content with restoring order and peace to Rome, he now seemed to aim at universal empire. The foreign princes were disgusted and offended at his arrogance. The Roman populace grew tired of his magnificent processions and of his taxes. The papal legates declared him a traitor and a heretic, and the nobles, taking advantage of the general discontent, attacked him in Dec., 1347, and drove him from the city seven months after his accession to power. After two years of retirement among the Franciscan monks in Southern Italy, he again appeared in the *rôle* of a political reformer at the court of the Emperor Charles IV., who sent him as a prisoner to the pope at Avignon. Innocent VI., however, the successor of Clement VI., thought that Rienzi could be used to restore

peace and order in Rome, where, during the rule of the nobles, things were worse than ever. Releasing him from prison, he sent him with Cardinal Albornoz to Rome in the quality of a senator, and in Aug., 1354, Rienzi made a sort of triumphal entry into the city. He was received with enthusiasm, but very soon it became apparent that the man's character had changed sorely under his misfortunes. His fantastic arrogance was the same, but now it was accompanied by caprice, suspicion, and cruelty. The nobles never acknowledged his government, and he had to besiege them in their castles; and the populace became so infuriated by his arbitrary measures that a crowd surrounded him on the stairs of the Capitol and killed him Oct. 8, 1354.

Revised by F. M. Colby.

Riesengebirge, ree'zen-ge-beer'ge [Germ., Giant Mountains]: a mountain range which, for a distance of about 50 miles, forms the boundary between Bohemia and Prussian Silesia. It is continued on the W. by the Erzgebirge, and on the E. by the Sudeten. The highest peak is Schneekoppe, 5,253 feet.

Rieti, rĕe-ā'tĕe (anc. *Reate*): town; in the province of Perugia, Italy; on the Velino; 40 miles N. E. of Rome (see map of Italy, ref. 5–E). The walls which still surround the town, now divided into the old and the new city, were reconstructed on earlier foundations in 1250. There is a fine cathedral, with a monument by Thorwaldsen. The first Bishop of Rieti is said to have been Prosdocimus, a disciple of St. Peter. The fruits and other agricultural products of the neighborhood are of a superior quality. Pop. 9,618.

Revised by M. W. Harrington.

Rif: a region of high mountains of plutonic origin fronting on the Mediterranean, between Tetuan and Melilla, Northwest Morocco. The mountains are well wooded with wild olive and cork trees. Troglodyte caves have been found. Small game abounds. Grain is grown in the rich valleys, and the natives, partly Berber and partly Arab tribes, are well-to-do and fine people physically, but so extremely fanatical that their country has not been satisfactorily explored, though lying near Europe. They are frequently in trouble with the government, as they often refuse to pay taxes. C. C. A.

Rifle [from *rifle*, to groove, from Dan. *rifle*, to chamfer, rifle, groove; cf. Ger. *riefeln*, rifle, deriv. of *riefe*, groove]: a firearm (large or small) having the barrel grooved to give a rotary movement to the projectile. See Small-arms and Rifling of Ordnance.

Rifle-bird: a name applied by the early Australian settlers to the birds of paradise of the genus *Ptilorhis*, on account of the fancied resemblance of their plumage to the colors of the rifle brigade. The plumage of the male is black with beautiful steely-blue and green reflections. These are particularly brilliant on the lower part of the throat. The general color of the female is brown. *P. paradisea* is found in New South Wales, and other species occur in other parts of Australia and in New Guinea. F. A. L.

Rifling of Ordnance: the system of grooves in the bore of a firearm designed to give rotary motion to the projectile. The adoption of oblong projectiles necessitated some device to keep them point first in the air, and this can be done only by giving to the projectile a motion of rotation about its longer axis sufficient to counteract the tendency to rotation about its shorter axis. The rifling consists of a number of spiral grooves separated by lands; into them fits the rotating device on the projectile (see Projectiles), which compels it to rotate while the motion of translation is is being imparted to it. The studded system of projectiles requires deeper grooves than the other systems, and the number of grooves must be the same as the number of rows of studs. The expansive and compressive systems do not require any special number or depth of grooves. By the twist of the rifling is meant the angle made by the tangent to the rifle-curve with the axis of the bore. The twist may be uniform or increasing. *Uniform twist* was the kind first employed. It has the advantage of simplicity, and the projectile leaves the muzzle of the gun with a steady flight. The disadvantage of the uniform twist is that the pressure on the rotating device is not uniform at all points in the bore. It requires a very large pressure at first to cause the projectile to start, and this pressure rapidly decreases. This high initial resistance will delay the starting of the projectile, and may cause the powder-gas to reach a sufficiently high pressure to strain the gun.

The *increasing twist* has, on account of these objections, been adopted in the guns of larger caliber. With the increasing twist there is a gradual change from little or no twist at the beginning of the rifling to the maximum twist at or near the muzzle. When the grooves start almost parallel to the axis of the bore, the initial resistance to the starting of the projectile is reduced to a minimum. This is as it should be, since it is in this vicinity of the bore that the maximum powder pressure occurs. The object is to select such a rifle-curve that its twist will increase as the powder pressure falls off, and thus keep constant the pressure on the rotating device.

The British have adopted the parabola, whose equation is

$$x^2 = py,$$

for all guns except the 80-ton muzzle-loading rifle, which has for its twist a semi-cubic parabola, whose equation is

$$x^3 = py^2.$$

The latter is the form of the rifling in the U. S. service for the larger caliber guns. The twist of the army guns begins with 1 turn in 50 calibers at the breech, and increases to 1 turn in 25 calibers at a point about 2 calibers from the muzzle, where the twist becomes uniform for the rest of the distance in order to steady the projectile. In the naval guns the twist varies from 1 turn in 180 calibers at the breech to 1 turn in 30 calibers at the muzzle. The angular velocity with which a projectile leaves the muzzle, for the same muzzle velocity, depends only on the twist of the rifling at the muzzle. To cut the rifling in a gun it is mounted on a rifling-machine. A strip of steel is then bent into the developed form of the curve of the rifling and fixed to the bed of the machine to serve as a guide for the rifling-bar, which has a motion of rotation and translation, and carries at its end a cylindrical head with cutters.

J. C. W. Brooks.

RIFLING OF THE GUNS IN THE U. S. SERVICE.

KIND OF GUN. BREECH-LOADING, STEEL.	Kind of twist.	Twist in number of calibers.	Number of grooves.	Width of grooves, inches.	Depth of grooves, inches.	Width of lands, inches.
Field-guns:						
3·2-inch	Uniform.	30	24	0·3	0·05	0·119
3·6-inch	Uniform.	30	24	0·3	0·05	0·117
3·6-inch mortar	Uniform.	30	24	0·3	0·05	0·117
Siege-guns:						
5-inch	Uniform.	35	32	0·35	0·06	0·141
Siege-howitzer:						
7-inch	Uniform.	35	40	0·399	0·06	0·16
Seacoast-guns:						
8-inch	Increasing.	Breech, 50 / Muzzle, 25	48	0·373	0·06	0·15
10-inch	Increasing.	Breech, 50 / Muzzle, 25	60	0·373	0·06	0·15
12-inch	Increasing.	Breech, 50 / Muzzle, 25	72	0·373	0·06	0·15
Naval guns:						
All guns	Increasing.	Breech, 180 / Muzzle, 30	4 times the caliber in inches.	Breech, 0·485 / Muzzle, 0·415	0·05	Breech, 0·30 / Muzzle, 0·37

Ri'ga: capital of the government of Livonia, Russia; on the right bank of the Dwina, 7 miles from its mouth in the Gulf of Riga; 350 miles by rail S. W. of St. Petersburg (see map of Russia, ref. 6–B). The fortifications of the city have been razed and the walls converted into promenades which surround the old city, separating it from its suburbs. The former has narrow streets and mediæval houses, while the

latter are laid out in broad streets with modern buildings. Among the public buildings the most notable are St. Peter's church, built in 1406, with a tower 460 feet high; the governor's residence, formerly the palace of the grand-master of the order of the Knights of the Sword, built 1494–1515; the city-hall, and the new exchange. There are manufactories of cotton, woolen, linen, and iron goods, cigars, corks, spirits, oil, glass, paper, jute, etc., and the ship-building industry is very flourishing. Riga derives its greatest importance, however, from its commerce. An average of 2,400 vessels, of over 1,000,000 tons, enter its harbor annually. The value of its annual imports—comprising coal, salt, iron, steel, dyewoods, fish and wine, etc.—averages about 22,000,000 rubles, and that of its exports—comprising flax, hemp, timber, grain, hides, oilcake, camel and horse hair, and mineral oil—averages about 55,000,000 rubles. The city was founded in the beginning of the thirteenth century by Albert von Apeldern, Bishop of Livonia. He established the order of the Knights of the Sword, which within a few years was united to the order of the Teutonic Knights. The prosperity of Riga began when it became a member of the Hanseatic League under the protectorate of Poland. It was taken by Gustavus Adolphus in 1621, and incorporated with Russia in 1710. Nearly half the inhabitants are Germans and German-speaking Jews, the remainder being about equally divided between Russians and Letts. Pop., with suburbs (1897) 282,943.

Riga, Gulf of: an inlet of the Baltic, 100 miles long, 80 miles broad, bounded by the Russian governments of Kurland, Livonia, and Esthonia. It receives the Dwina. Oesel is a large island at its entrance.

Rigdon, Sidney: Mormon elder; b. in St. Clair township, Allegheny co., Pa., Feb. 19, 1793; received a fair English education, and was working as a printer at Pittsburg when about 1812 a manuscript was offered for publication by an eccentric preacher named Solomon Spaulding. It was entitled *The Manuscript Found, or The Book of Mormon*, and pleased Rigdon so much that he made a copy before it was returned to Spaulding, who died soon after. In 1819 Rigdon became a Baptist preacher; about 1821 a Disciple minister; and though at first professing orthodoxy, soon began to propagate singular doctrines connected with the manuscript in question. In 1829 he became acquainted with Joseph Smith, and with him devised the publication of *The Book of Mormon* as the basis of a new sect. He accompanied Smith to Kirtland, O., to Missouri, and to Nauvoo, where he was one of the presidents of the Church; was one of the originators of the "new revelation" permitting polygamy; was twice tarred and feathered, several times imprisoned, and was a candidate for the succession to the leadership on the death of Smith. On the election of Brigham Young (1844) Rigdon refused to acknowledge his authority, was excommunicated, returned to Pittsburg, Pa., and lived in obscurity; later removed to Friendship, N. Y., where he died July 14, 1876.

Rigg, James Harrison, D. D.: minister and educator; b. at Newcastle-on-Tyne, England, Jan. 16, 1821; educated at the Old Kingswood School; entered the Wesleyan Methodist ministry in 1845; appointed principal of Westminster Training College for Schoolmasters 1868; president of the Wesleyan Methodist Conference 1878–79, and for the second time in 1892–93; member of royal commission of national education in England 1886–88; on the staff of *The Quarterly Review* from the first (1853); one of the editors for many years, and sole editor since 1885. He has published *Principles of Wesleyan Methodism* (London, 1850); *Congregationalism and Connexionalism Contrasted* (1852); *Modern Anglican Theology* (1857; 3d ed. enlarged, with *Memoir* of Kingsley, 1879); *Essays for the Times on Social and Ecclesiastical Subjects* (1866); *The Sabbath and the Sabbath Law before and after Christ* (1869); *The Living Wesley* (1875; new ed., enlarged as *Centenary Life of Wesley*, 1891); *Churchmanship of John Wesley* (1878); *The Connexional Economy of Wesleyan Methodism* (1879); and important pamphlets on ecclesiastical and educational topics.

A. Osborn.

Riggs, Elias, D. D., LL. D: missionary and linguist; b. at New Providence, N. J., Nov. 10, 1810; graduated at Amherst College 1829 and at Andover Theological Seminary 1832. He was in Athens, Greece, 1832–34, in Argos 1834–38, in Smyrna 1838–53, and from 1853 in Constantinople, except in 1857–58, when he taught Hebrew and the cognate languages in Union Theological Seminary, New York. He translated the Bible into Bulgarian, Armenian, and Turkish, and published *A Manual of the Chaldee Language* (1832; 2d ed. 1858); *Grammar of the Modern Armenian Language* (1847); *Vocabulary of Words used in Modern Armenian, but not found in the Ancient Armenian Lexicons* (1847); *Notes on the Grammar of the Bulgarian Language* (1847); *Outline of a Grammar of the Turkish Language as written in the Armenian Character* (1856); *Suggested Emendations of the Authorized English Version* (1873); *Notes on Difficult Passages of the New Testament* (1889), and other writings. Revised by Benj. I. Wheeler.

Riggs, James Stevenson, D. D.: minister and New Testament scholar; b. in New York, July 16, 1853; graduated at the College of New Jersey in 1874; spent two years at Leipzig and Tübingen; graduated at Auburn Theological Seminary in 1880. After a pastorate of four years in Fulton, N. Y., he was Professor of Biblical Greek in Auburn Theological Seminary 1884–92; since 1892 Professor of Biblical Criticism and the New Testament. He is the author of many articles and pamphlets, and of *The Bible in Art* (1895).

Riggs, Kate Douglas (*Wiggin*): See the Appendix.

Right Ascension: in astronomy, the angular distance between the first point of Aries (*q. v.*) and the point in which the circle, passing through a heavenly body and the poles of the heavens, intersects the celestial equator. It is always measured from W. to E., and corresponds to longitude on the earth, as Declination (*q. v.*) corresponds to latitude. The right ascension of a heavenly body is ascertained by a transit instrument and a clock. These determine the meridian passage and the time at which it takes place, respectively. Right ascension is usually expressed in time, one hour corresponding to 15° on the celestial sphere.

R. A. Roberts.

Rights: See Jurisprudence, Political Science, and Justice.

Rights, Bill of: See Bill of Rights.

Rigi, or **Righi**, ree'gĕe: a mountain of Switzerland, in the canton of Schwytz. It is isolated between the lakes of Zug and Lucerne, and rises 5,902 feet above the sea, 4,500 feet above the lake. Several carriage-roads and two railways lead from the base of the mountain to the top, which offers a very extensive view.

Rigor Mor'tis [Lat., rigor or stiffness of death; cf. *rige're*, be stiff]: the condition of muscular rigidity developing shortly after the death of the body. It is due to suspended nutrition of the tissues, and begins when their response to artificial irritation and electricity ceases. Rigor mortis develops at a variable period after death, and when established lasts a variable time. In persons who die suddenly, as by accident or by heart disease, and in whom the muscles are well developed and nourished, rigor mortis may be postponed for many hours—twelve or twenty-four—and may then persist for two or three days. Reversely, when death is the result of exhaustive disease, the blood is impoverished and the muscles are wasted and flabby, rigor mortis develops speedily—within an hour, or even a few minutes—and is incomplete and of brief duration. As soon as rigor mortis passes off, the relaxed body begins to decompose. Rigor mortis was formerly explained as a state of contraction, the death-act of the muscular fiber. It is now believed to be due to the separation and coagulation of the albuminoid substance in the fluid of the muscle, following the cessation of nutrition. Revised by W. Pepper.

Rigveda: See Sanskrit Literature.

Riley, Charles Valentine, M. A., Ph. D.: entomologist; b. in London, England, Sept. 18, 1843; studied at college, Dieppe, France, 1854–57, and Bonn, Prussia, 1857–59; removed to U. S. 1860; studied practical agriculture 1860–63; connected with *The Evening Journal* and *Prairie Farmer* at Chicago 1863–68; appointed State entomologist of Missouri 1868, in which year he began, with Benjamin D. Walsh, State entomologist of Illinois, the publication of *The American Entomologist*; president of the Academy of Science of St. Louis 1876–77; appointed chief of the U. S. entomological commission (with Dr. Alpheus S. Packard, Jr., and Prof. Cyrus Thomas) under the Interior Department 1877; U. S. entomologist under the Department of Agriculture 1878; curator of insects U. S. National Museum 1881; general secretary American Association for the Advancement of Science 1881. D. in Washington, D. C., Sept. 14, 1895. He published nine annual reports on the insects of Missouri (1868–77) and three annual reports as U. S. entomologist. He was also the author of *The Locust Plague in the United*

States and of *Potato Pests*, and of many other works on insects injurious to vegetation. The French Government presented him in 1873 with a grand gold medal for services rendered to French grape-culture, and he received the only first gold medal awarded to an American at the international forestry exhibition, Edinburgh, 1884. He presented to the National Museum, Washington, D. C., his collection of over 20,000 species of North American insects.

Riley, James Whitcomb: poet; b. at Greenfield, Ind., in 1853. He became a sign-painter, then a strolling player, and afterward an editorial writer on the Indianapolis *Journal*. His dialect poems became very popular, and he took to giving public recitations of them in many cities. Among his books are *The Old Swimmin' Hole* (1883); *The Boss Girl* (1886); *Afterwhiles* (1888); *Pipes o' Pan* (1889); *Rhymes of Childhood* (1890); *Green Fields and Running Brooks* (1892); *Armazindy* (1894); *A Child-World* (1896).

Rime: a more correct spelling of the word Rhyme (*q. v.*).

Rimini, ree'mĕe-nĕe (anc. *Ariminum*): town; province of Forlì, Italy; on the Marecchia, near the Adriatic; 44° 4′ N. lat., 12° 34′ E. lon. (see map of Italy, ref. 4–E). It is walled and well built, with fine streets and squares, but has an air of decay. The main street is the Corso, the two principal squares, Piazza Cavour and Piazza Giulio Cesare, opening upon it. The latter derives its name from the tradition that on a stone pedestal, still seen, Cæsar harangued his troops after crossing the Rubicon. The city possesses two remarkable antiquities—the bridge of Augustus, of pure white marble with five arches, begun by that emperor and finished by Tiberius, still in good preservation, and the Porta Romana, a triumphal arch, erected 27 B. C. in honor of Augustus. There are also ruins of an amphitheater. The Cathedral of San Francesco, built in the fourteenth century and splendidly restored in the fifteenth by Sigismondo Malatesta, is a masterpiece of the Gotho-Italic. Several other churches and the Palazzo del Comune contain admirable pictures. The house of Francesca di Rimini, whose story suggested the most pathetic passage in Dante's *Inferno*, is still pointed out. So, too, is St. Anthony's chapel, and another chapel on the canal indicating the scene of his famous sermon to the fishes. In the Gambelunga Library, founded 1617, are 23,000 volumes. Rimini occupies the site of an ancient Umbro-Etruscan city, subsequently a Roman stronghold, enlarged and embellished by Julius Cæsar and later Roman emperors. It became the seat of an archbishop in 260; a great council of 400 Western bishops was convened here in 359. Under the exarchate of Ravenna it was the chief city of the maritime Pentapolis, the other four towns being Pesaro, Fano, Sinigaglia, and Ancona. From 1200 until 1503 it was, save for a brief period, governed by the great Ghibelline family of the Malatestas. Their tombs are seen in the cathedral, and their quaint castle is now a prison. After 1528 it was definitely included as papal territory in the so-called legation of Ravenna, until in 1860 it was united to the kingdom of Italy. The fisheries furnish its principal industry. The harbor is nearly filled up by sand, but vessels of 100 tons may enter the Porto Canale. Rimini is a popular resort for sea-bathing. Pop. 10,838. E. A. Grosvenor.

Rimouski, ree̊-moos-kee': popular summer resort and port; on the right bank of the lower St. Lawrence, County Rimouski, Quebec, Canada; station on the Intercolonial Railway, 184 miles N. E. of Quebec (see map of Quebec, ref. 2–F). It is the see of a Roman Catholic bishop, and has a fine cathedral and a college. In the Rimouski river and lakes near by the trout and salmon fishing is good. The chief industries are fishing and lumber. Pop. (1891) 1,417.

Rimsky-Korsakow, Nicolaus A.: See the Appendix.

Rin'derpest, Cattle-plague, or **Steppe Murrain** [*rinderpest* = Germ.; *rinder*, cattle, plur. of *rind*, ox, cow + *pest*, plague]: a contagious eruptive fever among cattle, endemic or nearly so in Russia, and occasionally sweeping as a most destructive epizoötic throughout Europe. It considerably resembles smallpox in its symptoms and progress. It is not confined to neat cattle, but attacks nearly all other ruminant mammals, and even some others. Man, the horse, swine, and fowls are quite exempt from it, so far as is known. The best treatment is the prompt destruction of all diseased animals. The only other treatment advised is the use of strong disinfectants and occasional stimulation; but it is found very difficult by any system of isolation and treatment to prevent the spread of the disease. From 30 to 90 per cent. of the diseased animals die under any treatment.

Rindfleisch, rint'flish, Georg Eduard, M. D.: pathologist; b. at Cöthen, duchy of Anhalt, Dec. 15, 1836; studied medicine in the University of Berlin, graduating M. D. in 1860; in 1861 began to practice in Breslau; in 1862 became Extraordinary Professor of Pathology at the University of Zurich; accepted the same chair at Bonn in 1874, subsequently filling the chair at the University of Würzburg. He is one of the foremost living pathologists. His master work, *Lehrbuch der pathologischen Gewebelehre* (1867; 6th ed. 1886), has been translated into the principal European languages. S. T. Armstrong.

Rinehart, William Henry: sculptor; b. in Carroll co., Md., Sept. 13, 1825; at the age of eighteen became assistant to a stonecutter; at the age of twenty-one went to Baltimore, where he apprenticed himself to a marble-worker. In 1855 he sailed for Italy, and remained there two years. In Baltimore he modeled several busts, a fountain figure for the U. S. General Post-office, and two supporting figures (*Indian* and *Backwoodsman*) for the clock in the new House of Representatives, Washington. In 1858 he settled in Rome. At the instance of Crawford's widow he completed the modeling of the bronze doors of the U. S. Capitol, which Crawford had left unfinished at his death; produced the life-size *Angel of the Resurrection* and *Jesus*, also a group of two *Sleeping Children*. One of his highest works was of this period—*Love Reconciled with Death*—bronze, life-size, for the tomb of Mrs. Walters. His portrait-busts became widely recognized. The State of Maryland commissioned him to make an heroic statue in bronze of Chief Justice Taney for the State-house grounds, Annapolis. His statue of *Clytie Forsaken by Apollo* was bought by a gentleman of Baltimore, who gave it to the Peabody Institute of that city. Besides the works already named, Rinehart in his later years produced the group of *Latona and her Children*, *Antigone*, *Atalanta*, and *Endymion*. D. in Rome, Oct. 28, 1874.
Revised by Russell Sturgis.

Ring [O. Eng. *hring*: O. H. Germ. *hring*, *ring* (> Mod. Germ. *ring*): Icel. *hringr* < Teuton. *hringos*: O. Bulg. *kragŭ*, circle]: an ornament worn on the finger, frequently invested with symbolical meaning. From the remotest antiquity the finger-ring (usually connected with a seal) was an emblem of an authority which could be delegated by the simple process of delivering it to an agent. The cases of Pharaoh and Ahasuerus are instances in point. Precious stones of great value were employed in rings by the Hebrews and Persians, and later by the Greeks and Romans. They have long been in almost universal use in Christendom as tokens of marriage or betrothal, and are often engraved with mottoes. The "fisherman's ring" is an indispensable article of the papal chancery, and the custom has been imitated by the bishops of some Christian churches. Magical virtues have often been ascribed to rings both by pagan and Christian nations, and traditions of poison concealed in rings have played a large part in the criminal annals of the Middle Ages.

Ring, Bernard Jacques Joseph Maximilien, de: archæologist; b. at Bonn, Rhenish Prussia, May 27, 1799, of Alsatian parents; received a completely French education; devoted himself from his sixteenth year to the study of archæology; resided from 1815 to 1848 in various places of Germany, investigating German antiquities, and wrote *Vues pittoresques des Vieux Châteaux du Grand-duché de Bade* (folio, 1829): *Description du Château de Tubingue* (1835); *Établissements celtiques dans le Sud-ouest de l'Allemagne* (1842); *Histoire des Germains depuis les temps les plus reculés jusqu'à Charlemagne* (1850); *Établissements romains du Rhin et du Danube* (2 vols., 1852–53, crowned by the Academy); *Essais sur la Rigsmaal-Saga et sur les trois Classes de la Société germanique* (1854); and *Histoire des Peuples opiques, de leur Législation, de leur Mœurs, de leur Langue, etc.* (1859). D. at Bischheim, Alsace, in 1875.

Ringbone: an exostosis or bony tumor on the coronet of the horse, most common on overworked horses, but sometimes seen on colts, or even newly dropped foals. Ringbone may stiffen and spoil a horse for the road, although not unfrequently there is no practical trouble from it; but it injures a horse's market-value, and is practically incurable.

Ringworm: a parasitic cutaneous disease occurring most frequently among children and upon the face and neck. It is properly called *tinea circinata*, being analogous to *tinea sycosis*, or barber's itch. These diseases are due to a parasitic growth, consisting of innumerable sporules which

find a nidus in the hair-follicles and excite secondary inflammation of the skin. Ringworm is contagious, not only from person to person by close contact, but in the uncleanly is transplanted from spot to spot on the head and hands or wrists. The treatment is by parasiticides, or remedies destructive to parasitic life; local application of tincture of iodine, iodine and ammonia, sulphurous acid, sulphur dry or in ointment, carbolic acid, creosote, oil of cade, mercurial ointment, oleate of mercury, solution of corrosive sublimate, and cantharidal collodion. Revised by W. Pepper.

Rink, Henrich Johann: naturalist; b. at Copenhagen, Denmark, Aug. 26, 1819. He took part in the Galatea expedition around the world 1845–47, and as a result published *Die nikobarischen Inseln* (1847). He held many positions in connection with Greenland, and made extensive researches in that country. In 1852 he published *Den geografiske Beskaffenhed af de danske Handelsdistrikter i Nordgrönland*; in 1866–71 he published his *Eskimoiske Eventyr og Sagn*; in 1875 *Om Grönlands Indland og Muligheden af at bereise samme.* In 1877 he published in London *Danish Greenland*, and in 1887, in Copenhagen, *The Eskimo Tribes*, with a comparative vocabulary. D. Christiania in 1894. Revised by Rasmus B. Anderson.

Riobamba, rēĕ-ō-baam′băă: a town of Ecuador; 103 miles S. S. W. of Quito; on a plain between the Chimborazo and Altar Mountains, 9,100 feet above the sea (see map of South America, ref. 3–B). It was an ancient Indian town, and important during the conquest. On Feb. 4, 1797, it was completely destroyed by an earthquake in which over 20,000 persons are said to have perished. The new town is badly built and has little importance except as a station on the road from Quito to Guayaquil. Pop. 12,000. H. H. S.

Rio Branco: See Rio Negro.

Rio Bravo: the Rio Grande (*q. v.*).

Rio Cuarto, ree′ō-kwaar′tō (formerly *Concepcion*): a town of the province of Córdoba, Argentine Republic; on the Rio Cuarto, 112 miles S. of Córdoba (see map of South America, ref. 8–D). Until 1874 it was a frontier post, exposed to Indian attacks; it is growing rapidly, and is the second town of the province in population, an important railway center, and the emporium of a rich grazing district. Pop. (1892) 14,000. H. H. S.

Rio de Janeiro, Portug. pron. ree′ō-dā-zhăă-nāi′-rō [Portug., river of January, a name given to the bay, then supposed to be a river's mouth, because it was discovered on Jan. 1]: a maritime state of Brazil, bordering on São Paulo, Minas Geraes, and Espirito Santo, and inclosing the Municipio Neutro or federal district. Area (excluding the Municipio Neutro), 26,634 sq. miles. It includes the mountainous districts of the Coast Range and part of the valley of the Parahyba river, with lowlands near the mouth of the latter containing the Lagoa Feia (see Feia); there are also lowlands and lagoons along the coast. Rio de Janeiro is one of the great coffee-producing states, and sugar-cane and rice are raised on the lowlands. Most of the trade is through the port of Rio de Janeiro. The manufactures are considerable. Up to 1894 the capital was Nictheroy; it is now Petropolis. Pop. (1894) estimated, 1,390,398. H. H. S.

Rio de Janeiro: capital and most important port of Brazil, and the largest city of South America; on the west side of the bay of Rio de Janeiro; lat. (of the observatory) 22° 54′ 24″ S., lon. 43° 10′ 21″ W. (see map of South America, ref. 7–G). The bay is perhaps the most magnificent harbor in the world. The entrance, between high rocks, is about a mile wide and perfectly clear; within, it expands into a broad sheet with many bays, stretching inland for 17 miles, the whole surrounded by strangely formed mountains and hills, with the needle-like pinnacles of the Serra dos Orgãos at the northern end. Most ships can be loaded directly at the fine docks. The city occupies flat land and hills partly surrounding a group of wooded mountains. The older streets are narrow and often crooked, with few pretentious buildings; the newer ones, farther back from the bay, are wide and lined with substantial houses. The business center, from which street-cars run to the outskirts, is the narrow Rua do Ouvidor; it is lined with retail shops, *cafés*, etc., and is a favorite afternoon promenade; no carriages are allowed on it. The finest dwellings, surrounded by gardens, are in the outskirts and on the hills; the beauty of the scenery in these outskirts elicits the admiration of every tourist; Botofogo, for example, lies between the mountains and a placid arm of the bay, with the Sugar Loaf rock, 1,200 feet high, before it. There are several public parks, including the beautiful Passeo Publico, and the Botanical Garden in the suburbs. The handsomest church and the most richly decorated building in South America is the Candelaria. The old monasteries are now used for public buildings, and have been supplemented by handsome modern structures, such as those of the Department of Agriculture, the national printing-office, and the mint. There are several hospitals, and that called Mizericordia is said to be the largest and most richly endowed in the world. There is a well-appointed observatory; a national library, the largest and most valuable in South America, besides several other libraries; polytechnic school, national college, schools of medicine, fine arts, etc., and a naval school. The museum occupies the old imperial palace, an unpretentious building, but surrounded by a beautiful park; the collections in some branches are very valuable. The bay is defended by several forts, and there is an extensive navy-yard. The Corcovado Mountain, about 2,500 feet high, has precipitous sides looking down on the streets; a mountain-railway runs to a hotel on the summit. Other beautiful resorts are the high valley of Tijuca, and Nictheroy, on the other side of the bay.

Rio de Janeiro has a large foreign element, and much of the trade is in the hands of foreign merchants. The commerce is very important. Rio exports more than half of the total coffee product of the world, or some 400,000,000 lb. annually; the crop is brought in by railways. The largest exports, especially of coffee, are to the U. S.; most of the imports are from Europe. Regular steamers run to the U. S., Europe, the western coast of South America, New Zealand, etc. The climate is warm from May to October, temperate during the rest of the year, and always damp and somewhat changeable; lung diseases are consequently prevalent. Notwithstanding good drainage and modern sanitary improvements, yellow fever is generally prevalent during the warm months, and at intervals there are severe epidemics. A good but somewhat inadequate water-supply is obtained by fine aqueducts from the Corcovado and Tijuca. The bay was discovered (probably) by João Manoel and Amerigo Vespucci Jan. 1, 1502. French Protestants tried to form a settlement on it, but were driven out in 1567 by the Portuguese, who then founded São Sebastião, or Rio de Janeiro. It became the capital of Southern Brazil in 1762, and of the whole of Brazil in 1774. From 1808 to 1821 it was the residence of the Portuguese court, and hence the capital of Portugal. The revolution of 1889 broke out here; during the naval rebellion of 1893–94 the city was bombarded, but not seriously injured. Population of the city proper (1893) about 300,000. The Municipio Neutro, which includes the city, is a federal reservation, similar in character and government to the District of Columbia in the U. S.; area, 538 sq. miles; estimated population, with the city (1893), 471,775. See Valle Cabral, *Guia do Viajante no Rio de Janeiro* (1884); Agassiz, *A Journey in Brazil* (1868). Herbert H. Smith.

Rio de la Plata: See Plata, Rio de la.

Rio de Oro: a bay (mistaken by an early explorer for a river) lying between the African mainland and the Ed-Dajla peninsula, on the Atlantic coast, N. of the Tropic of Cancer. It is in Spanish territory, and the Spaniards have establishments there devoted chiefly to fishing. The Spanish possessions on this Saharan coast extend (since 1884) from Cape Bojador to Cape Blanco, and part of the region inland consists of the oases of Adrar, where grain is raised to some extent, and many sheep, goats, camels, horses, and cattle graze. The chief town of Adrar is Shingeti, and 30,000 people live there. C. C. Adams.

Rio Grande, or **Rio Grande del Norte**, ree′ō-graan′dā-dĕl-nōr′tā [Span., great river of the north]: a large river which rises in Southwestern Colorado, flows first E. and then S. through New Mexico, flows thence S. E., forming for several hundred miles the boundary between the U. S. and Mexico, and falls into the Gulf of Mexico after a course of about 1,800 miles. It is navigable for small boats only for about 450 miles, or to Kingsbury Rapids; is generally shallow, frequently interrupted by rocks and cataracts, and is subject to periodical inundations near its mouth. Its principal tributary is the Rio Pecos. Brownsville, Tex., and Matamoras, Mexico, are situated on opposite sides of the Rio Grande, 35 miles above its mouth.

Rio Grande do Belmonte: See Jequitinhonha.

Rio Grande do Norte: an eastern maritime state of Brazil, between Ceará and Parahyba, with a coast including

the angle formed by Cape St. Roque. Area, 22,195 sq. miles. The coast-lands are low, bordered by immense sand-dunes, and without good harbors; the interior is an irregular plateau continuous with that of Ceará, and like it in its long, dry seasons and occasional destructive droughts. This is one of the poorest and least populous of the Brazilian states; grazing and sugar and cotton planting are the only industries of importance; hides, sugar, and a little cotton and rice are exported. Pop. (1894) estimated, 347,818. The capital and principal town and port is Natal.

HERBERT H. SMITH.

Rio Grande do Sul [Portug., great river of the south]: the common name of São Pedro do Rio Grande do Sul, the southernmost and one of the most important states of Brazil, between Santa Catharina, the Atlantic, Uruguay, and the Argentine Republic. Area, 91,335 sq. miles. Near the coast are two large lakes, the LAGOA DOS PATOS (*q. v.*) and the Lagoa Mirí, the latter partly in Uruguay; they are separated from the ocean by low and swampy lands, and communicate with it by the navigable Rio Grande do Sul, which gives its name to the state. Inland from the lakes the surface is varied, but generally hilly, rising to low mountains in the center and N., and subsiding to plains westward, where the river Uruguay forms the boundary with the Argentine Republic. The river JACUHY (*q. v.*) and the lakes form interior waterways of great importance, and the upper Uruguay is also navigable for vessels of light draught. To the N. of the Jacuhy the land is wooded, fertile, and well suited for agriculture; large tracts are taken up by thriving agricultural colonies of Germans and Italians, their trade centering at Porto Alegre, the capital. An extensive region in the northwest is unsettled. S. of the Jacuhy the land is open, resembling Uruguay; it supports great herds of cattle, which are marketed at Pelotas; the lower classes in this district resemble the Uruguayan gauchos. The exports are hides, dried meat, maize, beans, etc. The manufactures (in the northern part only) are growing in importance. The state lies beyond the tropics; frosts occur during the winter (June–September), and light snows fall on the hills. The revolutionary spirit, which has frequently shown itself in this state, is nearly confined to the southern or pastoral districts. An attempt to secede and form a republic begun in 1835 was put down only after nearly ten years of civil war, and there was a formidable rebellion 1892–94. Pop. (1894) estimated, 774,406, including 150,000 German and Italian colonists. HERBERT H. SMITH.

Rio Grande do Sul: city; the most important port of the state of the same name; on the Rio Grande do Sul, a channel through which the Lagoa dos Patos discharges into the Atlantic (see map of South America, ref. 8–F). The mouth of this channel is obstructed by shifting sandbars, which at intervals have nearly closed the passage, and expensive engineering works have failed to keep it clear. Vessels drawing 12 feet pass at favorable times. The city, on flat land backed by swamps, is important only for its commerce. A railway connects it with Pelotas, and steamers ply regularly on the lakes. Pop. 20,000. H. H. S.

Rioja, rĕe-ō′*k*ha, FRANCISCO, de: poet; b. at Seville, Spain, about 1585. He was educated in the University of Seville, and obtained such knowledge of Greek, Latin, and Hebrew as to excite the admiration of his contemporaries. He entered the Church, and seems at first to have had a place at Seville. About 1614, however, he went for a time to Madrid, apparently attracted by the great Count-Duke Olivares, who seems to have known and liked him before he had himself risen to power. This first taste of life at court was probably not to Rioja's mind, for shortly after he was again in Seville, writing his excellent poetical *Epístola moral á Fabio*, full of sound advice as to the superiority of a quiet and unambitious life. But in 1321 the death of Philip III. gave Olivares entire direction of affairs, and the poet was unable to resist an invitation from him to come to Madrid as his friend and counselor. He was given the place of librarian of the royal library, and was for a time chronicler of Castile. He also made the acquaintance of the best wits of the court, and Lope de Vega, Cervantes, Montalván, and others spoke of him as one of the best poets and scholars of the time. It is probable that his residence at Madrid was broken by a period in Seville, and it is certain that he had the bitter experience of imprisonment by reason of a false charge made to Olivares about him. When the latter fell from power in 1643, however, Rioja was one of those who accompanied him from the court. In 1645 Olivares died and the poet retired to Seville. But once more, in 1654, this time apparently by royal command, Rioja removed to Madrid, being given a position as councilor in the supreme court of the Inquisition, which he held till his death, which occurred at Madrid, Aug. 8, 1659. The body of Rioja's poetical work is not great, but almost everything he wrote is distinguished by beauty of form, delicacy of style, and deep feeling for nature. Hence few poets of the Siglo de Oro are better known. His *Poesías* have been published, with extensive biography, by D. Cayetano Alberto de la Barrera (*Soc. de Bibliófilos Españ.*, Madrid, 1867). The same editor has also issued *Adiciones á las poesías de D. Francisco de Rioja* (Seville, 1872). A. R. MARSH.

Rioja, La: a northwestern province of the Argentine Republic, between Catamarca, Córdoba, San Luis, San Juan, and Chili. Area, 31,500 sq. miles. The Andes, with an average height of 13,000 feet, form the western frontier, and there are several parallel ranges covering more than half the province. The high valleys between these are the inhabited regions. The southeastern part is mainly an arid plain very thinly settled. The climate is very dry and little of the land can be cultivated without irrigation. This and the lack of communications make Rioja one of the poorest provinces. The principal industry is agriculture. Wine, wheat, maize, lucern, etc., are produced. There are rich deposits of copper, silver, and gold, as yet but little utilized. The province long resisted Rosas and the confederation, and until 1863 it was distracted by wars. Pop. about 70,000. La Rioja (pop. about 10,000), the capital and largest town, was founded in 1591. H. H. S.

Rion: See PHASIS.

Rio Negro [Span., black river]: a river in the region of the Argentine Republic known as Patagonia; rises in the Andes, flows N. E., E., and E. S. E., and enters the Atlantic near lat. 41° S. Length about 650 miles. Nearly the whole course is said to be navigable for vessels of light draught, and small steamers now ply on the lower portion, where there are several thriving settlements. H. H. S.

Rio Negro: one of the most important northern tributaries of the Amazon; rises in Southern Venezuela and (after entering Brazilian territory) keeps a general E. S. E. course to its mouth in lon. 59° 58′ W. Length about 1,350 miles. The lower course is broad and lake-like, and is navigable for about 600 miles. Above this about 20 miles are obstructed by rapids, but beyond them the river is navigable for a long distance. Above the rapids it is connected by the CASSIQUIARE (*q. v.*) with the Orinoco. The principal western branch is the Uaupés, rising in the Colombian Andes, probably over 700 miles long, and navigable. The Rio Branco rises on the confines of Venezuela, British Guiana, and Brazil, and flows S. over 400 miles to the Rio Negro. All these rivers run through generally forest-covered regions with but few civilized settlements. They are much frequented by rubber gatherers and traders. Manáos, the capital of the state of Amazonas, is at the mouth of the Negro. H. H. SMITH.

Rio Negro: a territory of the Argentine Republic; in the northern part of Patagonia, bordering on Neuquen, La Pampa, Buenos Ayres, the Atlantic, Chubut, and Chili. Area said to be 130,000 sq. miles, but the limits are not yet fixed. The Andes and their spurs cover the southwest. Most of the remaining surface is a plateau crossed by the valleys of the Colorado on the N. and the Rio Negro farther S. Large tracts are suitable for grazing. The territory, abandoned until about 1880, is being rapidly taken up for grazing purposes. In 1895 there were about 10,000 inhabitants, and the exports were valued at $1,560,000. The capital, Viedma, has about 3,000 inhabitants. H. H. S.

Rio São Gonçalo: See LAGOA DOS PATOS.

Riot [from O. Fr. *riote*, *riotte*, quarreling, brawling, reveling, feasting: Ital. *riotta*, quarrel, probably from dimin. of Lat. *reus*, defendant, the accused]; at common law, a disturbance of the peace by three or more persons acting in concert and in a manner calculated to inspire terror. Many text-writers declare that the riotous enterprise must be of a private nature, and that if it is of a public nature it amounts to treason; but there is judicial authority for the view, which seems the correct one, that a tumultuous disturbance of the peace is punishable as a riot, although engaged in for the purpose of showing an unlawful opposition to the government. *Pennsylvania* vs. *Morrison*, Addison (Pa.) 274; *People* vs. *Most*, 128 N. Y. 108.

It is not necessary that the persons plan in advance of

their assembling to do any unlawful act. For example, if having gathered in front of a theater without preconcerted design to commit a breach of the peace, they attempt to force their way into the building and attack the police who are guarding the doors and rescue those who are arrested, they are rioters. (*People* vs. *Judson*, 11 Daly 1.) Nor is it necessary that they intend to terrify others. They may intend to engage in a mere frolic, as in a charivari or "horning" of a householder, or in entering the stable of another and shaving his horse's tail; yet if this is done in a tumultuous and terrifying manner the enterprise is a riot. *State* vs. *Alexander*, 7 Richardson (S. C.), 5.

An *unlawful assembly* is the meeting of three or more persons with a riotous purpose. If they enter upon the execution of that purpose, yet fall short of an act amounting to a riot, their offense is a *rout*. Modern legislation has modified the common-law rules governing these three offenses.

FRANCIS M. BURDICK.

Riouw-Lingga, rĕe-ow'ling'gă: an archipelago of the China Sea, making an extension of the Malay Peninsula; belonging to the Dutch and forming part of the residency of Riouw. It is formed of two groups of islands, that of Riouw being the northern and adjacent to Singapore, and Lingga the southern. The Riouw group consists of about thirty islands, the largest of which is Bintang with an area of about 400 sq. miles. The Lingga group is separated from the preceding by the Strait of Dempo, 10 miles broad. It consists of two large islands—Lingga (area, 320 sq. miles) and Singkep (area, 204 sq. miles)—and many smaller ones. The area of the whole archipelago is estimated at 1,823 sq. miles. The islands are rocky, like the peninsula rather than the adjacent alluvial shores of Sumatra. The highest peak is that of Lingga, 3,711 feet high. The islands are covered with thick and valuable forests. Among the productions are sago, rice, pepper, and gambir, the last forming the principal export. Tin has long been mined. The aborigines are Indonesian and negrito, and have nearly disappeared. The inhabitants are now mainly Malays, Chinese, Klings, and Javanese, with a few Europeans. Pop. about 80,000.

MARK W. HARRINGTON.

Riparian Rights [*riparian* is from Lat. *riparius*, deriv. of *ripa*, the bank of a stream]: strictly speaking, such rights as appertain to the ownership of land upon the banks of rivers and other natural water-courses. Thus defined, the expression would include the rights enjoyed by riparian proprietors over the public streams by which their lands are bounded (such as the right of access, of wharfage, of ferriage, etc.), as well as those mutually exclusive rights of user in the private streams, whose beds are the property of the adjoining owners.

The expression is sometimes, however, more loosely and with less propriety used to describe all of the rights, whether of the public or of adjoining owners, which the law recognizes in any public or private waters. As thus employed it would comprehend the public right of navigation on the sea or on navigable streams, as well as the mutual rights of the abutting "littoral" proprietor and the public in the seashore.

For these several classes of rights, see LAKES, RIVERS, and SEASHORE. See also FILUM AQUÆ and WATERCOURSES, and consult the following authorities: Angell on *Tidewaters* and on *Watercourses*; Hall on *The Seashore*; Gould on *Waters*; and Pomeroy on *Riparian Rights*.

G. W. KIRCHWEY.

Ripley: village; Brown co., O.; on the Ohio river and the Chesapeake and Ohio Railway; 50 miles S. S. E. of Cincinnati (for location, see map of Ohio, ref. 8–D). It occupies a site between the river and a steep bluff, is in a noted "white burley" tobacco-growing region, has a large river commerce, and contains flour and saw mills, piano and shoe factories, leaf-tobacco packing-houses, 2 national banks with combined capital of $200,000, and 2 weekly newspapers. Pop. (1880) 2,546; (1890) 2,483; (1900) 2,248.

EDITOR OF "BEE."

Ripley, ELEAZER WHEELOCK: soldier; b. at Hanover, N. H., Apr. 15, 1782; a nephew of President John Wheelock and a son of Sylvanus Ripley, D. D., Professor of Divinity at Dartmouth (d. Feb. 5, 1787); graduated at Dartmouth College 1800; practiced law in Maine, residing chiefly at Portland; was a member of the Massachusetts Legislature 1810–11; Speaker and elected State Senator 1812; was appointed colonel of the Twenty-first Infantry 1813; was wounded in the attack upon York (now Toronto), Canada, Apr. 24, 1813; became brigadier-general Apr. 14, 1814; commanded the Second Brigade under Gen. Brown on the Niagara frontier; took part in the battles of Chippewa and Niagara, being severely wounded in the latter, in which he won the brevet rank of major-general; was conspicuous for gallantry in the defense of Fort Erie Aug. 15, and in the sortie of Sept. 17; received a gold medal from Congress; resigned from the army 1820; settled in Louisiana, where he practiced law; served in the State Senate, and was a member of Congress 1835–39. D. at West Feliciana, La., Mar. 2, 1839.

Ripley, GEORGE: critic and journalist; b. at Greenfield, Mass., Oct. 3, 1802; graduated at Harvard 1823, and at Cambridge Divinity School 1826; was pastor of a Unitarian church in Boston 1826–41; resided several years in Europe, where he made a careful study of French and German literature; wrote *Discourses on the Philosophy of Religion* (1839); *Letters to Andrews Norton on the Latest Form of Infidelity* (1840); and edited *Specimens of Foreign Standard Literature* (14 vols., Boston, 1838–42); was associated with Emerson and Margaret Fuller in conducting *The Dial* 1840–41; contributed to *The Christian Examiner* and other magazines; was the chief promoter of the celebrated socialistic experiment at Brook Farm, Roxbury, Mass., 1841–47; was one of the editors of *The Harbinger*, a Fourierite organ, 1844–48; removed to New York 1847; became literary editor of *The New York Tribune* 1849, and remained so until his death; published (with Bayard Taylor) *A Handbook of Literature and the Fine Arts* (1852), and edited (with Charles A. Dana) *The American Cyclopædia* (New York, 16 vols., 1858–63), which was revised (Dr. Ripley, editor-in-chief), and appeared 1873–76. D. in New York, July 4, 1880. See his *Life*, by O. B. Frothingham (Boston, 1882).

Revised by H. A. BEERS.

Ripon; town; in Yorkshire, England; on the Ure; 23 miles N. W. of York (see map of England, ref. 6–I). The cathedral was originally founded on the ruins of St. Wilfrid's Abbey about 680, but of this building the crypt only remains. The present structure was begun in the twelfth century, and was entirely restored by Sir Gilbert Scott (1862–76). Its chief interest is from its various styles of architecture. Ripon has been the seat of a bishopric since 1836. There are several tanneries and foundries. Pop. (1891) 7,512.

Ripon: city; Fond du Lac co., Wis.; on the inlet of Green Lake, and the Chi., Mil. and St. P. and the Chi. and N. W. railways; 20 miles W. by N. of Fond du Lac, 86 miles N. W. of Milwaukee (for location, see map of Wisconsin, ref. 6–E). It is in an agricultural, dairying, and stock-raising region; has good water-power and water and sewerage systems; and contains Ripon College, 9 churches, a public library, 2 national banks with combined capital of $110,000, a monthly and 2 weekly periodicals, 2 flour and feed mills, several creameries, knitting-factory, pickle-works, and box and crate factory. Pop. (1880) 3,117; (1890) 3,358; (1900) 3,818.

EDITOR OF "COMMONWEALTH."

Ripon, GEORGE FREDERICK SAMUEL ROBINSON, Marquis of: statesman; b. in London, England, Oct. 24, 1827; became *attaché* to the British legation at Brussels 1849; sat in Parliament from 1852 until he succeeded his father as Earl of Ripon and Viscount Goderich, Jan. 28, 1859; inherited the earldom of De Grey on the death of an uncle Nov. 14, 1859; became in the same year Under-Secretary for War, and in Feb., 1861, Under-Secretary for India; became Secretary for War, with a seat in the cabinet, Apr., 1863; was made Secretary of State for India Feb., 1866, and lord president of the council Dec., 1868; was chairman of the high joint commission which negotiated the Treaty of Washington 1871; was rewarded with the title of marquis on his return June 23; was installed grand-master of the Freemasons of England Apr. 23, 1870, but resigned that position Aug., 1874, and was received into the Roman Catholic Church at Brompton Sept. 4, 1874. On the return of Gladstone to power the Marquis of Ripon was appointed Viceroy of India, which office he held until 1884. His attempts to extend the rights of the natives and to curtail in some respects the privileges of the Europeans made him most unpopular with the latter. He was First Lord of the Admiralty in 1886, and was appointed Colonial Secretary in 1892.

Revised by F. M. COLBY.

Ripon College: an institution at Ripon, Wis., in a campus of 10 acres. It was organized in 1854, and is privately endowed for the purpose of furnishing to young men and women opportunities for obtaining an education of the high-

est college grade. It has four departments—college, preparatory, music, and art. Three college courses are offered—the classical, the scientific, and the literary. Though owing its establishment and prosperity chiefly to the Congregationalists, it sustains no organic denominational connection. Its ideals are Christian, but not sectarian. It has six buildings, a library of 10,000 volumes, mineralogical and botanical cabinets, and considerable apparatus for work in chemistry, biology, and physics. There are 14 instructors and about 150 students. RUFUS C. FLAGG, D. D., *President.*

Ripple-marks: a wavy surface produced on sands or other granular material by the passage of a current of air or water. They are seen in great perfection and beauty on dunes, where the crests of the wavelets are usually a few inches apart. They appear on a much larger scale, with crests several feet or even yards apart, on barren, wind-swept slopes of volcanic cinders. They appear on the beds of streams, not only under the continuous current but in embayments where the water sways to and fro. They are extensively developed on sandy coasts, in shoal water outside the line of breakers, and doubtless they occur on the ocean-bottom at all depths where currents are swift enough to move sand. They are less frequently seen on surfaces of fine mud. The surfaces of sandstone layers frequently exhibit ripples identical with those observed along shores, and these are accepted by the geologist as evidence that the sand composing the sandstone was deposited in a zone of active currents and presumptively in shallow water. Ripple-marks are also found, but less commonly, upon layers of limestone.
G. K. GILBERT.

Riprap: a deposit of loose angular stones of large size, used for constructing a breakwater, or as a protection to piles and piers. See BREAKWATER.

Ristić, JOHN: statesman and author; b. at Kragujevatz, Servia, 1831; studied in Germany and Paris; took an important part in the exciting political events of his country; Minister of Foreign Affairs 1867 and again in 1872, and during the war with Turkey in 1877; represented Servia at the Congress of Berlin 1878; was head of the regency during the minority of King Alexander from the abdication of King Milan in 1889 until the king's assumption of government, Apr. 13, 1893; published in German *Kurze Charakteristik des geistigen und sittlichen Zustandes von Serbien* (Heidelberg, 1851) and *Die Neuere Literatur der Serben* (Berlin, 1852). C. H. THURBER.

Risto'ri, ADELAIDE: actress; b. at Cividale, Friuli, Italy, Jan. 29, 1822; the daughter of humble comedians. When but four years of age she played childish parts, and at the age of twenty she had attained distinction at Parma, and later was successful at Leghorn. At this period her talent was in comedy; her favorite pieces were the plays of Goldoni. In 1847 she married Marquis Capranica del Grillo and withdrew from the profession for about two years. During the siege of Rome Ristori left the stage for the hospitals, and there labored as a sister of charity. In 1850 she reappeared, and for several years played in the Italian cities, as Myrrha, Francesca di Rimini, and Mary Stuart. In 1856 Ristori made her *début* in Paris, where she met with great success, and won the homage of such men as Jules Janin and Dumas. She subsequently appeared in Spain, Holland, St. Petersburg, Berlin, and Constantinople; in 1866 visited the U. S., going thence to South America, Brazil, the Argentine Republic, and Havana; in 1874 was again in America. The popular pieces in America were *Queen Elizabeth*, *Marie Antoinette*, and *Mary Stuart*. She played also Judith, Medea, Lucrezia Borgia, etc. In 1884 she made a farewell visit to the U. S., but she had lost her ability to hold an audience. She published an autobiography—*Ricordi e studi artistici* (Turin, 1887). Revised by B. B. VALLENTINE.

Ritchie, ANNE ISABELLA (*Thackeray*): author; b. in London in 1838; a daughter of William Makepeace Thackeray. She passed a part of her childhood in France, was married in 1877 to her cousin, Richmond Thackeray Ritchie, and has resided mostly at Kensington. Among her writings are *Old Kensington* (1873); *Toilers and Spinsters* (1873); *Bluebeard's Keys* (1874); *Miss Angel* (1875); *Madame de Sévigné* (1881); *Records of Tennyson, Ruskin, and Browning* (1892); *Lord Tennyson and his Friends* (1893); and, with R. Evans, *Lord Amherst and the British Advance Eastward to Burma* (1894). H. A. BEERS.

Ritchie, Sir WILLIAM JOHNSTON: jurist; b. at Annapolis, Nova Scotia, Oct. 28, 1813; educated at Pictou, and was called to the bar in 1838. He was a member of the executive council of New Brunswick from 1854 till appointed a puisne judge of the Supreme Court of New Brunswick, Aug. 17, 1855, which position he retained until appointed chief justice of New Brunswick, Dec. 6, 1865. He became puisne judge of the Supreme Court of Canada Oct. 8, 1875, and was appointed chief justice Jan. 11, 1879. He was knighted in 1881, and was deputy governor of Canada from July, 1881, to Jan., 1882, and again from Sept. to Dec., 1882. He was appointed deputy of the governor-general Mar. 5, 1884. D. Sept. 25, 1892. NEIL MACDONALD.

Rite [Lat. *ritus*, a usage]: a term which designates not merely a religious ceremony, but the aggregate of such ceremonies or the ritual system of any Church. Thus there is the Latin and the EASTERN RITE (*q. v.*), and the Latin rite has some minor rites. The Ambrosian rite in Northern Italy had more than 1,000,000 followers as late as the latter half of the nineteenth century; the Mozarabic rite in Spain had a limited use, etc. See RITUALIST.
Revised by W. S. PERRY.

Rites, Congregation of: a department of the administration of the Roman Catholic Church: first organized by Pope Sixtus V., and consisting originally of six cardinals and a corresponding number of secretaries and consultors. Everything belonging to the liturgy, the rites of the administration of the sacraments, the ceremonies of the Church, the beatification and canonization of saints, etc., falls under its jurisdiction. It consists of cardinals, consultors, and secretaries. See Bangen, *Die römische Curie.*
Revised by J. J. KEANE.

Ritschl, ALBRECHT, D. D.: theologian; b. in Berlin, Germany, Mar. 25, 1822; studied at Bonn and Halle; instructor and professor at Bonn 1846 to 1864, and then at Göttingen till his death there Mar. 20, 1889. He became the head of a school of theology bearing his name. In his earlier years he was an adherent of the Tübingen school, but broke away from it in 1857, when he published the second edition of his *Entstehung der altkatholischen Kirche* (1st ed. Bonn, 1850). His other principal works are *Die christliche Lehre von der Rechtfertigung und Versöhnung* (3 vols., 1870–74; 2d ed. 1882; 3d ed. 1888; also translated into English *A Critical History of the Christian Doctrine of Justification and Reconciliation*, Edinburgh, 1872); *Die Geschichte des Pietismus* (1880); *Theologie und Metaphysik* (1881; 2d ed. 1887); *Unterricht in der christlichen Religion* (1875; 2d ed. 1881; 3d 1886); *Schleiermacher's Reden über die Religion* (1874); besides a number of essays in periodicals. Ritschl's theological system is found in a compendious form in his *Unterricht.* The work on *Rechtfertigung*, etc., presents it in a much fuller though less systematic form.

Ritschl adopts as a fundamental principle the Neo-Kantian (more particularly, Lotze's) doctrine of cognition, emphasizing the view that we know things not as they are in themselves, but as they are for us; or, as he expresses it, that all religious judgments are judgments of value. He lays stress accordingly on the subjective element—on personal experience—as being the ultimate fact in religion. Hence he condemns the introduction of merely speculative discussions into theology. He rejects the doctrines of original sin, of the Trinity, and of the Incarnation, as being metaphysical rather than religious. He does not believe in the personal pre-existence or miraculous birth of Christ. He regards Christ, however, as having been specially called to reveal God to men, which revelation he accomplished through a faultless life of devotion to his work of establishing the kingdom of God—i. e. a community of men led by the principle of mutual love. As being the first to exemplify a perfect devotion to God's will, Christ became a mediator, or priest, to bring men to God. He made God known as being essentially love, the love being manifested especially in the free forgiveness of men's sins, no propitiation being needed as a condition. All pardonable sins are to be reckoned as sins of ignorance.

Ritschl rejects natural theology, and makes little account of external evidences for Christianity. The occurrence of miracles he admits in name rather than in fact; but he emphasizes the historical character of Christianity, and insists that men are pardoned and saved only as they are members of the Christian community. He accordingly strongly condemns mysticism and pietism, holding that the notion of direct individual relations between men and God or Christ is essentially fanatical and mischievous. While he regards the Scriptures as containing the most authentic statement

of what the original Christianity was, he adopts no strict doctrine of inspiration; and he and his school entertain very free views as to the prerogatives of biblical criticism, holding that the essential thing is faith in the person of Christ rather than in his deeds or words or in dogmatic statements about him.

The theology of Ritschl is original only in the sense of being a peculiar composite. Like Schleiermacher, he holds that the religious sense is something immediate and ultimate, and that theology is independent of all secular science. With ordinary orthodox Christians he holds that Christianity came by a divine revelation. With the rationalists he is inclined to reject the mysterious and the supernatural, and to hold loose views of the inspiration and authenticity of the Scriptures; and in spite of Ritschl's denunciation of mysticism, the difficulty of combining this latter feature with perfect assurance of faith leads him (and more especially some of his followers, as Herrmann and Kaftan) to a sort of mysticism in the exposition of the relation of the Christian to Christ.

Notwithstanding some marked divergences of doctrinal views among Ritschl's adherents (some of them, e. g., disagreeing with him respecting the pre-existence of Christ), there is among them a strong *esprit de corps*, and they work together zealously in propagating their views and in securing the appointment of men of their school for the vacant places in the theological faculties. Among the more prominent representatives of the Ritschl school are W. Herrmann, of Marburg, Th. Häring, of Göttingen, Julius Kaftan, of Berlin, and H. Wendt, of Jena (dogmaticians); A. Harnack, of Berlin, and F. Loofs, of Halle (historians); E. Schürer, of Kiel. and H. Schultz, of Göttingen (exegetes).

C. M. Mead.

Ritschl, Friedrich Wilhelm: classical scholar; b. at Grossvargula, Thuringia, Apr. 6, 1806; studied under Reisig at Halle; privat docent there 1829; professor 1832; at Breslau 1833; at Bonn from 1839–65, when he resigned in consequence of petty intrigues, accepting a call to Leipzig, where he died Nov. 8, 1876. Ritschl's magnetic influence as a teacher can only be compared to that of Gottfried Hermann; he may be said to have been the founder of a philological school, and many of his pupils have been called to occupy chairs in German universities. His lasting fame as a scholar rests upon his work on *Plautus*, and the epigraphical and linguistic studies of early Latin to which it gave rise. The complete edition of the comic poet was begun in 1871 with the *Trinummus*, to which are added exhaustive and justly celebrated Prolegomena, and was completed in 1894 by some of his pupils. Of his other contributions, many of which are of an epoch-making character, only a few can be here cited: *Parerga Plautina et Terentiana* (1845) contain, among other valuable treatises, the famous dissertation on the *Fabulæ Varronianæ*; in the *Priscæ Latinitatis Monumenta Epigraphica* the author collected in 100 large folio plates artistic facsimiles of Latin inscriptions of the republican period, to which he added an exhaustive commentary. His minor writings, among which the various articles on the *Alexandrian Library* and on the *Literary Activity of Varro* are perhaps the most noteworthy, have been republished in five volumes of *Opuscula*. See L. Müller, *Friedrich W. Ritschl* (1877); Bursian, *Gesch. der class. Philol. in Deutschland*, pp. 812–840; and especially O. Ribbeck, *F. W. Ritschl, Ein Beitrag zur Gesch. der Philologie*, 2 vols., pp. 348, 591 (1879–81).

Alfred Gudeman.

Ritson, Joseph: scholar; b. at Stockton-on-Tees, England, Oct. 2, 1752; studied law; became a conveyancer in London and deputy high bailiff of the duchy of Lancaster; devoted most of his time for many years to antiquarian researches; edited a vast number of reprints of old and rare books. D. at Hoxton, Sept. 3, 1803. Among his works were *Observations on Warton's History of English Poetry* (1782); *Ancient Songs from the Time of King Henry III. to the Revolution* (1790); *A Collection of Scottish Songs* (1794); *Robin Hood Ballads* (1795); *Bibliographia Poetica* (1802); and *Ancient English Metrical Romances, with Dissertation and Glossary* (3 vols., 1802). See his *Letters*, edited with a memoir, by Sir N. Harris Nicolas (2 vols., 1833).

Revised by H. A. Beers.

Rittenhouse, Benjamin: instrument and clock maker; b. in Norriton township, (now) Montgomery co., Pa., 1740 or 1741; brother and assistant to David Rittenhouse. From Feb. 26, 1776, to Dec., 1778, the State of Pennsylvania maintained a gun-factory, of which he was superintendent. He was representative in the Ninth, Tenth, and Twelfth General Assemblies of Pennsylvania (1784–88); commissioner to survey the Schuylkill river Oct. 20, 1789; associate judge of the court of common pleas of Montgomery co., Pa., Mar. 28, 1792, for ten or fifteen years, when he moved to Philadelphia. In 1796–97 he made a surveyor's chain, by order of Congress, which has been the standard of the U. S. Land-office ever since. He was elected a member of the American Philosophical Society Jan. 16, 1789. D. in Philadelphia, Aug. 31, 1825.

Anita N. McGee.

Rittenhouse, David, F. R. S., LL. D.: astronomer and mathematician; b. Apr. 8, 1732, at Paper-mill Run, Roxborough township, near Germantown, Pa., where about 1690 his great-grandfather, William Rittinghuysen, a Hollander, established the first paper-mill in America. In boyhood he worked on his father's farm at Norriton, during which time he came into possession of some mathematical books: made himself master of Newton's *Principia*: discovered for himself the method of fluxions when in his nineteenth year; made a clock at a still earlier age, and undertook clock-making as a profession in 1751. He afterward made an orrery, which was purchased by Princeton College 1770, and later a larger one for the University of Pennsylvania. In connection with Mason and Dixon he was employed in 1763, to determine the initial point of their survey, which he did with instruments of his own construction; fixed the northern, southern, and western boundaries of Pennsylvania, and performed similar tasks for other States; was appointed by the American Philosophical Society to observe the transit of Venus June 3, 1769, which he did successfully in his private observatory at Norriton; calculated the elements of the (future) transit of Dec. 8, 1874; and observed the transits of Mercury of 1769 and 1782. In 1770 he settled at Philadelphia, where he continued the manufacture of clocks and mathematical instruments. He was elected to the provincial Legislature in 1776; was a member of the convention which formed the State constitution of Pennsylvania 1776; held various official positions during the Revolution; was State treasurer 1777–89; director of the U. S. mint 1792–95. In the latter year, after the death of Franklin, he became president of the American Philosophical Society, and was chosen a fellow of the Royal Society. D. in Philadelphia, June 26, 1796. His papers on astronomical, physical, and mathematical subjects are found in the first four volumes of the *Transactions* of the American Philosophical Society. A *Eulogium* upon him was delivered by Dr. Benjamin Rush 1796; his *Life* was written by his nephew, William Barton (1813), and by Prof. James Renwick in Sparks's *American Biography*, 1st series, vol. vii. (1834).

Revised by Anita N. McGee.

Ritter, Carl: geographer; b. at Quedlinburg, Prussian Saxony, Aug. 7, 1779; studied at Halle; traveled much, and was appointed Professor of Geography at the University of Berlin in 1820. By his lectures, as well as by his works, he exercised a decisive influence on the study of geography, remodeling the whole science and attracting general attention to its problems and results. D. in Berlin, Sept. 29, 1859. His principal works are *Die Erdkunde im Verhältniss zur Natur und zur Geschichte des Menschen* (1st ed. 2 vols., 1817–18; 2d ed. 19 vols., 1822–59, comprising only Africa (i.) and Asia (ii.–xix.)); *Europa, ein geographisch-historisch-statistisches Gemälde* (2 vols., 1807); *Die Stupas* (1838); *Einleitung zur allgemeinen vergleichenden Geographie und Abhandlungen zu einer mehr wissenschaftlichen Behandlung der Erdkunde* (1852). After his death were published *Geschichte der Erdkunde* (1861); *Allgemeine Erdkunde* (1862); and *Europa* (1863). Parts of his works have been translated into English by W. L. Gage: *Comparative Geography* (1865) and *The Comparative Geography of Palestine and the Sinaitic Peninsula* (4 vols., 1866). His *Life* was written by W. L. Gage (Edinburgh, 1867).

Ritter, Frederic Louis: See the Appendix.

Ritter, Heinrich: philosopher; b. at Zerbst, Germany, Nov. 21, 1791; studied theology and philosophy at Halle, Göttingen, and Berlin, and was appointed Professor of Philosophy at Berlin in 1824, at Kiel in 1833, at Göttingen in 1837, where he died Feb. 3, 1869. His principal work is his *Geschichte der Philosophie* (Hamburg, 12 vols., 1829–55), ending with Kant; the most prominent of his works, all relating to the history of philosophy, are *Versuch zur Verständigung über die neuste deutsche Philosophie* (1853); *Die Halbkantianer und der Pantheismus* (1827); and *Ueber Unsterblichkeit* (several times reprinted).

Ritual: See Liturgics.

Ritualist [from Lat. *ri'tus*, form and manner of religious observances, a religious usage or ceremony]: strictly speaking, one who has made the rights and usages of the Church a matter of study; but the term is commonly used to designate a party in the Anglican Church which seeks to minimize the effect of the Reformation, which is regarded by them as a "deformation," and, in order to show sympathy with the ante-Reformation Church, and to make prominent doctrines which they regard as "Catholic," has revived rites and practices which have their origin in the mediæval days. The Ritualists claim that in reviving these usages they follow in obedience to the letter of Church law; in other cases they conform to Catholic practice, and their acts are not forbidden. They style themselves simply Catholics. As a body, they have shown great zeal and self-denial, and in some respects resemble the early Methodists. Denounced as Romanizers and betrayers of their Church, the Church Association, powerful through the money it commands, was formed for their prosecution, culminating in the celebrated trial of the Bishop of Lincoln for alleged ritualistic practices, which terminated in a practical victory for the bishop and his sympathizers. The decision in this case of the Archbishop of Canterbury has been generally accepted and further prosecutions are unlikely.

From the Church of England, ritualism has extended to her daughter in the U. S., and has occupied the attention of more than one general convention. In 1871, at the Baltimore General Convention, the discussions on ritualism occupied the greater portion of the session. After most brilliant and prolonged debates a canon forbidding certain practices was adopted which has proved practically inoperative, and there has been throughout the American Church an increasing reverence and dignity marking the conduct of the Church's services which are certainly results of the ritual movement. There has not been found to any extent that development of ritual which tends to the inculcation of Roman Catholic doctrine. The ritual canon of 1871 still stands in the *Digest of Canons*, but it is doubtful if a prosecution for its infraction would be attempted on any section of the Church. See Liturgics. Revised by W. S. Perry.

Ritual Law: See the Appendix.

Ritual of the Dead, or **Book of the Dead** (Egypt. *Per-m-hru*, going forth by day, Fr. *rituel funéraire*, Germ. *Totenbuch*): the collection of sacred writings of the Egyptians which, in greater or less compass, were placed on the walls of tombs and pyramids, on sarcophagi, and on various articles of funereal furniture, or on papyri which were deposited with the mummies of the dead. In part it was of very ancient composition, but its chapters had no organic connection between themselves, and the whole did not have any definite and final form till very late in Egyptian history.

The general view made Thoth the author of this as of other sacred writings. The oldest chapters are said to have been composed in Heliopolis; the 130th and 64th chapters are reputed to have been found at Denderah in the time of Hesep-ti, the fifth king of the first dynasty, while the 178th chapter is inscribed on the sarcophagus of Mycerinos of the fourth dynasty. As time passed the number of chapters grew and their length increased, till a fairly complete copy filled a papyrus 15 inches wide and from 80 to 90 feet long. Theban copies of the eighteenth to the twentieth dynasties contained ninety chapters at most, while a text of the twenty-sixth dynasty, republished by Lepsius in his *Totenbuch*, contains 165 chapters. In a complete compilation the number would be considerably greater. According to Édouard Naville, who has made special investigations on the subject, there were four recensions of the text: (1) That of the Old and Middle Kingdoms down to the thirteenth dynasty, found only in the hieroglyphic writing; (2) the Theban, of the eighteenth to the twentieth dynasties, written generally in the hieroglyphic, though sometimes in the hieratic character; (3) a similar recension found after the twentieth dynasty, usually written in the hieratic, and with no fixed order of chapters; and (4) the Saitic and Ptolemaic, in both hieroglyphic and hieratic script, the text thoroughly revised, and the number and order of the chapters quite fixed and uniform. The first recension has come to us in selected extracts in the texts on the sarcophagi, tombs, and pyramids of the fifth and sixth dynasties, and on the sarcophagi and papyri of the eleventh and twelfth dynasties. The Theban copies of the eighteenth to the twentieth dynasties are found on sarcophagi, but particularly on papyri in hieroglyphic or hieratic characters, accompanied by vignettes, which contain sometimes as many as thirteen colors. The titles of the chapters are in red and the text in black ink. When written in hieroglyphs the lines are vertical; in hieratic script, horizontal. These papyrus rolls were sometimes placed in a niche in the wall near the head of the mummy, or, later, beside or beneath it, or even inside the encasing bands. Occasionally they were put in a little drawer in the pedestal of an Osirian figure which was deposited with the mummy. Extracts from the *Book of the Dead* have also been found written on the linen mummy-bands themselves. The chapters thus buried were the most important in the collection.

The book, as a whole, is entirely lacking in logical or chronological order, and in a systematic arrangement of its parts. It is also not properly or entirely a funeral ritual, since the acts prescribed are only in part to be done to or for the dead. The deceased is himself the principal active agent. Aside from certain ceremonial observances and directions, the book is concerned with the journey of the dead through Amenti, the western region of the departed; with the speeches and prayers which he is to address to the gods and other beings whom he will meet in the course of his migrations; with the magical formulas which are calculated to deliver him from the ills and dangers that threaten; with the formulas which were placed on amulets to insure the safety of his bodily members; with the hymns to be sung in honor of the great gods; and with the scenes of the judgment in the hall of Osiris when the heart of the deceased is weighed in the scales over against the symbol of truth and justice, and where the "negative confession" that the deceased has *not* committed certain reprehensible or heinous acts of irreligion or of immorality is repeated to the forty-two assessors.

The localities of the future existence of the soul were vague, and the most that can be said is that they were generally patterned after the conditions known in Egypt, especially those of the Delta region. There was a river divided into branches, islands, and fruitful fields, which produced sure harvests wrought by labor in which the "justified" had a share. But before reaching these beatific regions of Àaru (or Àalu) the dead was brought into the Hall of Double Justice (truth and righteousness), where Osiris was seated beneath a canopy. Before him were seated the forty-two assessors or judges, each from a different city of Egypt, and each set to judge of a particular form of sin. The four genii who had special charge of the vital organs of the deceased were also present. Anubis, the god of the dead, led in the deceased, who was received by Mat, the goddess of truth. The "negative confession" was repeated, and the truth of the protestations of innocence thus made was tested by weighing the heart of the dead, Horus being the principal actor, Mat the witness, and Thoth the recorder of the event. If declared righteous, the heart of the justified one was returned to him, along with his various bodily powers, and he became a whole man again. If the result was adverse the fate of the dead is not clear, but he seems to have died a second time, being devoured by the judge or by a female hippopotamus which guarded the entrance to the fields of Àaru. The beatific life was similar to the terrestrial, but from it the justified could return to the earth by means of magical formulas, and could even return again to the mummy itself. At will the dead could take on any desired form of bird or beast, and in the speeches set for repetition the dead set himself on terms of equality with the very gods. For the literature of the subject, see Egyptology. Renouf's translation mentioned in that article was published separately (London, 1893–94), and Pierret's translation was rendered in English by Charles H. S. Davis (New York, 1894).

Charles R. Gillett.

Rivas, or **Nicaragua**: a town of Nicaragua; capital of a department of the same name; 4 miles from the west shore of Lake Nicaragua, a little N. of the line of the proposed ship-canal (see map of Central America, ref. 7–H). It was the ancient Indian town of Nicarao, noted in the history of the conquest; most of the inhabitants are Indians. The place is very picturesque, its scattered houses being surrounded by fruit-trees, but it has little commercial importance. Here Walker was finally defeated in Nov.–Dec., 1856. Pop. about 10,000. H. H. S.

Rivas, Angel de Saavedra, Duke of: See Saavedra, Angel, de.

Rive-de-Gier, reev'de-zhi-ā' (Fr., bank of the Gier): town of the department of the Loire; 14 miles E. N. E. of St.-Étienne; on the Gier, an affluent of the Rhône, on the Givor

Canal, and on the railway from Lyons to St.-Étienne (see map of France, ref. 6-G). It is a center of iron manufacturing and has important coal mines in its neighborhood. It has also glass-factories, tanneries, and factories of articles in leather. Pop. (1896) 13,803. M. W. H.

Rivera, rē̆e-vā'rāă, José Fructuoso: soldier and politician; b. at Paysandú, Uruguay, about 1790. He was a partisan leader in the civil wars, and after Uruguay became independent was the first regularly elected president 1830–35. In 1836 he revolted against his successor, Oribe, heading the Colorados party, whose long struggle with the Blancos marks the subsequent history of Uruguay. Oribe was driven out, and Rivera was again president 1838–42. Then Rosas, dictator of Buenos Ayres, aided Oribe, who began the "nine years' siege." Rivera acted against him in the field, but on Mar. 28, 1845, was defeated at India Muerta by Urquiza, Oribe's ally. In 1853 Rivera aided in the deposition of Giro at Montevideo, and became a member of the executive triumvirate. D. at Montevideo, Jan. 13, 1854. H. H. S.

River-bullhead: See Miller's Thumb.

River Falls: city (settled in 1851, incorporated in 1885); Pierce and St. Croix cos., Wis.; on the Kinnickinnick river, and the Chi., St. P., Minn. and Omaha Railway; 12 miles S. E. of Hudson, 16 miles N. E. of Hastings, Minn. (for location, see map of Wisconsin, ref. 4–A). It is in an agricultural region; has abundant power for manufacturing from the river; and contains 6 churches, 2 public-school buildings, a high school, the Fourth Normal School of the State, gas and water-works, 2 State banks with combined capital of $64,000, and a weekly newspaper. The principal manufactures are flour and starch. Pop. (1880) 1,499; (1890) 1,783; (1900) 2,008. Editor of "Journal."

Riverhead: town; capital of Suffolk co., N. Y.; on the Peconic river, at the west end of Great Peconic Bay, and the Long Island Railroad; 4 miles S. of Long Island Sound, 75 miles E. by N. of Brooklyn (for location, see map of New York, ref. 8–F). It contains a national bank with capital of $50,000, a State bank with capital of $5,000, a savings-bank, a weekly newspaper, grist, woolen, paper, planing, and moulding mills, and carriage, chocolate, organ, and soap works. Pop. (1890) 4,010; (1900) 4,503.

River Hydraulics: that branch of hydraulics which deals with the flow of water in rivers. The principles are also applicable in a simplified form to canals and other artificial conduits. In the early part of the seventeenth century Castelli and Torricelli, pupils of Galileo, applied the principles of that master to hydraulics. The latter discovered the law governing the issue of fluid-veins from small orifices in the sides of a reservoir, and suggested this law as applicable to the flow of rivers. Near the close of the century Guglielmini elaborated this theory, which was generally adopted by the scientific world because no one attempted to verify its consequences by actual experiment. In 1732 Pitot, by observing sub-surface changes of velocity with the tube which bears his name, overturned this school of hydraulics. Attention being thus called to the importance of a practical treatment of the problem, experiment was multiplied; and finally, in 1786, Dubuat laid the foundation of the modern school by announcing his great principle that the flow is due to gravity acting through the slope of the surface, and that the true method of enunciating in mathematical language the law of motion is to equate expressions for the accelerating and retarding forces. During the nineteenth century many investigators have attacked the problem upon this general basis, and the general laws of distribution of velocities in a cross-section of a stream have become fairly known, while many formulas for mean velocity have been proposed.

The elaborate hydraulic survey of the Mississippi river, made from 1850 to 1860 by Humphreys and Abbot, resulted in a system of river hydraulics of which the following is a brief outline: The law of distribution of velocity in both vertical and horizontal planes was shown to be parabolic. The ratio between the mid depth and mean velocity is sensibly constant, being about 0·96, and it is independent of wind effect. This last discovery has been of particular value in reducing the labor of gauging streams. In algebraic language, the most important of these laws for sub-surface velocity are expressed as follows, with D, d_1, and d denoting, respectively, the total depth, the depth of the axis, and the depth of any particular point; and v, V, V_0, V_D, $V_{\frac{1}{2}D}$, V_{d_1}, V_m denoting, respectively, the mean velocity of the river, the velocity at any depth d, the surface velocity, the velocity at the bottom of the river (the depth being D), the velocity at half the depth, the maximum velocity, and the mean of the whole vertical curve:

$$b = \frac{1{\cdot}69}{\sqrt{D + 1{\cdot}5}}. \tag{1}$$

$$V = V_{d_1} - \sqrt{bv}\left(\frac{d - d_1}{D}\right)^2. \tag{2}$$

$$V_m = \tfrac{8}{3} V_{d_1} + \tfrac{1}{3} V_D + \frac{d_1}{D}(\tfrac{1}{3} V_0 - \tfrac{1}{3} V_D). \tag{3}$$

$$V_{\frac{1}{2}D} = V_m + \tfrac{1}{12}\sqrt{bv}. \tag{4}$$

The formula for the mean velocity deduced is the following, in English feet: v denotes the mean velocity per second; a, the area of cross-section; p, the wetted perimeter; W, the width; b, the value given in eq. (1); s, the sine of the slope corrected for bends—its numerical value is the quotient of the total fall in water-surface between the terminal stations, less the value of h in the bend formula, by the total distance between them measured on the middle line of the channel; N represents the number of angular changes each 30° of the latter line. The value of v in the bend formula is found by successive approximations.

$$v = \left(\sqrt{0{\cdot}0081b + \left(\frac{225a\sqrt{s}}{p + W}\right)^{\frac{1}{2}}} - 0{\cdot}09\sqrt{b}\right)^2. \tag{5}$$

$$h = \frac{Nv^2}{536} \quad \text{(bend formula)}. \tag{6}$$

Among other formulas for mean velocity that of Kutter (see Hydraulics) has received the widest acceptance, and as it contains a coefficient of roughness, it can be adapted to different classes of streams as well as to artificial channels.

Gauging of Rivers.—For practically gauging the discharge of a large river the following plan is recommended: Select a locality in a straight portion where the current is regular. Lay out a base-line 200 feet long parallel to the direction of the flow, and determine accurately the cross-section in front. Establish two theodolites, and, for numerous floats well distributed between the banks, note the angular distance from, and the time of transit past, each end of the base. These floats should be made double, the surface float being a tin ellipsoid or other light body bearing a little flag. The lower float may be a large open keg, ballasted with lead so as to hang vertically. The connecting cord should be as small as practicable. The rate of movement of the whole will thus be essentially that of the lower keg. The center of this keg should be placed at six-tenths of the depth below the surface, because in the absence of wind the velocity at that point very nearly represents the mean of the velocities in the vertical. The level of the water on a gauge should be read at regular intervals. To reduce the observations draw upon a sheet of section-paper the base-line and two perpendiculars to mark the lines across which the times of transit were noted. From the recorded angles and a table of natural tangents the paths of each float are plotted, and upon each is written the seconds of its transit past the base. The total width of the river is next divided into as many equal divisions as show sensibly unvarying velocity. The mean of all the seconds of transit in each division is then reduced to feet per second, and adopted as the velocity in that division. A mean of all these velocities, interpolations being made if any are missing, closely approximates to the mean velocity of the river.

Where the depth will permit, rods or tubes, loaded to float vertically, and extending from the surface nearly to the bottom, are often used, thus integrating mechanically the velocities in a vertical. For small streams various forms of meters are often employed, which consist essentially of a submerged wheel, with apparatus designed to record the number of its revolutions; and the accuracy of the result, of course, depends entirely upon the precision with which these revolutions can be translated into feet per second. Electricity has been skillfully applied to record the number of revolutions of the wheel, and thus the registering apparatus can be observed on land or in a boat.

Oscillations.—As the volume of water in the channel increases, the surface-level of the river rises. The amount of this rise varies greatly in different parts of the course, especially when the stream discharges into the sea or a large lake. In such cases the oscillation is insignificant near the

mouth, and the range between high and low water regularly increases for a certain distance until the influence of the sensibly unchanging level of the recipient of its waters disappears. Above this point the range becomes more uniform for the main river, but ultimately diminishes as the sources are approached. The mathematical laws governing this oscillation were first experimentally studied upon the Mississippi, and with the following results: (1) The local slope at any station is far from constant, since the measured discharge exhibits extraordinary but normal changes at different epochs for any given reading of the gauge, when the other conditions upon which the flow depends must be identical. Near the mouth of the Ohio these variations at high stages exceed 30 per cent., the discharge being much larger with a rising than with a falling river. (2) This variation is not the same in all rises, the difference being greater in high than in low stages, and larger in the upper river than near its mouth. (3) The local slope in any particular rise increases regularly as the river rises, and more rapidly in large than in small oscillations; it attains its maximum value when the surface still lacks a few inches of extreme height. In falling, the slope is always much less than at corresponding levels in rising. (4) During any given oscillation the rate of the increase of local slope in rising is usually the same as that of the loss in falling.

Mechanical Work.—A great river is constantly performing an immense amount of mechanical work in pulverizing and moving forward solid material. Its capacity for this work is proportional to the *vis viva* of its waters, but the amount actually performed depends in great measure upon the nature of its bed and upon the geological formations through which it flows. The Mississippi annually transports in suspension to the sea a mass of alluvion 1 sq. mile in area and 241 feet in height, weighing over 400,000,000 tons, while at the same time it is pushing over the bars at its mouth an additional amount equal to one-tenth of this enormous quantity.

The fact that, in general, under the moving waters lies a moving bed, presents in a forcible light the difficulties encountered by the hydraulic engineer in attempting to permanently improve the navigable channel of a great river. A bar removed at one point often reappears, perhaps in an aggravated form, below. The river is always at work, and to oppose it or modify its action usually exacts continuous labor. On many rivers the banks, especially in the bends, are abraded by the current; and this action, occurring in the sinuous course which is characteristic of large volumes of water in motion, often results in cutting off a bend, thus violently changing the regimen of the stream for long distances, and entailing difficulties not easily foreseen or prevented. The general effect of such cut-offs is the following: Immediately above the site the water-surface is lowered by the full amount of the bend resistance (eq. 6) and by one-half of the fall of the river in a straight portion of its course equal in length to the shortening effected by the cut-off. Immediately below the site the water-surface is raised by the latter quantity. In receding from the site, both above and below, these effects become less, and ultimately disappear. Where the banks are liable to erosion by the river a cut-off is always a misfortune. Any immediate benefit above is compensated by injury below, and the ultimate effects upon the channel are liable to be disastrous to both sections.

When a sediment-bearing river flows through a district below the level of its floods other peculiar phenomena are presented. The water escaping over the natural banks loses its velocity and deposits the matter held in suspension. The heavier particles drop first, and the result is to gradually raise the level of the banks near the river, and thus cause it apparently to traverse a low ridge sloping in both directions from the main channel. If the banks are sufficiently tenacious to resist erosion, this action, continued for a long period, may result in confining the stream between natural embankments. Such cases, however, are rare, but artificial works are often employed to assist nature when the fertility of the region to be thus reclaimed offers sufficient pecuniary inducements. Many of the chief rivers of Europe, and some of those of America, Asia, and Africa, are thus more or less perfectly confined to their channels throughout their alluvial regions. The Po is a well-known example of this kind, and is often cited as proving that the ultimate effect of levees is to raise the bed of the main river by preventing the escape of the sediment brought down by the floods. This is an error of fact, as has been fully demonstrated by Lombardini, the most eminent hydraulic authority of Italy. Indeed, no effect of this kind has ever been established as occurring upon any river. In the U. S. the Mississippi is the most conspicuous example of the application of levees to the prevention of inundations. A gigantic system has been inaugurated, extending from the mouth of the Ohio to the Gulf, and, although imperfect in its details and execution, it has added immensely to the wealth of the region. Similar artificial embankments upon a grand scale are in progress of construction upon the Irrawadi, in British Burma.

Reference is made to Humphreys and Abbot's *Physics and Hydraulics of the Mississippi River* for an exhaustive discussion of the laws of flow above briefly indicated. For the application of Kutter's formula, see Herring and Trautwine's *Flow of Water in Rivers and other Channels* (1889). See also the articles HARBORS, HYDRAULICS, LEVEES, MISSISSIPPI RIVER, etc.

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Revised by M. MERRIMAN.

Rivers [from O. Fr. *riviere*, Fr. *rivière* : Ital. *riviera* : Span. *ribera* < Lat. **riparia*, subst. of adjec. *riparius*, deriv. of *ripa*, bank]: streams of considerable size by which the water gathered from a certain catchment area or basin, bearing with it the waste of the land-surface, is led to lower ground, usually to the sea. All those streams which unite in a single trunk on their way to the sea constitute a river system. As the volume of a typical river is supplied only by the rainfall over its basin, those streams and rivers near the seacoast whose volume is dependent on the inflow of the tide should be called tidal rivers; those, like the lower Delaware or Hudson, whose volume depends on the submergence of their lower valleys beneath sea-level should be called estuaries or fiords (see FIORDS); while those strips of salt water included between the mainland and adjacent linear sand-bars, as Indian and Banana "rivers" on the Florida coast, are lagoons, and should not be called rivers at all.

Rivers may be treated in three ways: First, their general natural history, in which the development of rivers is traced from the beginnings to the latest phases of their history, from the simplest to the most complicated examples; second, their descriptive geography, in which the existing rivers of the world are described locally; third, their hydrography, in which their manner of flow, their floods, and their uses as water-powers and in irrigation and navigation are considered. This article is chiefly devoted to the first of these headings.

The Origin of Rivers.—A new-made or original river begins its life either on the surface of a newly raised land area, or on an old land whose surface has been so deformed by mountain growth as to extinguish all pre-existing rivers. The intermittent surface rivulets of wet weather, and the slow-creeping ground water beneath the surface, follow the new constructional slopes of the land, and gather in the trough lines between the slopes to form streams, the ground water emerging in springs not only at the head of the streams, but at innumerable points along the stream channels. The various streams that are led by the form of the new land to unite on the way to the sea form a single constructional river system, each stream occupying a constructional trough or valley, the total drainage area being inclosed by a watershed or divide that is determined by the shape in which the land has been uplifted or deformed, and hence called a main constructional divide; the branches of the system are separated by subordinate divides, which may be appropriately called subdivides. If the new-made land is smooth, like the coastal plain of Texas, the streams follow its gentle slope to the sea, their nearly parallel courses being determined only by the faint inequality of the surface. When the new-made land is uneven, the divides are better defined; in such regions the inequality of uplift generally forms basin-like depressions—hence constructional lakes are often found on an infantile river system; such imperfections of drainage discharge are very characteristic of the earliest stages of river life. Good examples of infantile, lacustrine river systems are found in the recently broken country of Southern Oregon, where the ridges still closely retain their constructional form, and where the depressions between them are frequently basin-shaped; but as the rainfall there is moderate or scanty, the rivers of the region are dwarfed from lack of water-supply; few of the basins overflow, and hence many of the rivers fail to reach the sea.

Young Rivers.—Thus established, the various members of the river system proceed to cut down their channels as close to sea-level as they can. The trenches cut below the

original constructional troughs of the country are called consequent valleys. All but the deepest of the constructional lakes are in this way drained, and the flow of the streams becomes more continuous. The river now enters well on its life-work of carrying along the waste of the land on its way to the sea, the waste being received partly from the cutting of the stream channels, partly from the creeping and washing of the soil from the steep sides of the young consequent valleys, and partly from the broad constructional slopes of the region. Whenever, during the process of channel cutting, the streams pass from a resistant to a weak rock structure, an increase of slope is developed at the point of contrast, forming rapids; where the contrast of resistance is well marked, the increase of slope may be abrupt, and thus many waterfalls may come to characterize youthful streams. See CATARACTS.

Adolescent Rivers.—A river of good size soon cuts down its valley close to sea-level, or base-level, as it is now generally called, and on thus assuming a gently sloping course it enters its adolescence; but its small side-streams may still retain youthful features. Adolescence of the trunk stream is therefore characterized not only by the disappearance of the initial constructional lakes, but also by the wearing away or recession of the youthful waterfalls, and the attainment of a slope on which the ability of the river to do work is just equal to the work that it has to do. The river course is then said to be graded. Large streams may attain a graded course on weak rocks during the youth of their system; small branches on resistant rocks will not grade their courses until after adolescence. The depth of an adolescent valley depends on several factors: First, the height of the land in which the valley is cut; the rivers of low-lying Florida are unable to cut deep valleys, because their drainage area is hardly above base-level; while the COLORADO RIVER (*q. v.*) is cutting down a vast cañon, because the plateaus across which its course is laid have been lifted so high; it still has rapids and falls, and is only entering adolescence. Second, the depth depends on how close the channel may approach base-level; this depends on the grade that the river may assume, and this in turn depends on the volume and load of the stream—for example, in a region of given height a large river will cut down a deeper consequent valley and assume a gentler grade than a small river; for the large one can carry its load on a faint slope, while the small one will need a steeper slope on which to gain velocity with which to do its work; for this reason a graded river descends more rapidly in its upper course, where the volume is small, than in its lower course, where its volume is greater. Again, in two river basins of similar area and structure, but one in a dry and the other in a wet climate, the river in the first can not in its adolescence cut down so deep a valley as the river in the second; for the volumes of the two rivers must differ. Still again, of two rivers of equal size, one trenching a region of hard rocks, the other at work in a region of similar form and height but of weak rocks, the former will cut a deeper adolescent valley than the latter, because the former will have but a moderate load of land-waste, while the latter will be surcharged with detritus from the easily weathered rocks of its basin, and will need a comparatively steep grade on which to do its work. It is for two of these reasons, the dryness of the climate and the weakness of the rocks, that the rivers of the U. S. which cross the elevated western plains from the Rocky Mountains eastward have not cut deeply intrenched valleys; they are characteristic adolescent rivers with well-graded courses, but the land-waste from the weak rocks of the plains is shed into them so rapidly, and their volume is so reduced by the small rainfall, that they have practically ceased deepening their valleys, while their slope is still comparatively steep and their channels are still high above base-level. Other illustrations of the control of grade by load are found in those rivers which run from the Alps out upon the plains of Lombardy. Some of them pass through lakes on the way, and are there filtered of their load from the mountains; then below the lakes they cut down the plain that they traverse, while others emerge from the mountains well charged with detritus and are unable to trench the plain; they may even build it up by depositing some of their load upon it.

Subsequent Rivers.—While the trunk river is grading its valley and the consequent lateral streams are advancing toward the graded condition as fast as they can, certain new branches, not represented in the original constructional river system, make their appearance. These are developed at various points, but especially wherever the walls of a consequent valley expose a weak stratum or rock-mass; for as the consequent valley widens by the wasting of its side-slopes, the widening will be fastest where the slopes consist of weak rocks; and thus in time numerous lateral ravines will be developed, lengthening headwards into valleys along the lead of the weak rocks by which they are guided. Such valleys and the streams that drain them are called subsequent. As the subsequent streams increase their drainage area, the original basins of the consequent branch streams are split up; thus the whole drainage area is more minutely subdivided and the rainfall is more promptly delivered to the water-courses. Commensurate with this change, the area of wasting slopes is increased, and thus the load washed down to the streams, and by them to the main river, is also increased. It may happen that the grade assumed by the main stream at the beginning of its adolescence is then found to be too faint, and hence some of the load is laid down, building a FLOOD-PLAIN (*q. v.*), and thus steepening the grade of the river and giving it a velocity that enables it to carry the remaining load. The deep alluvium with which the trench of the Missouri river is partially filled may have been accumulated in this manner, for the upper branches of this river are actively gnawing into the plains, and rapidly increasing the area of wasting slopes from which the load of the trunk river is chiefly derived.

Migration of Divides.—During the adolescent stage of river life it frequently happens that a stream may gnaw its way headward into the valley of another stream of the same river system or of an adjacent system, whose channel is at a higher level on account of greater distance to the sea, or of resistant rocks which have retarded its deepening somewhere farther down its course. Then the growing stream, working to advantage on the steeper slope or on the weaker rocks which guide its growth, may tap the other, thus abstracting its upper part and diverting it to the growing stream and leaving its diminished and beheaded lower part to follow its former valley. Subsequent streams are particularly active in making captures of this kind. Thus one river system may grow at the expense of another, as the divide between them is forced to migrate away from the steeper streams at the heads of the deeper valleys. Changes of this kind are going on in the Alps, where the Italian streams are frequently gaining at the expense of those discharging northward—as, for example, in the upper Engadine valley, where the Maira is capturing the headwaters of the Inn.

Deltas.—During all this time of river growth most of the land-waste that has been carried down to the river mouth accumulates there, forming a DELTA (*q. v.*), while the finest waste is carried out to deeper water. Rivers that enter the sea from steep mountain-slopes build stony deltas; but ordinarily the delta is composed of silt, reduced to fine texture during its long travel from its source down the valley to the sea. Under a fitting climate deltas are therefore fertile, and may support a large population, although exposed to the danger of sudden changes in the course of the river branches that traverse them and of FLOODS (*q. v.*) both from the rivers and the sea, the latter being caused by the high water of on-shore storm-winds. The outline taken by the growing delta varies according to the ratio of the power and load of the river to the activity of the shore-waves and currents. When the former are in excess, as at the mouth of the Mississippi, the delta grows rapidly forward with branching fingers wherever the distributary streams enter the sea; but where the waves and currents have the upper hand, the front of the delta is rounded, as in the case of the Rio Grande, where there is a smooth curve, convex seaward. The delta of the Po is of intermediate form. Acutely pointed deltas, like that of the Tiber, are probably caused by the combined action of river and shore currents.

Flood-plains.—As the delta grows forward there is necessarily a slight building up all along the flood-plain in order to maintain the needed grade of the river; and this entails an extension of the flood-plain up the valley, particularly at that stage of river life when the load is increasing. Hence with advancing adolescence this extremely valuable portion of the river valley increases its area, tempting occupation from its fertility, but, like the delta, subject to danger from floods. The Ohio valley offers an excellent illustration of this phase of river growth. The flood-plain and delta are somewhat higher along the river banks, where the silt is deposited at time of overflow; the plain slopes gently to either margin as well as down the valley. Consequently,

small lateral tributaries are frequently deflected down the faint depression between the valley-wall and the flood-plain; thus the Yazoo runs southward along the eastern side of the Mississippi flood-plain for many miles, and would continue to the Gulf as an independent stream if the main river did not swing over to the eastern bluffs and take it in at Vicksburg.

Meanders.—During the deepening of valleys of moderate slope the initial bends in the river course are frequently exaggerated until a distinctly sinuous channel is produced. This feature is still further increased when the river is free to swing from side to side on a flood-plain. Fully developed meanders are then developed, their radius of curvature increasing with the volume of the stream, and their arc of curvature lengthening with the faintness of grade. As the meanders appear, the river course is lengthened; hence the deepening of the valley is retarded, or else the valley previously deepened may have to be somewhat filled. A meandering river tends to cut its outer bank, particularly at time of high water, and the silt thus gathered at one bend is deposited on the inside of other bends farther down stream; thus the location of the meanders is continually changing. It often happens that a cut-off is formed across the neck of a long meander, thus diverting the river to a shorter course, and leaving the abandoned curve to form an ox-bow lake. All stages of these changes may be seen on the flood-plain of the Mississippi.

Maturity.—With the advancing development of these various features, a river system gradually enters its maturity, and during this stage its activities are in fullest play. The rainfall was at first only imperfectly delivered to the river, having long distances to creep on the broad slopes of the constructional surface, and often being delayed in lakes. It now everywhere finds some well-prepared slope, down which it is promptly led to one of the numerous streams of the system; the loss by evaporation is much reduced. The perfect dissection of the land-surface by many valleys promotes the shedding of waste from the slopes at the fastest possible rate; the nice arrangement of graded channels, steepest at head waters and thence decreasing to the mouth, enables the streams to work most effectively as transporting agents. Moreover, the development of subsequent branch streams, and the rearrangement of original lines of flow by tapping and diversion, have brought about a mature adjustment of streams to structures, possible only as a result of the patient search for the best lines of work by the denuding and transporting forces, of which the river is the more visible expression. The clear testimony that well-adjusted rivers give in favor of the uniformity of geological processes deserves more attention than it has generally received.

It is during maturity that the three parts of a river system, often referred to as if normally characterizing all rivers and all stages of development, are best represented. The head waters or torrent portion, where the volume is small, where the slope is steep, where falls may still exist, and where the waste of the land is chiefly derived; the middle portion, of larger volume and strong, steady flow on a moderate grade, with a narrow flood-plain in a well-inclosed valley; and the lower portion, where the valley is more widely opened, where there is a widespread flood-plain ending in a forward-growing delta, the river meandering freely on the plain, and branching out to several mouths at the delta front. It is during and after maturity that rivers are most useful as navigable waterways.

Old Age.—After maturity the powers of the river gradually decay. The surface of the river basin is reduced to a peneplain of slight relief, the rainfall is less promptly discharged, and more is lost by evaporation; even the upper branches lose their activity, and the waste of the land is carried away more and more slowly. As the load thus decreases, the flood-plains that were built up during maturity are gradually attacked and worn down to fainter and fainter grades. At the same time the river and its branches wander more and more freely to one side or the other, being little restrained by the fading valley-slopes; and thus the well-defined, mature adjustment of streams to structures is somewhat lost. This stage is rather ideal than actual, however, for few rivers enter so late a period without some disturbing interruptions in the course of their normal development, such as those considered below.

Effects of Depression.—When the region drained by a river is evenly depressed, the lower part of the valley is submerged and converted into an estuary, bay, or fiord (see Coast); at the same time all the branches which formerly entered the trunk river below the head of the estuary now enter the sea independently, and must thereafter be regarded as separate rivers. Thus the Taunton, Blackstone, and Pawtuxet rivers now enter Narragansett Bay separately, and are properly described as independent rivers; but they are only the dissevered branches of a trunk stream that once flowed down the valley which is now submerged. The Susquehanna, Potomac, James, and others are similarly the dissevered branches of a former Chesapeake river. In the same manner it is probable that all the streams which now enter the Baltic Sea independently once joined a trunk river, which followed the axial line of the sea-trough.

Effects of Elevation.—When the region drained by a river system is evenly uplifted changes of two kinds are introduced. First, a new strip of land is added outside of the former coast-line, and the old trunk river is extended across this strip to a new mouth. By such extension it often happens that several formerly separate rivers are ingrafted on a single new trunk. Many branches of the lower Mississippi have thus been joined to the main river by the elevation of the coastal plain and the recession of the waters of the Gulf of Mexico. Second, inasmuch as the slope of the new coastal borderland is nearly always steeper than the grade needed by the extended river, the uplift allows the river to cut its valley to a greater depth than before; thus its powers are revived. This is particularly apparent in the case of a well-graded mature or old river, whose valley has become open; in consequence of uplift a narrow young valley will be cut along the bottom of the older and wider valley, and thus a composite topography—a topography developed with relation to two base-levels—will be introduced, of which many examples may be found. Most of the rivers of Pennsylvania and Virginia follow valleys of this composite nature. The cañon of the Colorado river is sunk in the bottom of a more open upper valley. The gorge of the middle Rhine is cut down in the bottom of a more open valley that traverses the highlands of the Schiefergebirge. The Ohio and the Missouri are both believed to be thus revived from a former old age, their narrow adolescent valleys of the present cycle of denudation being eroded beneath uplifted peneplains of a former cycle of denudation. The Great Falls of the Missouri in Montana are a characteristic feature of the second youth of that river.

When a meandering old river is uplifted it cuts down a steep-sided meandering valley, and usually enlarges the radius of its curves in doing so, cutting steep valley walls on the outside of the curves and long slopes on the spurs of land that descend between the curves. The north branch of the Susquehanna in Pennsylvania, the Osage in Missouri, the Seine in Northwestern France, and the Moselle in Western Germany—all exhibit these incised meanders. The meanders are sometimes so strong that the necks of the spurs are cut through, and the roundabout river course is abandoned. Such deserted incised meanders are known on the upper Ohio near Pittsburg, on the Moselle, and on the Neckar.

One of the most marked consequences of uplift is a revival of the processes of capture of such streams as deepen their courses slowly, by others (chiefly subsequent streams) whose channels are cut down more rapidly. The adjustment of streams to structures thus proceeds even further than in the previous cycle, for at the beginning of the first cycle there were no subsequent streams along weak structures, but at the beginning of the second cycle the subsequents are well formed, and they soon far outstrip the remaining consequents in their conquest for drainage area. It is believed that by such changes as these the Schuylkill has been greatly curtailed by the Susquehanna on the W. and the Lehigh and Delaware on the E.; in England the Trent has beheaded the Witham, and the Severn has probably beheaded the Thames, which seems once to have risen in Wales; the upper Meuse has lost branches on the W. to the Seine and on the E. to the Moselle.

Effects of Deformation.—Interruptions in the normal progress of river development are frequently caused by some uneven movement of the region, rather than by a simple uplift or depression. The region may be tilted by a slight angle, increasing or decreasing the slope toward the sea. A large part of the Atlantic coastal slope of North America was thus affected at a time when its rivers had reached old age, and the surface of the land had been reduced to a peneplain of moderate relief: then the tilting gave an increased slope to the rivers and an emphatic revival of their waning powers, and they are now in adoles-

cence or maturity of the cycle thus introduced. For example, the slanting upland of New England is dissected by the Connecticut, whose valley deepens inland in consequence of the greater elevation that the old lowland has received in Northern Massachusetts than at the coast. The valleys of the Hudson, Delaware, Susquehanna, Potomac, and others are similarly accounted for.

Inequality of slope in adjacent river systems introduced by gentle warping is an effective means of promoting the migration of divides, the steepened streams gaining area at the expense of those whose slope is decreased. Thus it is believed that the present northwest course of the Tennessee, near Chattanooga, is a diversion from a former southwest course, in consequence of slight deformation of the region.

More decided deformation is detected along the northern margin of the Alps, where the mountain-making forces seem to be invading the Piedmont districts and crushing them into incipient folds. When a land-surface is thus more or less warped the graded courses of its rivers are deformed; thus lakes may be formed where the river trough is depressed, and more active valley cutting may be indueed where it is elevated, and in this way the marginal lakes of the Alps are explained, although glacial action has also undoubtedly contributed to their origin. The deformation of the Linmat, producing Lake Zurich, has been minutely studied.

Similar changes have progressed to a more advanced stage in the southern marginal ranges of the Himalaya; but while ephemeral lakes may have been formed on various outflowing rivers up-stream from the line of uplift, this stage is now past, and the rivers escape across the new ranges with unobstructed flow and essentially along their former courses; for the upturned strata of the foot-hills are the delta deposits of the earlier stage of river history. Rivers like these, of which the Sutlej may be taken as the type, maintained their flow in spite of uplifts across their course, and are called antecedent. The Green river of Wyoming, a chief headstream of the Colorado, is by some regarded as antecedent, being thought to have kept its course through the great uplift of the Uinta Mountains; but the argument to this conclusion does not seem to be decisive.

Volcanic Accidents.—The lava-flows poured forth by volcanic or fissure eruptions run to the lowest ground that they can reach, and gradually congeal. In this way the rivers of the lava-buried areas are displaced and take new courses alongside of or across the lava surface. Thus the Snake river, gathering mature head waters among the mountains of Western Wyoming, crosses the lava-plains of Idaho in a young cañon; its upper and lower parts are as dissimilar as the upper and lower parts of an extended river that comes from older inland uplands to a newer coastal plain. If the region possessing displaced rivers of this kind is elevated the revived streams cut down new valleys to one side of their buried valleys, such being the relation of several older and newer rivers on the western slope of the Sierra Nevada in California, where the old river-gravels buried under the lava-flows are much sought for as a source of gold, while the new rivers flow in deep cañons.

Climatic Accidents—Desiccation.—When the climate of a region turns from humid to arid the supply of a river system weakens, the head waters shorten, and the volume diminishes. In crossing lowlands the river is further lessened by evaporation, so that it may at last disappear, though its course to the sea remains open. Withered rivers of this kind may be found in the Argentine Republic, where they fail to reach the ocean, although the country slopes forward from their lower ends. Many withered rivers are found in the Great Basin of the U. S., where the side-streams, descending from the mountains, are unable to reach their former trunk stream, while the dwindling trunk stream fades away on the desert plains. During winter rains the withered system is somewhat invigorated; in summer droughts it is reduced to dissevered remnants. In the Sahara the withering of the rivers is often complete; the valleys or wadies remain, but they lead no water, unless beneath the sands of their trough.

Climatic Accidents—Glaciation.—The effects of glaciation (see GLACIERS) are among the most interesting accidents that can happen to rivers; and they are of great importance to civilized nations, inasmuch as they prevail over parts of Northeastern America and Northwestern Europe. During the occupation of a country by an ice-sheet there is a peculiar drainage system upon and under the ice, as is observed in Greenland and Alaska. Streams fed by rains and surface-melting in summer flow for a time on the surface, and then disappear by plunging down crevasses; they emerge from tunnels at the ice margin, sometimes bursting out with much energy, and bearing a heavy load of coarse and fine detritus, which they spread out in their further course, often building up stony flood-plains in their valleys or deltas in the sea.

During the retreat of an ice-sheet it sometimes evacuates a district that slopes toward its front. A marginal lake then accumulates in the depression and overflows at the lowest point in the rim, scouring down a valley trench of considerable size; but when a still further retreat of the ice allows a lower discharge of the lake, this trench is abandoned except by such local drainage as it may receive from either side. In this way explanation is given of certain small rivers in broad valleys in the northern part of the U. S.; the upper Minnesota, the Desplaines by Chicago, Little river between the heads of the Maumee and the Wabash in Ohio, the Mohawk by Rome, N. Y., all being examples of this curious kind (*Popular Science Monthly*, Nov., 1894).

The most striking glacial accidents in river history are found after the retreat of the ice from the glaciated country, when the surface streams again take unconstrained possession of it. Supposing that the region had had a matured drainage system before the ice invasion, then the ice rounds off the peaks and ridges, deepens and widens the valleys, often eroding basins in their troughs, or clogging them with the drift that is left irregularly distributed over the country. The preglacial stream lines are therefore more or less obstructed, and hence the post-glacial streams often lose their way, being here detained in an eroded basin or in a hollow behind a drift barrier, and there turning across an old divide or spur along a new line of flow. Streams thus affected are as a rule characterized by frequent lakes and long reaches alternating with rapids or gorges along their new courses. (See LAKES, CATARACTS, and GORGE.) The delicacy of adjustment to structural lines that prevailed in the preglacial drainage system is confused or lost. There are little streams in large valleys; large streams in little valleys; falls in the lower portion of the river courses; and lakes everywhere. The rivers of Canada, Maine, Scandinavia, and other glaciated regions exhibit all these features in profusion. They are rapidly establishing better graded channels; filling lakes, which appear as meadows; pushing back falls and cutting down gorges (see NIAGARA FALLS); terracing valleys that were clogged with drift. The economic value of the rapids and falls thus produced is very great; nearly all the manufacturing cities of New England are located at water-powers of this accidental origin; Ottawa, Rochester, and Minneapolis are similarly determined.

Complicated History of Large Rivers.—While the several phases in the life and development of rivers here outlined are easily apprehended when considered separately, such is not the case with the development of actual rivers of large size, such as the Mississippi, Amazon, Rhine, or Danube. The successive uplifts by which the present drainage area has been constructed; the various cycles or partial cycles of denudation through which one part or another of the river has advanced; the accidents that its different branches have suffered—all combine to accumulate a history so complex that geographical study in its present state does not suffice to apprehend it clearly. Yet the real significance of each part is so closely dependent on its plan of development, and the relations of the various parts of a river system follow so distinctly from the history that they have been through, that nothing less than an analysis of their origin suffices to bring them clearly before the understanding. A full account of the Mississippi system would require an extended monograph. Its oldest parts are probably to be found in the upper branches of the Tennessee and New rivers, which descend from the mountains of Carolina and Virginia. Similar ancient head waters in Pennsylvania have been turned by diversion or deformation into the Atlantic rivers. Along the northern watershed the deposits of glacial drift are at many points sufficient to alter the direction of preglacial drainage; the so-called head of the Mississippi is certainly one of its youngest parts. The great western branches, the Missouri, Arkansas, and others, are young compared to the Ohio. The lower course of the trunk stream is a recent addition to the upper branches.

Economic Relations of Rivers.—In the economies of nature rivers are the great avenues of transportation along which the waste of the land, gathered by the creep of the soil and the wash of the wet-weather streams, is carried to

the sea. In the economies of man rivers appear in the most varied relations. In regions where rivers are young, their valleys are not yet prepared for occupation, but are so steep-sided that they are left over as waste or forested land; settlements are then generally on the uplands away from the streams, as is repeatedly illustrated on the dissected coastal plain of the U. S. and on the dissected plains of the interior, as those of Central Missouri. As the river life advances, and the valley widens in adolescence and later on, settlements are made near the streams, and the more thoroughly dissected uplands are less populated. The early races of man must frequently have been dwellers in open valleys of mature rivers, judging by the repeated accounts of floods in traditional history. Villages from which modern cities have sprung have often been located by certain peculiar river features; at river mouths, as New York; at the head of bays formed by submerging rivers, as Providence; at the head of tide-water on submerged rivers, as Albany and Trenton; at the junction of river branches, as Pittsburg; at waterfalls, as Lowell. Rivers whose volume is large, by reason of the fortunate growth of their basins, serve as most important means of internal communication, as the Amazon; but the modern development of the railway seriously lessens the use of communication by river, as in the case of the Mississippi and its branches. The head waters of rivers are often used as furnishing water-supply for cities, while the trunk streams are employed in the disposal of sewage. Irrigation involves the diversion of streams in their upper courses into canals, which are led along the valley-sides at a gentle grade, thus even reaching the divides between adjacent streams, whence their water is easily distributed to the fields on the slopes. An opposite art is developed in the construction of dikes or levees near the river-banks, to prevent the overflow of the flood-plain, as on the Mississippi. Extensive operations of this description are undertaken to restrain a river from shifting its meanders, as on the Missouri; or to lead it into a more direct course than its natural channel, as has been done for the Rhine.

W. M. Davis.

Law of Rivers.—Under this title is comprehended not only riparian rights proper, or such as are peculiar to the ownership of land on the bank of a river, but also the rights of all persons, whether riparian proprietors or not, in public or private streams.

Flowing waters are by their nature, and so by law, incapable of private ownership. Whether the waters in question are those of a great river, flowing in a bed as wide and free as the sea, or whether they make their way in a tiny watercourse through the lands of private owners, no one, whether he owns the bed of the stream or not, can lay claim to the water as private property. He has, at the most, certain rights of use and enjoyment, exclusive or common, in the water of the stream. If he is a riparian proprietor he has certain peculiar and exclusive rights in the water, which arise out of and constitute a part of his property in the soil over which it flows. If he is not a proprietor he may nevertheless share in the general or common right of the public to use the stream for navigation or other proper purpose. In the case of a public or so-called navigable stream, the riparian or private rights are inconsiderable, and the law concerns itself almost wholly with the rights of the public in the stream; in the case of private or non-navigable waters, on the other hand, the public rights are insignificant in comparison with the private rights of the riparian proprietors. The subject therefore naturally divides itself into two distinct topics, viz., the law of public and that of private streams.

Public Streams.—A public stream is one the bed of which is vested in the state. At common law no rivers have this public character except such as are navigable by great ships, and only those rivers are deemed to be navigable in which (and only so far as) the tide ebbs and flows. Accordingly, the expression "navigable river" has come into general use to denote a public stream, though the common-law test of navigability—the presence or absence of tides—which in Great Britain is always consistent with the physical fact, is obviously inapplicable to the great internal waterways of the U. S., and has generally been abandoned. The principle is now well established in the U. S. that all streams which are navigable in fact for vessels customarily used in the operations of commerce are navigable in law. Used in its natural sense, however, the term navigable is a very elastic one and affords a very uncertain test of the public character of a stream, inasmuch as a watercourse which will not admit great ships may nevertheless support a considerable commerce carried on in small boats or barges. Accordingly, the question as to whether a certain stream is public or not is often a vexed question of fact, and streams which have no relation to the great waterways of commerce may nevertheless, by legislative or judicial determination, have the character of public waters impressed upon them.

As has been said above, the most important characteristic of a public river is that it is, like the seashore, subject to no private property rights. Riparian proprietors, as such, have in general no greater rights in the stream than are enjoyed by the public at large. The only exception to this rule at common law is the owner's right of access to his own land, and of mooring vessels in the river adjoining his land and keeping them there a reasonable time for the purpose of loading and unloading. His rights in these respects are precisely analogous to those of an owner of land upon a highway the fee of which is vested in the state. Indeed, it is as highways that public waters are chiefly regarded in law, and the most important of the public rights in them is that of navigation in vessels of all kinds for purposes of commerce or pleasure. Navigable rivers are, moreover, arms of the sea, and are, as such, subject to the common rights of fishing, of taking seaweed, and of cutting and taking ice, as well as to any other uses of profit or convenience which may be enjoyed in common by all persons having occasion to resort thereto. The only restrictions upon these public or common rights is that they shall be exercised reasonably and with due regard to their mutual enjoyment, and that the less important rights (as fishing, for example) shall be exercised in due subordination to those that are more important (as navigation). It may be added that there is at common law no right in the public to use the bank of a river—the same being private property—even for purposes connected with the navigation of the river, as towing, mooring vessels, etc. The civil law, on the other hand, recognized easements of this nature in favor of the public over riparian lands, and the principle has survived in the modern codes which are based on the Roman system.

The law of the seashore, which makes high-water mark the line of division between the property of the littoral proprietor and that of the state, applies equally to tidal rivers. In the case of public waters which are not subject to the ebb and flow of the tide, the limit of riparian ownership is the ordinary water-mark. Below that line—as below high-water mark on the seashore—lies the property of the crown, or state. This property right in the bed of a river (which the state may grant to a riparian proprietor or to any other individual or corporation, in fee simple or otherwise) is in the U. S. generally vested in the several States which have political jurisdiction over the waters in question, though the Federal Government, in the case of rivers flowing through or between several States, exercises a general jurisdiction in the interests of commerce.

Private Streams.—The law governing private streams concerns itself for the most part with the mutual rights and obligations of the riparian proprietors. An owner of land through which such a stream flows is deemed to be the owner of its bed. Opposite riparian owners are presumptively owners of the bed to the middle line of the stream respectively. (See Filum Aquæ.) As has been said above, however, this proprietorship of the bank and bed does not carry with it any exclusive property in the water of the stream. Every such proprietor has the right to use the running water so long as it is within his own territory, but he can not pollute or divert it, or appreciably diminish its volume, nor, in fact, make any use of it which is inconsistent with a similar use by every other riparian owner. He has the sole right of fishing, of cutting ice, of boating or skating in and upon such parts of the stream as flow over his land, and may grant any or all of these rights to others who are not riparian proprietors. But such a grant will not put the grantee in the position of a riparian owner so as to give him a right of action against other riparian proprietors for an excessive or improper use of the stream on their part. Exclusive rights to use the water, to divert it permanently into artificial channels, to discharge it upon the land below, or to overflow the land above, may be gained by express grant from the proprietors whose lands are affected by such user, or by prescription. The soil of one riparian proprietor may be gradually increased or diminished by the action of the current, or by imperceptible changes in the course of the stream. The law recognizes this process of enlargement of one man's boundaries at the expense of his neighbor under

the name of "accretion," as a valid means of acquiring title to land. The legal consequences of accretion are the same whether it goes on in public or private streams or on the seashore; but if the process of change be a sudden or violent one, it will have no legal consequences whatever. Thus if a watercourse should suddenly desert its ancient bed and form for itself a new channel, the original boundary-line between the opposite owners, running through the middle of the old bed, will be preserved unchanged.

The rights of the public, so extensive and important in the case of public waters, are greatly narrowed in the case of private streams. There is in general no common right of navigation or fishing or any other user in such waters. Nevertheless, a stream which is strictly private so far as the title to its shores and bed is concerned, may become subject to a public easement of navigation or of floating logs. The public right in such cases is presumably acquired from the riparian owners, a grant or dedication by the latter being presumed from the long and general use of the stream for such purpose by the public. It is, however, highly probable that considerations of public policy will, in the newer parts of the U. S. at least, lead to a general recognition of common rights of navigation in suitable private streams, even where there has been no general use of the stream from which to infer a dedication.

For the distinction between riparian rights proper and such as pertain to waters percolating through the soil or flowing in undefined channels, see the article on Watercourses. For other similar and related rights, see Lakes, Riparian Rights, Seashore, and authorities there cited.

George W. Kirchwey.

Rivers, Richard Henderson, D. D.: educator and minister of the Methodist Episcopal Church South; b. in Montgomery co., Tenn., Sept. 11, 1814; graduated at La Grange College, Alabama, in 1835; elected Assistant Professor of Languages, and in 1836 Professor of Languages, in that institution; was president of the conference school at Athens, Ala., in 1843; vice-president and Professor of Moral Science in Centenary College, Louisiana, in 1848, and president in 1849; was called to the presidency of La Grange College in 1854, and remained in that position after the removal of the institution to Florence, Ala., and the change of the name to Wesleyan University, until it was broken up by the civil war; was subsequently president of Somerville Female College, Tennessee, Centenary Institute, Summerfield, Ala., and Logan Female College, Kentucky; was president of Martin Female College, Pulaski, Tenn., 1874–78; was pastor in Auburn and Eufaula, Ala., 1878–83; took charge of Broadway church, Louisville, Ky., 1883–87; was a member of the Tennessee Conference; published *Mental Philosophy*, *Moral Philosophy*, *Our Young People* (1880); *The Life of Robert Paine* (1884); and *Arrows from Two Quivers* (1890). D. at Louisville, June 21, 1894. Revised by A. Osborn.

Riverside: city (founded in 1870); capital of Riverside co. (created from the southwest part of San Bernardino County in 1893), Cal.; on the Santa Ana river, and the Southern Cal. Railway; 118 miles N. W. of San Diego (for location, see map of California, ref. 12–G). It was founded by colonists from New England, who constructed two irrigating canals, one of which cost $50,000, and engaged extensively in the cultivation of oranges, lemons, figs, and grapes, the manufacture of pottery and cabinet furniture, and the production of raisins. There are several churches, public and private schools, high school, two libraries (Library Association, founded in 1879, and Public, founded in 1889), 2 national banks with combined capital of $200,000, 3 State banks, a savings-bank, and 2 daily and 3 weekly newspapers. Pop. (1890) 4,683; (1900) 7,973.

Rives, Amélie: See Chanler, Amélie.

Rives, William Cabell: Senator; b. in Nelson co., Va., May 4, 1793; educated at Hampden-Sidney and William and Mary Colleges; studied law under Jefferson; served as a volunteer in the war with England 1812–15; became prominent in Virginia politics; was a member of Congress 1823–27; minister to France 1829–32, and again 1849–53; Senator from 1832 to 1845, with a brief interruption; a member of the peace conference of 1861, and of the Confederate Congress at Montgomery. D. near Charlottesville, Va., Apr. 26, 1868. He was the author of *The Life and Times of James Madison* (Boston, 3 vols., 1859–69) and other works.

Riviera, rēē-vēē-ā'răă (i. e. the shore): name given to the coast of Liguria, Italy, from the French frontier to the Cape of Porto Venere, near Spezia (see map of Italy, ref. 4–B). It is celebrated for its natural beauty and the salubrity of its climate. Its winter climate is one of the most mild and genial known, and this, with its ready accessibility, attracts to it each winter a very large number of invalids. It is customary to divide it into the Eastern Riviera (Riviera di Levante) and the Western (Riviera di Ponente), the two meeting at Genoa. See Black, *The Riviera, or the Coast from Marseilles to Leghorn* (1890); Murray, *A Handbook for Travellers on the Riviera* (1890); Macmillan, *The Riviera* (1892). Mark W. Harrington.

Riviere, rēē'vi-ār', Briton: figure and animal painter; b. in London, Aug. 14, 1840; pupil of his father, William Riviere (1806–76); graduated at Oxford in 1867; Royal Academician 1881; medal, Centennial Exposition, Philadelphia, 1876; third-class medals, Paris Expositions, 1878 and 1889. Two of his most celebrated works are *Let Sleeping Dogs Lie* and *The Astrologer*. Studio in London. W. A. C.

Rivière du Loup (en Bas), -dü-loo': post-village (called also Fraserville); Temiscouata County, Quebec, Canada; on the southeastern shore of the river St. Lawrence, 125 miles below Quebec, and terminus of the Temiscouata Railway, at the mouth of the picturesque stream of the same name (see map of Quebec, ref. 3–E). It is the seat of Fraserville Institute, a convent, and an academy, and has a good trade. It is a place of summer resort. Pop. (1891) 4,175, nearly all French.

Rivière du Loup (en Haut), now **Louiseville**: post-village; capital of Maskinongé County, Quebec, Canada; on the north shore of Lake St. Peter, 66 miles below Montreal (see map of Quebec, ref. 4–B). It has a good trade and manufactures of leather. Pop. about 2,000.

Rix-dollar [from Swed. *riksdaler*: Germ. *reichsthaler*; *reich* (Swed. *rik*), kingdom, realm + *thaler* (Swed. *daler*), thaler, dollar]: a silver coin formerly used in the Scandinavian countries and Germany. Its value varied in the different countries from a little less than 40 cents to a little more than a dollar.

Rizzio, rit'sēē-ō, or **Riccio**, rit'chēē-ō, David: minister of Mary, Queen of Scots; b. at Turin, Italy, in 1540; the son of a dancing-master; was brought up in France; became an accomplished musician; obtained favor at the court of Savoy, where he was selected on account of his skill in languages to accompany an embassy sent to Scotland about 1563. Having attracted the attention of Mary, Queen of Scots, by his musical talent, she appointed him one of the pages of her chamber, and soon afterward (Dec., 1564) made him her secretary for foreign languages. He acquired great influence over her, and was accordingly hated by less fortunate courtiers; was an advocate of the marriage to Darnley, after which he was appointed keeper of the privy purse to the king and queen; was bitterly denounced by Knox and the Reformers on account of his Roman Catholicism; has even been regarded by some writers as a secret papal legate, and was regarded by many as the queen's paramour and father of Prince James. Several of the most powerful nobles, especially Morton, Ruthven, Lindsay, and Maitland, formed a conspiracy to assassinate him, and obtained the written concurrence of the weak Darnley by working upon his jealousy and by promising him the title of king. Introduced by Darnley into the queen's chamber, Ruthven and George Douglass struck down Rizzio in her presence, dragged him into the adjoining room, and killed him Mar. 9, 1566. It has been charged that Knox and other Reformers were privy to this murder. This is improbable, but Knox wrote of it in his *History of Scotland* as "a just act, and most worthy of all praise." F. M. Colby.

Roach [M. Eng. *roche*, connected with O. Eng. *reohha*, Germ. *roche*, roach. The Eng. *ray*, name of same fish < Fr. *raie* < Lat. *rāja*]: a kind of fish, the *Rutilus rutilus*, of the family *Cyprinidæ*. It is placed with its associates in a group distinguished by the pharyngeal teeth being in single series of five or six each, with crenate ridges and slightly hooked tips, the presence of twelve to fourteen anal rays, and the position of the dorsal fin opposite to the ventrals; the body is silvery, and the lower fins tinged with red, at least in the adult; the mouth is terminal. The roach generally attains a length of about 8 inches, and sometimes reaches as much as 10 or 12, and is under a pound in weight. It is distributed throughout Europe N. of the Alps, and, though insignificant as a game-fish, it is generally included in European works on angling. In the U. S.

the name is applied to several related species of cyprinoids, as the chub or fallfish (*Semotilus bullaris*), and in some

The European roach.

places to the sunfish (*Lepomis gibbosus*), and even to the sciænoid spot or lafayette (*Liostomus xanthurus*).

Revised by F. A. Lucas.

Roach: a kind of insect. See Cockroach.

Road, Law or **Rule of the**: primarily, the law governing the meeting or passing of travelers upon the highways; secondarily, the rules governing the steering, sailing, etc., of vessels meeting or passing upon navigable waters.

Law of the Road for Vehicles, etc.—This may be summed up as follows: (1) When two vehicles meet, each must bear to the right in the U. S., to the left in Great Britain. (2) In general, of vehicles following paths that cross, the one first to reach the point of meeting has the right of way. (3) In Great Britain, when one vehicle overtakes another, the foremost gives way to the left, and the other passes on at the right. These rules are not so peremptory that they must always be observed by drivers of vehicles, but their observance depends upon the general rule that all persons traversing a highway, whether walking, riding, or driving, must use reasonable care and diligence, under the circumstances, to avoid collision, even though it should be necessary to turn in the opposite direction from that prescribed by the customary law of the road. (See Angell on *Highways*). For pedestrians, the rule on both sides of the Atlantic is to keep to the right.

Law, or Rule, of the Road at Sea.—The rules governing the meeting, crossing, etc., of vessels at sea, and the precautions required to avoid collision, have now become a matter of international importance; and the tendency is toward the adoption of a uniform system by all maritime countries. On Oct. 16, 1889, a maritime conference met at Washington, D. C., at the invitation of the President of the U. S., issued in pursuance of specific provisions of Congress to all maritime nations in diplomatic relations with the U. S. The object of the conference was to discuss, revise, and amend the rules, regulations, and proceedings concerning vessels at sea, and navigation generally. The conference rose on Dec. 31, 1889, and a report of its proceedings was published in three volumes. The rule of the road as recommended by the conference in most respects corresponds closely with that which already existed, and was in general adopted by Austria, France, Germany, the Netherlands, Portugal, Sweden, Spain, and the U. S.; it was to go into effect on Mar. 1, 1895. British shipping-masters, pilots, etc., however, strenuously opposed its adoption, maintaining that in some important respects (as with respect to fog-signals and the screening of side lights) the rule was impracticable. In deference, therefore, to representations made by the British Government the date at which the rule should go into effect was postponed. They now acquiesce, and the date has been fixed as July 1, 1897. The following is a statement of the law which was enacted by the U. S. Congress to carry out the provisions of the recommendation of the conference, as proclaimed by the President Dec. 31, 1896.

Steering and Sailing Rules.—(1) When two sailing vessels are approaching one another, so as to involve risk of collision, (*a*) a vessel running free shall keep out of the way of a vessel which is close-hauled; (*b*) a vessel close-hauled on the port tack shall keep out of the way of a vessel close-hauled on the starboard tack; (*c*) when both are running free, with the wind on different sides, the vessel with the wind on the port shall keep out of the way of the other; (*d*) when both are running free, with the wind on the same side, the one to windward shall keep out of the way of the other; (*e*) a vessel with the wind aft shall keep out of the way of the other. (2) When two steam-vessels are meeting end on, or nearly so, each shall alter her course to starboard, so that each may pass on the port side of the other. (3) When two steam-vessels are crossing so as to involve risk of collision, the one which has the other on her starboard shall keep out of the way of the other. (4) When a steam-vessel and a sailing vessel are proceeding so as to involve risk of collision, the steam-vessel shall keep out of the way of the other. (5) Every vessel overtaking another shall keep out of the way of the overtaken vessel. (6) In narrow channels every steam-vessel shall, when it is safe and practicable, keep to that side of fair-way or mid-channel which lies on the starboard side of such vessel. (7) Where by any rule one vessel shall keep out of the way of the other, the latter shall keep her course and speed, and the former, if the circumstances of the case admit, shall avoid crossing ahead of the other.

In obeying and construing these rules due regard shall be had to all dangers of navigation and collision, and to any special circumstances which may render a departure from these rules necessary in order to avoid immediate danger.

Rules in regard to the Lights.—(1) The rules regarding lights shall be complied with in all weather from sunset to sunrise, and during such time no other lights which may be mistaken for the prescribed lights shall be exhibited. (2) A steam-vessel shall carry forward in front of the foremast, if there be one, and not less than 20 feet above the hull, a white light; on the starboard side a green light; on the port side a red light. The two side lights must be arranged with screens so that they can not be seen across the bow, nor more than two points abaft the beam. A steam-vessel when under way may carry an additional white light forward. (3) A steam-vessel towing another vessel shall in addition to her side lights carry two, if towing more than one vessel three, white lights. (4) A vessel not under command through accident shall carry two red lights in a vertical line not less than 6 feet apart aft of its white lights, or, in the day, two black shapes or balls 2 feet in diameter. (5) A sailing-vessel under way, and any vessel being towed, shall carry the same lights as are prescribed for a steam-vessel under way, with the exception of the white lights, which they shall never carry. (6) A vessel being overtaken by another shall show from her stern a white light or a flare-up light. (7) A vessel under 150 feet in length, when at anchor, shall carry forward, not more than 20 feet above the hull, a white light; a vessel 150 feet or more in length shall carry forward a white light, not less than 20 nor more than 40 feet above the hull, and aft another such light not less than 15 feet below the forward one.

Special rules are provided for steam-vessels of less than 40 tons, and vessels under oars or sails of less than 20 tons, which enable those vessels to carry a prescribed number and kinds of lights in a way more adapted to their size. Special rules are provided for pilot-boats, ferry-boats, etc.

Sound-signals in Fog, etc.—(1) All signals prescribed for vessels under way shall be given by steam-vessels on the whistle or siren; by sailing vessels and vessels towed, on the fog-horn. (2) A steam-vessel under way shall sound at intervals of not more than two minutes a prolonged blast. (3) A steam-vessel under way, but stopped and having no way upon her, shall sound at intervals of not more than two minutes two prolonged blasts with an interval of about one second between them. (4) A sailing vessel under way shall sound at intervals of not more than one minute when on the starboard tack one blast, when on the port tack two blasts in succession, and when with the wind abaft the beam three blasts in succession. (5) A vessel at anchor shall at intervals of not more than a minute ring the bell rapidly for about five seconds. (6) A vessel towing shall at intervals of not more than two minutes sound three blasts in succession, one long, followed by two short, and shall not give any other signal. (7) A steam-vessel wishing to indicate to another "The way is off my vessel, you may feel your way past me," may sound three blasts in succession, a short, long, and short.

Sound-signals for Vessels in sight of one another.—Steam-vessels must indicate their course by one short blast for "I am directing my course to starboard"; two short blasts, "I am directing my course to port"; three short blasts, "My engines are going full speed astern."

In all these rules every steam-vessel under sail and not under steam is considered a sailing vessel, and every vessel under steam, whether under sail or not, is considered a steam-vessel. "Steam-vessel" includes any vessel propelled by machinery. A vessel is "under way" when not at anchor or made fast to the shore or aground. F. Sturges Allen.

Road-runner: See Cuckoo.

Roads [O. Eng. *rād*, a riding, journey, road, deriv. of *rīdan*, ride]: highways in the country and the streets in vil-

lages and small towns, often called common roads to distinguish them from paved city streets and from railways. The number of roads in a civilized community involves a large outlay for construction, and a heavy annual expenditure for repairs, so that the question of economy in road-making and maintenance is an important one. Good roads promote traffic and industry, while poor ones are a constant bar to the development of the towns which they connect. The location, construction, and maintenance of roads form a branch of civil engineering, and it is only the engineer who can conduct these operations so as to secure the greatest public convenience with the least expenditure.

The Romans built many roads extending to all parts of the empire, and portions of some of these are found at the present day in fair condition. Twenty-nine military roads centered at Rome, which with their numerous branches had, according to Antoninus, a total length of 52,964 Roman miles. The most important of these had a paved width of 16 feet, with curbs and unpaved sidewalks, but the prevailing width was 8 feet. There were also roads for single carriages, and for horsemen, of lesser width. The military roads were essentially pavements of dressed stone blocks, laid with very close joints on a foundation of concrete which rested on a sub-foundation of large flat stones, the entire thickness being about 3 feet. The road surface was quite smooth, and level transversely. Grade was usually disregarded, and the course of the road laid out in a straight line over hills and valleys. Milestones marked the distances from all parts of the empire to a gilt column in the Forum at Rome. In respect to durability, these roads were probably superior to any since constructed, but they were very expensive and the steep grades often rendered portions ill adapted to traffic. Macadam has said that their construction "was a kind of desperate remedy to which ignorance has had recourse," and from the point of view of engineering economy and the proper adaptation of means to ends Roman roads can not be recommended.

A number of Roman roads were built in England in the second and third centuries, and later some of these were widened and made public highways. The roads in England and throughout Europe were, however, in a deplorable condition during the Middle Ages, and indeed until the beginning of the nineteenth century no systematic method of construction and repair was known. About 1350 certain roads in England were given to private companies to repair, and toll was allowed to be collected. In 1553 the parishes were made responsible for the maintenance of the roads, but the burden proved to be too heavy, and the results were unsatisfactory.

The early explorers of Mexico and Peru found excellent roads between the prineipal towns. One of the military roads of Peru is said to have been nearly 2,000 miles long, with tunnels through mountains and bridges or ferries over streams; this was 20 feet wide and paved with flagstones covered with bitumen. In India and Persia there were also a few good roads in early times. In the latter country royal roads for the use of the ruler were built by the side of the common roads and kept in better condition, from which originated the phrase "There is no royal road to learning."

The earliest roads in the U. S. were mere Indian trails along watercourses and through gaps in mountain ranges. In New England the towns had control of roads, and there are records of some "eight and ten rods wide" which were authorized to be laid out, but only about one or two rods were devoted to traffic, the remainder being left uncleared. The prevailing method of construction and repair, when any method at all was used, was to plow two parallel furrows about 20 feet apart and scrape the loosened earth upon the space between them to form the road-bed.

Turnpikes were maintained in the U. S. during the eighteenth century by private companies which were allowed to collect toll, and the surface of these was often of gravel or broken stone. In 1796 an act of Congress authorized a national road from Baltimore westward, which was built for 650 miles through Pennsylvania, Ohio, and Illinois; its width is 80 feet, of which 30 feet is of broken stone, sometimes on a foundation of large stones. Although not properly kept up since the introduction of railways, it is still known as a good road.

The roads of Europe are in a far better condition than those of the U. S. This is due partly to the fact that they are older, but mainly to better and more effective methods of construction and maintenance. Gravel or broken stone is employed for a road surface, proper drainage is provided, and systematic repairs are made at stated intervals. The dirt from the gutters is carted away instead of being spread on the road-bed, while this is kept in good condition by the frequent addition of broken stone properly compacted and rolled. Among the famous roads of Europe may be mentioned that from Geneva, over the Simplon Pass of the Alps, to Milan, which was built by Napoleon as a military route, and which cost the French Government about $3,250,000, or nearly $15,000 per mile; this is more than double the cost of construction of good roads under ordinary conditions.

About 1885 public opinion in the U. S. began to be aroused, mainly through the influence of bicycle riders and manufacturers, as to the deplorable condition of country roads and the great advantage of better methods of construction and repair. This movement has been productive of excellent results, yet very much remains to be done in order that these roads may be in a condition comparable to those of Europe. Methods of locating, building, and repairing roads are well known to civil engineers, and can be as easily carried out as those for the construction and maintenance of railways, but the public refuses or neglects to intrust the work to them. County commissioners, township supervisors, selectmen, and borough committees are the authorities who control the building and repair of roads, and these generally decide nearly all questions relating thereto, irrespective of the experience of other localities or of the rules of engineering. The method, so extensively prevailing, whereby farmers are allowed to work out their road-tax instead of paying it in money, is perhaps the greatest evil of the present system, and wherever it prevails good roads can never be secured. Under this method the mud of the gutters is annually loosened by the plow, transferred by the scraper to the middle of the street, and spread to a rounded surface without any attempt at compacting or rolling, so that the rains wash it quickly back again to the sides and the condition of the road during a large part of the year is very poor. It is safe to say that in the majority of cases the money spent in such repairs is entirely wasted.

The cost of road improvements in fifty counties of the State of New York during 1892 was $2,716,000, and this does not include that spent in cities, towns, and villages. This annual sum, if expended in accordance with engineering principles, is sufficient to produce in a few years roads comparable in every respect with those of Europe.

It is one of the gratifying features of the road agitation that State Legislatures are urged to make such laws as will insure that the construction and maintenance of common roads shall be placed in the hands of civil engineers. Every effort spent in securing the passage of such laws tends to the improvement of roads. The building of a common road is easy compared to that of a railway; the principles and methods are given in great detail in engineering literature, and it is by the scientific application of these that the roads of Europe have been brought to such a high degree of perfection.

Location.—A road should be so laid out that its length between the points to be connected is as short as possible, the grades at the same time being such as to allow easy traction for vehicles and also thorough drainage. A slight grade will provide for drainage if proper ditches are constructed. The maximum grade for earth roads should be about 10 per cent.—that is, 10 feet of vertical rise to 100 feet of horizontal distance, while gravel roads may be limited to 7 per cent., and macadam roads to about 4 or 5 per cent. On these grades a horse exerts twice as much force in pulling up the load as on a level.

The width of roads in the U. S. has usually been too great. Sixteen feet is sufficient for the easy passage of two vehicles, and it is better that this width should be kept in good condition than that 30 or 40 feet should be maintained in poor order at greater cost. In the neighborhood of cities widths of 24 or 30 feet are sometimes required. To these widths are to be added those necessary for gutters or ditches, and for sidewalks when such are necessary.

The best transverse form is that of two planes of slight inclination connected by a short curved surface near the middle. It is a common error to make the section too rounding and the inclination of the sides too steep. Many good roads show to the eye but little elevation in the middle, and the harder and smoother the road-covering the less is the elevation required.

Construction.—In order to render the road free from dust and mud and the traction easy to animals some kind of road covering other than the natural soil is usually neces-

sary. Gravel is often employed for this purpose, and when properly compacted or rolled on a good foundation it gives good satisfaction. This gravel should consist of angular grains in order that it may form a compact bed. The effect of frost on the road-bed is to be prevented by ditches which are deep enough to drain the subsoil, the longitudinal grade carrying away the water.

The system of road-making devised by Macadam in the early part of the nineteenth century has been much used in Great Britain. The road-bed is first excavated to a depth of 8 or 10 inches and compacted by rolling. Successive layers of broken stone are then laid and each layer thoroughly consolidated. The top layer is generally composed of splinters or smaller stones, and this is made thicker at the middle than at the sides so as to give the proper transverse form. The stone should be broken into fragments nearly cubical, and no stone should be used which will not pass through a ring $2\frac{1}{2}$ inches in diameter. Macadam's influence greatly improved the condition of roads in Scotland and England, and Parliament awarded him £2,000 in recognition of his services.

The system introduced by Telford is similar to that of Macadam, except that stone blocks are set in contact to serve as a foundation for the broken stone. The term "macadam road" is, however, popularly applied to both systems of constructions. Fig. 1 is a part of a cross-section of a road, showing a layer of stone blocks about 6 inches in depth, a layer of broken stone 4 inches deep, and a top layer of binding material 1 or 2 inches thick. The stone blocks are set in close contact, with the widest ends down, and rammed. The broken stone is applied in two or three thicknesses, each being thoroughly rolled while moistened. In Fig. 2 an arrangement of the stone blocks more suitable for soft soils is shown, the upper figure being a section across the road and the lower one a plan. In very soft soils concrete may be used as a foundation.

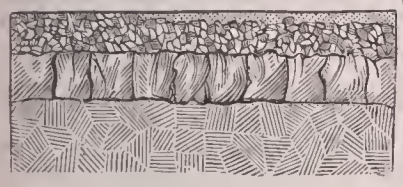

Fig. 1.

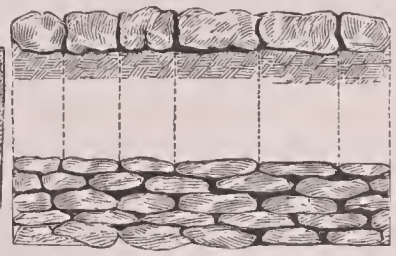

Fig. 2.

Road-coverings should be of tough and durable materials, trap and granitic rock being the best. Some limestones make good roads, while others are entirely unsuitable, as they grind into dust under the action of the traffic. It is important that the road-bed should be thoroughly rolled, and for this purpose a steam-roller is superior to one drawn by horses. A 10 or 12 ton roller appears in general to produce the best results. Each layer should be rolled about fifty times in order to secure a first-class roadway.

Maintenance.—In Europe there are two methods for keeping road-surfaces in proper order: one of constant repairs in which the dust and mud are daily swept up and removed, while new material is supplied to fill ruts and depressions; and the other of partial repairs by which at stated periods additions of fresh material are made to the road-bed, while the daily work is confined to sweeping and to filling ruts by leveling off the surface. The former method is applicable to roads of light traffic, and the latter to those of heavy traffic. The high price of labor in the U. S. precludes the system of constant daily repairs, except on city streets and park roads. In addition to renewal of the road-surface, the ditches and drains are to be kept open and the refuse carted away. The cost of maintenance of a broken-stone road is usually about the same as the interest on the cost of construction.

The cost of the construction of macadam road-surfaces ranges from 50 cents to $1.60 per square yard of surface, or from $3,000 to $9,000 per mile, depending upon width of road, depth of the stone, and character of the foundation. Such roads are well adapted to streets of light traffic in towns and cities. In the article Pavements are given statistics of fifty-one cities in 1892; these same cities reported in that year 1,446 miles of macadam and telford roads. The advantage and economy of these systems for common roads are so great that they are rapidly being built in the eastern part of the U. S. In order, however, that they may be kept in the best order, very heavy loads should not be allowed to pass over them, unless on wide tires.

In 1891 a committee of the citizens of Philadelphia offered prizes for the best papers on the making and care of common roads. The prize papers were published under the auspices of the University of Pennsylvania, under the title *A Move for Better Roads*, and the adjudicators also expressed the four following recommendations in relation to the subject: (1) That in the improvement of roads the macadam system, consisting of small angular fragments, in sizes not exceeding from 2 to $2\frac{1}{2}$ inches in their longest dimension, according to quality, should be used, wherever a stone surface is both practicable and justifiable; (2) that the minimum width of the metaled surface for a single track should be $8\frac{1}{4}$ feet, of such depth as the amount of traffic and character of the subsoil may require, to be determined by the engineer in charge; (3) that the bed to receive the stone must be so prepared that it can not be saturated with water, and to accomplish this great attention should be paid to the character and drainage of the subsoil; (4) that there should be legislative enactment regulating the width of the tires of wheels, and that the minimum width for all cart, dray-wagon, or other heavy draught vehicles should be 4 inches, to be increased, when the capacity of the vehicle exceeds half a net ton per wheel, at the rate of 1 inch for each 400 lb.

References.—The literature of the subject is very extensive, particularly that in periodicals. Macadam's essays on road-making were published in London from 1820 to 1825, and then collected in a book which passed through many editions. Gillespie's *Manual of Road-making*, one of the earliest American books, was first issued in 1845, and revised in 1871. See also Gillmore's *Roads, Streets, and Pavements* (1876); Herschel and North's *Road-making and Maintenance* (1880); and Byrne's *Highway Construction* (1892). Special reports from U. S. consuls concerning the roads of Europe will be found in a volume issued by the Department of State in 1891 under the title *Streets and Highways in Foreign Countries*. A monthly magazine of a popular character, called *Good Roads*, is published in New York. An organization called the National League for Good Roads has issued literature of a useful character, and in 1893 it exhibited several short pieces of road at the Columbian Exposition at Chicago, illustrating methods of construction. See also Pavements. Mansfield Merriman.

Roanne, rō′aan′: town; in the department of Loire, France; 52 miles by rail N. W. of Lyons; on the Loire, which here becomes navigable and is crossed by a stone bridge (see map of France, ref. 6–G). It is a handsome town; has some manufactures of cotton, muslins, jewelry, and paper, and has considerable importance as an intermediate station of the traffic between Southern and Northern France. Pop. (1896) 33,912.

Roanoke: city (formerly the town of Big Lick, incorporated as a city in 1884); Roanoke co., Va.; on the Roanoke river, and the Norfolk and Western Railroad; 7 miles E. of Salem, the county-seat, 90 miles W. S. W. of Richmond (for location, see map of Virginia, ref. 6–E). It is in an agricultural and iron-mining region, at an elevation of 950 feet above sea-level, and is surrounded on all sides by mountains. The city has improved systems of water-works and sewerage, gas and electric light plants, and a street-railway system connecting it with Vinton on the E. and Salem on the W. There are 14 churches, 4 public-school buildings, public-school property valued at over $30,000, 5 large and several small hotels, 3 national banks with combined capital of $300,000, a State bank with capital of $250,000, an incorporated bank with capital of $200,000, a trust and deposit company with capital of $50,000, 3 building and loan associations, and 3 daily and 5 weekly periodicals. The assessed valuations in 1893 aggregate $10,987,741, and the net debt in 1894 was $758,500. The industrial establishments include locomotive-works, railway-car shops, iron and steel works, bridge-works, foundries and machine-shops, hydraulic-engine works, ice, canning and preserving, and paper-box factories, brick-works, and elevator-factory. Pop. (1880) Big Lick town, 669; (1890) city, 16,159; (1900) 21,495.

Roanoke College: an institution at Salem, Va.; chartered by the Legislature in the year 1853. It is governed by a self-perpetuating board of trustees. It has enrolled about 3,000 students, and a majority of its graduates (among whom have been included several Choctaw Indians) become ministers and teachers. There were 175 students in attendance

from eighteen States and Territories and four foreign countries in 1900. The college offers a four years' course, with electives. The grounds embrace about 20 acres. There are four brick buildings for college purposes. One of these is set apart for the library, which contains 22,000 volumes. An annex to this building was erected in 1894 for a reference library and reading-room. The mineralogical and geological cabinets contain about 14,000 specimens, and there is also a valuable numismatic collection. Two literary societies and a Y. M. C. A. are maintained. JULIUS D. DREHER.

Roanoke River: a stream formed by the union of the Dan and Staunton rivers at Clarkesville, Va. It flows 250 miles in an E. S. E. course into Albemarle Sound near Plymouth, N. C. It is a tidal stream to Halifax Falls, N. C., 75 miles from its mouth, and is navigable 75 miles farther to Weldon by steamboats, and throughout its course by bateaux. Its valley is picturesque and fertile.

Roaring: the noise made by some horses while drawing in the breath, especially while traveling fast. It is caused by a kind of wasting disease of the muscles of the larynx, and is incurable. Nevertheless, some of the best horses, like the great Eclipse, have been confirmed roarers. In England tracheotomy and the continued use of the tracheotomy-tube have been successfully employed for its relief.

Roasting: See COOKERY; also METALLURGY.

Roatan: See RUATAN.

Robbery [from O. Fr. *roberie*, deriv. of *rober*, rob : Ital. *rubare*, from O. H. Germ. *roubōn* > Mod. Germ. *rauben*, plunder, rob]: larceny from the person of another by violence or putting him in fear. The force or fear must precede or accompany the larceny. Hence it is not robbery to snatch from the hand of another and carry away his purse, or stealthily to take it from his pocket and then frighten him from retaking it. On the other hand, if the article taken is so attached to the person that violence is necessary to detach it, as where a watch-cord is broken in taking a watch, or where an earring is torn from the ear, or if the owner surrenders the property because put in fear by the taker, robbery is committed. The fear need not be of injury to the body of the person robbed. Fear of injury to that which he has a right to defend by force, as his child or his property, will suffice. It has been held that a threat to injure another's character in order to induce him to surrender his property is a sufficient putting in fear. Other decisions hold that the threat of injury to character must consist in charging the victim with unnatural crime. *Britt* vs. *State*, 7 Humphrey (Tenn.) 45.

The courts have given to "the person" an extended meaning in the definition of robbery. Whenever the stolen property is so in the possession or under the control of an individual that violence or putting in fear is the means used by the thief to secure it, the taking is from the person. Accordingly, a thief commits robbery when he binds the owner in one room of his house and frightens him into telling where property is to be found in another part of the building. *State* vs. *Calhoun*, 72 Iowa 432.

Robbery was a capital felony at common law. It is punishable in Great Britain by penal servitude. In many of the U. S. it has been defined by statute and divided into degrees, punishable by imprisonment for periods of varying length. See LARCENY. FRANCIS M. BURDICK.

Rob'bia, LUCA, della: sculptor; b. in Florence, Italy, about 1399; at first a goldsmith, he soon devoted himself to larger work in bronze and marble. At the age of fifteen he went to Rimini, where he sculptured some fine bas-reliefs for the tomb of the wife of Sigismund Malatesta. Being recalled to Florence by an order to do work for Santa Maria del Fiore, he executed six compositions for the campanile. At the age of seventeen he was further commissioned to design the marble ornament of one of the organs of the cathedral, having Donatello in competition with him. Luca's design was considered the finer, although neither was executed; but the bronze door of the sacristy beneath this organ was intrusted to him, for which he modeled ten figures and many lovely heads and other ornaments. After these works he gave up bronze and modeled in clay, having discovered a glaze that protected his work from atmospheric injury. The first of his decorations in this medium are in Santa Maria del Fiore, in the arch over his own bronze door, as well as over the arch of the sacristy, as also a *Resurrection* of marvelous beauty, now in the Academy of Fine Arts in Florence. Luca afterward found out how to give color to his ware. His first experiment in the colored glaze was in Or San Michele, and this reminds one of maiolica in its brilliancy. The fame of this new decorative work soon spread through Italy and over Europe, and his orders were innumerable—both for large panels for the inner decoration of churches as well as for outer walls above doorways, etc. His works abound in Tuscany. His brothers Ottaviano and Agostino, who were his pupils, helped him in the production of these works, and continued them after his death (in 1482). ANDREA DELLA ROBBIA, nephew of the famous Luca and son of his brother Mark, was born in Florence about 1436. He showed great artistic capabilities from an early age. After having shown his skill in the marble decorations of the chapel of Santa Maria delle Grazie, outside Arezzo, he devoted himself to producing colored reliefs in terra-cotta for Santa Maria delle Grazie, for the Cathedral of Arezzo, and for the loggia of the Hospital of the Innocents in Florence, besides much other work. He died in 1525.—His sons, GIOVANNI, LUCA, and GIROLAMO, also worked in their father's manner. Although the elder Luca, as the founder of the art, enjoys a special prestige among the Robbias, Andrea undoubtedly was the most talented. W. J. STILLMAN.

Robbins, CHANDLER, D. D.: clergyman; b. at Lynn, Mass., Feb. 14, 1810; graduated at Harvard 1829, and became pastor of the Second church (Unitarian) at Boston 1833, which position he long retained. He was the author of many addresses, sermons, and occasional publications: of a *History of the Second Church* (1852); of *Memoirs* of Maria E. Clapp (1858) and William Appleton (1863); and one of the editors of the *Proceedings* of the Massachusetts Historical Society, of which he was an active member. D. at Weston, Mass., Sept. 11, 1882. For biographical sketch, see Rev. O. B. Frothingham's *Boston Unitarianism* (1890).

Revised by J. W. CHADWICK.

Robert I. (King of Scotland): See BRUCE, ROBERT.

Robert II.: King of Scotland; founder of the Stuart dynasty; b. in Scotland, Mar. 2, 1316; son of Lord Walter Stewart, by Marjory, daughter of Robert Bruce; fought at the battle of Halidon Hill (1333); became joint regent with the Earl of Murray 1334, and sole regent 1338–41, during the minority and absence in France of his uncle, King David II.; was again regent with the Earl of March from the capture of the king at the battle of Nevill's Cross Oct., 1346–57; opposed a successful resistance to the project of imposing Lionel, Duke of Clarence, upon Scotland as king, and renewed his oath of fealty to David II. 1363; was imprisoned 1363–69; declared king after the death of David Feb., 1371; was crowned at Scone Mar. 26, 1371; conducted two wars with Richard II. of England, in the second of which the successful forays of Richard II. and the Duke of Lancaster into Scotland took place. These were avenged in 1388 by a successful invasion of England by two armies, one of which, commanded by James, Earl of Douglas, fought and won the celebrated battle of Otterburn (or Chevy Chase) July 21, 1388, but lost its leader. The kingdom suffered much from the border wars and from the disorders of the turbulent barons. D. at Dundonald Castle, May 13, 1390.

Revised by F. M. COLBY.

Robert III.: King of Scotland; son of Robert II. by his first wife, Elizabeth Mure of Rowallan; b. in Scotland about 1340; was first known as John Stuart, Earl of Carrick; succeeded to the throne in 1390; renewed the war with England 1399; was an imbecile ruler and left the administration in the hands of his ambitious and unscrupulous brother, Robert Stuart, Earl of Menteith, by whom the heir to the throne, David, Duke of Rothesay, was imprisoned and starved to death in Falkland Castle 1402. In 1400 occurred the invasion of Scotland by Henry IV. of England and the retaliatory expedition of the Scots resulted in their terrible defeat at Homildon Hill 1402. Robert sent his surviving son, Prince James, to France for safety against the designs of Menteith, and became the victim of incurable melancholy on learning the imprisonment of his son by the English, May, 1405. D. at Rothesay, Bute, in 1406.

Robert II., surnamed THE DEVIL: Duke of Normandy; son of Richard the Good; succeeded his brother Richard in 1028. He humiliated his vassals and kept order in his realm; conquered districts from his neighbors and regulated his frontiers; supported Count Baldwin IV. of Flanders against his sons, King Henry I. of France against his mother, and his nephews, Alfred and Edward of England, against Canute of Denmark; made Normandy the most powerful state in

France; and was the very image of mediæval energy, audaeity, unscrupulousness, and cruelty. From the height of his success he suddenly fell into melaneholy. He repaired to Rome with a magnifieent retinue; thence he went next year to Constantinople with a more modest train; and from Constantinople he journeyed on foot to Jerusalem. At the Holy Sepulchre he found consolation, but on his return died suddenly at Nicæa, July 2, 1035. His only ehild, born to him by a mistress, was William the Conqueror, who succeeded him. The text of the famous opera by Meyerbeer, *Robert le Diable*, is based on a romance of 1496, and has very little to do with history.

Robert, rō′bãr′, Louis Léopold: painter; b. in the canton of Neuchâtel, Switzerland, May 13, 1794. He studied in Paris with Charles Girardet, a Swiss painter, and partly under J. C. David, and gained a prize for engraving when twenty years of age. In 1818 he was able, with the help of a friend, to visit Italy, where he worked and studied for years, and spent much of his life thereafter. His peculiar gift as an artist was graceful composition, grouping of romantie figures in a picturesque way, and he found among the peasantry of Central Italy and the brigands who had been captured by the authorities the material which he liked. He exhibited many pietures from 1827 to 1836, many of them made popular by engraving; and his reputation was very high in France under Louis Philippe. His work is not very important in the purely artistic sense, as his color is cold and his painting not skillful, but will always be popular. D. by his own hand, in consequence of disappointment in love, at Venice, Mar. 20, 1835. At the Louvre are his pictures *Return of the Pilgrimage to the Madonna de l'Arco*, *A Roman Peasant Woman*, and the well-known *Harvesters of the Pontine Marshes*. Of other pictures, the *Neapolitan Improvisator* was exhibited in 1824 and the *Fishers of the Adriatic* in 1836, these marking the beginning and the end of his brief and brilliant career.

Russell Sturgis.

Robert College: an institution of learning at Constantinople, Turkey, projected by James H. and William B. Dwight, sons of Rev. Harrison G. O. Dwight, a veteran missionary in Turkey, and opened in 1863, under the control of Christopher R. Robert, a wealthy philanthropist of New York, who made arrangements with his friend Rev. Cyrus Hamlin, D. D., of Constantinople, to take charge of the college as its first president. Mr. Robert supported the college until his decease in 1878, when he bequeathed to it one-fifth of his estate. His total benefactions to it were about $450,000. The institution was opened in a rented building. In 1864 it was incorporated in the State of New York as one of the colleges of the University of New York. Under permission of the sultan, granted in 1869, the two main buildings were erected in 1871 and 1893 respectively, on a fine site on the Bosphorus. After fourteen years of service Dr. Hamlin resigned in 1877, and was succeeded by Rev. George Washburn, D. D. The curriculum corresponds generally to that of a New England college, though special attention is paid to the languages, no fewer than thirteen being taught. The chief language of instruction is the English. There is a preparatory course of two years, and a collegiate baccalaureate course of five years, both including instruction in the vernaculars of the students. From 1863 to 1893, inclusive, the total number of students by years was 5,149; of different students, 1,715; of graduates, 274. The college has already attained a most honorable standing, and has become of national, if not of international, importance.

William B. Dwight.

Robert-Fleury, rō′bãr′flō′ree′, Joseph Nicolas: historical and genre painter; b. at Cologne, of French parents, Aug. 8, 1797; pupil of Girodet, Baron Gros, and Horace Vernet; second-class medal, Salon, 1824, first-class 1834, and first-class Paris Expositions, 1855 and 1867; commander Legion of Honor 1867; member of the Institute 1850; director of the French Academy in Rome 1866. In 1833 he exhibited in Paris his *Massacre of St. Bartholomew*, which at once gained him a high reputation. His *Conference at Poissy in 1561* (1840), *Jane Shore* (1850), and *Sack of a Jew's House* (1855) are in the Luxembourg Gallery, Paris. Various works are in the museums at Versailles, Nantes, Montpelier, and Antwerp. D. in Paris in 1890.

William A. Coffin.

Robert-Fleury, Tony: historical, genre, and portrait painter; b. in Paris, France, Sept. 16, 1838; son of Joseph Nicolas Robert-Fleury; pupil of Paul Delaroche and Léon Cogniet; medals, Salons, 1864 and 1867; medal of honor, Salon, 1870; first-class medals, Paris Expositions, 1878 and 1889; officer Legion of Honor 1884. His *Last Day of Corinth* (1870) is in the Luxembourg Gallery, Paris. Studio in Paris.

W. A. C.

Robert Guiscard: See Guiscard, Robert.

Robert of Gloucester: a chronicler of English annals, of whose life nothing is known except that he was living at the time of the battle of Evesham (1265). His metrieal chronicle of England from the time of the fabulous Brutus to his own times was chiefly based upon Geoffrey of Monmouth's work. It extends to 10,000 lines, and is valuable as one of the earliest specimens of the English language. It was printed by Thomas Hearne (1724), and reprinted 1810.

Roberts, Benjamin Titus, A. M.: general superintendent Free Methodist Church; b. at Leon, Cattaraugus co., N. Y., in 1823; graduated at Wesleyan University in 1848; was a member of Genesee Conference, Methodist Episcopal Church, 1848–58; general superintendent of Free Methodist Church 1860–93; founder (1865) and president (1869–93) of A. M. Chesbrough Seminary, North Chili, N. Y.; published *Fishers of Men* (1878); *Why Another Sect?* (1879); *First Lessons on Money* (1886); *Ordaining Women* (1891). Founder (1860) and editor (1860–93) of *The Earnest Christian*, and editor of *The Free Methodist* 1886–90. D. Feb. 27, 1893.

Roberts, Charles G. D.: See the Appendix.

Roberts, David, R. A.: painter; b. at Stockbridge, Scotland, Oct. 24, 1796. He was educated as a decorative painter, and became a theatrical scene-painter; but was much attracted by the picturesque in architecture, and, after studying English buildings of the Middle Ages, went to France in 1824. In 1826 he exhibited his *Rouen Cathedral*, which was the beginning of his career as a painter of romantic landscape. In 1831 he was engaged in the founding of the Society of British Artists, and became its first president. In 1832 he visited Spain, and made many drawings afterward published in lithography. About 1838 he went to Palestine, and thence to Egypt; his pictures painted at this time, either in the East or after his return, and from studies made in the East, are the best of his work. In 1841 he was elected a Royal Academician. In 1851 he visited Italy, and his pictures for several years thereafter were of Italian subjects. In his old age he took the London waterside as his field of study, and painted picturesque views of the town as seen from the Thames. His work never attained any special value as landscape in the artistic sense, and lost less by rendering in lithography than most drawing or painting from nature would lose. Spirited and popular treatment of ruined buildings, Gothic cathedrals, men in unfamiliar costume, and the like, were his favorite themes. D. in London, Nov. 25, 1864. He published *Picturesque Sketches in Spain* (1837); *The Holy Land and Syria* (finished in 1849, 4 large vols.); *Italy: Classical, Historical, and Picturesque* (1859). Of his pictures, those of his middle life and strongest period are *Church of the Holy Nativity at Bethlehem*, the *Statue of Memnon at Sunrise*, the *Ruins of Philæ*, the *Gateway of the Temple at Baalbeck*. In the National Gallery in London are his *Church of St. Paul, Antwerp*, and the *Cathedral of Burgos*. Russell Sturgis.

Roberts, Ellis Henry, LL. D.: journalist; b. at Utica, N. Y., Sept. 30, 1827; learned the printing-trade: graduated at Yale College 1850; became in 1851 editor and proprietor of the Utica *Morning Herald*, an influential newspaper of Whig and subsequently of Republican principles; was a member of the presidential conventions of 1864 and 1868, of the State Legislature 1867, and of Congress 1871–75; was assistant treasurer U. S. at New York 1889–93; became treasurer of the U. S. in 1897. He published *Government Revenue* (1884) and *The Planting and Growth of the Empire State*, American Commonwealth Series (1887).

Roberts, Howard: See the Appendix.

Roberts, Robert Richford, D. D.: bishop of the Methodist Episcopal Church; b. in Frederick co., Md., Aug. 2, 1776; emigrated with his father's family in 1785 to Ligonier Valley, Western Pennsylvania, then the frontier of that State, where he was found "in the woods" by the earliest Methodist itinerants, "a stalwart youth in hunting-shirt of tow linen, buckskin breeches, and moccasin shoes." They supplied him with Methodist books, licensed him to exhort in 1800, and to preach in 1802. In the latter year he joined the Baltimore Conference, which then stretched over the Alleghanies. After itinerating in West Virginia and Penn-

sylvania, he was appointed to important churches in Baltimore, Philadelphia, etc., and in 1816 was elected bishop. He immediately returned to Western Pennsylvania and thence removed to Indiana, then the far West. He did much for Western missions, and the Indians called him "the grandfather of all the missionaries." D. in Lawrence co., Ind., Mar. 26, 1843. Revised by A. OSBORN.

Roberts, Sir WILLIAM, M. D., F. R. S.: clinician; b. in Anglesea, Wales, Mar. 18, 1830; graduated M. D. London University 1854; was physician to the Manchester Royal Infirmary 1855 to 1886, and Professor of Clinical Medicine at the Victoria University from 1876 to 1886. He practiced his profession in Manchester from 1885 to 1889, removing to London in the latter year. His more important publications are *A Practical Treatise on Urinary and Renal Diseases* (London, 1865; 4th ed. 1885); *Lectures on Dietetics and Dyspepsia* (London, 1885; 2d ed. 1886); *On the Chemistry and Therapeutics of Uric Acid, Gravel, and Gout* (London, 1892). S. T. ARMSTRONG.

Roberts, WILLIAM CHARLES, D. D., LL. D.: minister, educator, and secretary; b. at Galltmai, Cardiganshire, South Wales, Sept. 23, 1832; educated at Princeton College and Theological Seminary; was pastor of the First Presbyterian church, Wilmington, Del., 1858–61; of the First Presbyterian church, Columbus, O., 1861–64; copastor in the Second church, Elizabeth, N. J., 1864–66; pastor of the Westminster church, organized from the Second church under his leadership, 1866–80; corresponding secretary of the board of home missions 1880–86; president of Lake Forest University 1886–92; and was reappointed corresponding secretary of the board of home missions in 1892. Dr. Roberts was chairman of the committee that established Wooster University, Ohio; member of the first Pan-Presbyterian council, Edinburgh, 1877, and of the third, Belfast, 1884, where he read a paper on American colleges; moderator of the General Assembly, New York, 1889, and a member of the committee for the revision of the Confession of Faith. He is the author of a series of letters on the great preachers of Wales, the translator of the *Shorter Catechism* into Welsh, and has published occasional sermons. C. K. HOYT.

Roberts, WILLIAM HENRY, D. D., LL. D.: minister and professor; b. at Holyhead, Wales, Jan. 3, 1844; was educated at the College of the City of New York and Princeton Theological Seminary; statistical clerk in the U. S. Treasury Department 1863–65; assistant librarian of Congress 1866–72; pastor at Cranford, N. J., 1873–77; librarian of Princeton Theological Seminary 1877–86; Professor of Practical Theology in Lane Seminary 1886–93; permanent clerk of the General Assembly 1880–84. He has published *History of the Presbyterian Church in the United States of America* (1888); *Ecclesiastical Status of Theological Seminaries* (1892).

Roberts of Kandahar, FREDERICK SLEIGH ROBERTS, Earl: British general; b. in Cawnpur, India, Sept. 30, 1832; educated at Eton, Sandhurst, and Addiscombe; entered the Bengal artillery 1851; promoted through various grades to that of lieutenant-general 1883; served with great distinction in the Indian mutiny campaign, the Abyssinian campaign, and the Afghan campaigns; commander-in-chief in India 1885–93. His most noted exploit was the relief of Kandahar in the summer of 1880. He was created a baronet in 1881, and Baron Roberts of Kandahar, Jan., 1892. The soldiers nicknamed him Bobs Bahadur, the latter word meaning hero or champion. He was made field-marshal May 25, 1895, and commanded the forces in Ireland from 1895 till 1899; he was commander-in-chief in South Africa, 1899–1900. In October he was made commander-in-chief of the British army to succeed Lord Wolseley. He turned over the South African command to Lord Kitchener Nov. 30, 1900, and returned to England, arriving early in 1901, and was received with great honors and created an earl.

Robertson, FREDERICK WILLIAM: clergyman; b. in London, England, Feb. 3, 1816; abandoned the plan he had formed of entering the army; entered Brasenose College, Oxford, 1837, and graduated 1840; was settled in Winchester 1840–42, in Cheltenham 1842–47, in Oxford 1847, going that year to Brighton, where he died Aug. 15, 1853. Of his works, there have been published *Sermons preached at Trinity Chapel, Brighton* (five series, London, 1855–64); *Lectures and Addresses on Literary and Social Topics* (1858); *Expository Lectures on St. Paul's Epistles to the Corinthians* (1859); and *Notes on Genesis* (1877). His fame was posthumous, but it is permanent. His writings and biography were reprinted in the U. S. and widely read. He was one of the greatest and most inspiring of modern preachers, and has exerted great influence in liberalizing religious thought. He was, however, more a preacher than a theologian, and he left little in systematic form. He is usually, although perhaps erroneously, classed with Maurice and Stanley as a founder of the modern Broad Church party in the Church of England. See his *Life and Letters*, edited by Stopford A. Brooke (2 vols., 1865).

Robertson, GEORGE CROOM: educator and metaphysician; b. at Aberdeen, Scotland, Mar. 10, 1842; educated at Aberdeen, Berlin, and Göttingen Universities; became Assistant Professor in Greek at Aberdeen in 1864; Professor of Philosophy in University College, London, 1866–92; was editor of *Mind* 1876–91. D. in London, Sept. 21, 1892. His principal writings are *Hobbes*, in Blackwood's *Philosophical Classics* (1886), and several articles in *Encyclopædia Britannica* (9th ed.) and in the *Dictionary of National Biography*. He aided Alexander Bain in editing Grote's posthumous work on *Aristotle* (1872). See *Philosophical Remains of George Croom Robertson*, edited by Alexander Bain.

Robertson, HENRY: See the Appendix.

Robertson, JAMES: royal governor of New York; b. in Fifeshire, Scotland, about 1710; served as deputy quartermaster-general in the campaigns against Louisburg and Ticonderoga 1758–59; was appointed lieutenant-colonel of the Fifty-fifth Regiment; exchanged into the Sixteenth; was stationed at New York as barrack-master 1763–75; became notorious for his extortions and peculations; was appointed colonel 1772; went to Boston July, 1775; was appointed major-general Jan. 1, 1776; commanded a brigade in the battle of Long Island; went to England 1777; was appointed royal governor of New York 1779; took the oath of office Mar. 23, 1780; exerted himself with Gen. Greene to procure the exchange of Maj. André; became lieutenant-general Nov. 20, 1782; d. in England Mar. 4, 1788.

Robertson, JAMES, D. D.: minister and professor; b. at Alyth, Perthshire, Scotland, Mar. 2, 1840; educated at the Universities of Aberdeen and St. Andrews; missionary in Hasskeni, Constantinople, 1862–64; in Beyrout, Syria, 1864–75; minister of Mayfield church, Edinburgh, 1876–77; since 1877 Professor of Oriental Languages in the University of Glasgow. Dr. Robertson has published many articles on Eastern topics in various magazines; translated and edited *Müller's Outline of Hebrew Syntax* (Glasgow, 1882; three subsequent editions); published *Introduction to the Pentateuch* in Virtue's *New Illustrated Bible*, republished in *Book by Book* (London, 1892); *The Early Religion of Israel*, Baird lectures, 1889 (Edinburgh, 1892; three later editions); *The Old Testament and its Contents*, in *Guild and Bible Class Text-books* (Edinburgh, 1893); and *The Psalms: their Place in the History and Religion of Israel*, Croall lectures, 1894 (Edinburgh, 1895). C. K. HOYT.

Robertson, JOHN ROSS: See the Appendix.

Robertson, THOMAS WILLIAM: actor and dramatist; b. in England, Jan. 9, 1829; became an actor in a traveling company of which his father was manager; produced a play, *A Night's Adventure*, in 1851; settled in London and devoted himself to literature 1860, and wrote several very successful dramas, including *David Garrick* (1864); *Society* (1865); *Ours* (1866); *Caste* and *Play* (1868); *School* (1869); *M. P.* (1870); and *Dreams* (1869). D. in London, Feb. 3, 1871. See his *Principal Dramatic Works* (London, 1889).

Robertson, WILLIAM, D. D.: historian; b. at Borthwick, near Edinburgh, Scotland, Sept. 19, 1721; graduated at the University of Edinburgh 1741; became a minister of the Scottish Church at Gladsmuir 1743; joint minister of Greyfriars church, Edinburgh, 1759; principal of the University of Edinburgh 1762, and was appointed historiographer of Scotland 1764. D. at Grange House, near Edinburgh, June 11, 1793. Author of a *History of Scotland during the Reigns of Mary and James VI.* (2 vols., 1758–59); *History of the Reign of the Emperor Charles V.* (3 vols., 1769); a *History of America* (2 vols., 1777); and an *Historical Disquisition concerning the Knowledge which the Ancients had of India* (1791). During his lifetime and long afterward his name was ranked with those of Gibbon and Hume, and his complete *Works* have been often reprinted, but are now little read. His *Life* was written by Dugald Stewart (1801) and by Lord Brougham, who was a family connection.

Robespierre, rō'bes-pi-ār', MAXIMILIEN MARIE ISIDORE: revolutionist; b. at Arras, France, May 6, 1758. Losing his

parents at an early age, he was brought up by his maternal grandfather. He showed unusual promise, and took high rank at Arras and at the Collège Louis le Grand in Paris, where he studied with Camille Desmoulins. Admitted to the bar in 1781, he was soon advanced to the rank of criminal judge, but resigned on account of his reluctance to pronounce sentence of death. He was a devoted student of Rousseau, whose sentimentality made a great impression upon him. He drew up the *cahier* for the guild of cobblers at Arras, and was sent as a delegate of the *tiers état* to the States-General in 1789. His earnestness soon commanded attention and enabled him to exert a powerful influence, not only in the Assembly but in the Jacobin Club. Early in 1791 he urged and carried a motion to prevent any member of the present Assembly from being eligible for the next, and to prevent any deputy from taking office for the next four years. Having thus reduced the Government to mediocrity, the very course dreaded by Mirabeau, his own talent had free play. He was appointed public accuser, but on the flight of the king to Varennes he was overcome with fear and took refuge in the house of a carpenter. The club took a theatrical oath to defend his life, and finally, at the end of the Constituent Assembly, Sept. 30, 1791, responded to his hysterical appeals by carrying him home in triumph. He was the embodiment of sentimentality, his feelings impelling him alternately to peace and war. When the Girondists in the Legislative Assembly advocated war, Robespierre offered the most strenuous opposition in the Jacobin Club. His orations were pedantic and inflated in form, but they exerted not a little influence. In Apr., 1792, he resigned his office as public prosecutor, and in August we find him petitioning the Legislative Assembly for a revolutionary tribunal and a new national convention. For his success he was elected the first deputy to the new Convention, which opened Sept. 21. The Jacobins were bitterly attacked by the Girondists, but Robespierre and Danton drew together and succeeded in gaining the ascendency. The execution of the king, Jan. 29, 1793, still further strengthened the Jacobins, whose triumph became complete June 2. The Committee of Public Safety then took absolute control of affairs. Robespierre was elected member of this committee July 27. His popularity with the mob in Paris, his personal respectability, and his fluent oratory gave him great influence. Standing in the committee midway between the extreme and unscrupulous radicals on the one hand and the conservative element on the other, he strengthened his own position by pitting them against one another, and thus contributing to the general destruction that followed. The desperate intrigues of Mar. and Apr., 1794, sent Hébert, Desmoulins, and Danton, as well as their followers, to the scaffold, and left Robespierre in absolute power. He placed his friends in all the prominent Government positions, assumed complete control of the revolutionary tribunal, and ordered that the jury need not listen to a defense if it was otherwise convinced. This infamous provision, sweeping away as it did all guarantees of justice, was perhaps the most characteristic act of the Reign of Terror. The executions from this time till the fall of Robespierre averaged about thirty a day. The number of his enemies increased with his power. He surrounded himself with a body-guard, the fantastic trappings of which excited ridicule, and he set all Paris laughing at him by his method of setting up a new religion. He was to have thirty-six annual festivals, and the first of these he celebrated by walking at the head of a procession, and after a windy harangue setting fire to paper figures of Vice, Atheism, Selfishness, Annihilation, and Crime. All Paris suddenly awakened to a consciousness that they were ruled by a mountebank, as ridiculous as he was cruel. Signs of insubordination showed themselves immediately. Robespierre fought off inevitable disaster with desperation. In the Assembly he was assailed with the most violent epithets, and his voice was drowned in the tumult. He broke away from the Convention to appeal to the mob, whereupon the Convention declared him an outlaw. In the *mêlée* that ensued his jaw was broken by the shot of a gendarme, and the following day, July 28, 1794, Robespierre, with Saint-Just and twenty others, was carted to the guillotine amid the jeers of the populace.

AUTHORITIES.—Aulard, *La Société des Jacobins* (4 vols., 1891); Hamel, *Vie de Robespierre* (3 vols., 1865–67); Hamel, *Thermidor*; Lamartine, *History of the Girondists*; and the histories of the French Revolution by Thiers, Michelet, Louis Blanc, von Sybel, Stephens, Carlyle, and Taine.

C. K. ADAMS.

Robin [(shortened from *Robin-redbreast*) from O. Fr. *Robin*, dimin. of *Robert*, Robert]: the name applied in Great Britain to several well-known singing-birds of the family *Erythacinæ*, and improperly given in the U. S. to a species of thrush, the *Turdus migratorius*. There are fifteen genera of robins in Europe, Western Asia, and Northern Africa, most of them widely spread, resembling each other in their chief characteristic—the short tapering bill, curved at the extremity and partly covered with bristles. They all feed on worms, insects, and fruits, generally live on cultivated grounds, and have but slight fear of man. The best-known species is *Erythacus rubecula*, the robin-redbreast whose song is familiar to every British country household.

Robin, rō′băn′, CHARLES PHILIPPE: biologist and pathologist; b. at Josseron, department of Ain, France, June 4, 1821; graduated M. D. in Paris in 1846; devoted himself to the study of normal and pathological anatomy; in 1847 was made Associate Professor of Natural Sciences in the medical faculty; in 1858 was elected to the Academy of Medicine, and in 1866 to the Academy of Sciences; in 1862 he was appointed to the newly established chair of Histology. In 1865 he edited Nysten's *Encyclopædic Dictionary of Medicine*, for which he wrote a number of monographs. In 1864 he established the *Journal de l'anatomie et de la physiologie normales*, which he edited until 1885. In 1875 he was elected senator from Ain, and was re-elected in 1884. The progress made in France in histology is entirely due to his teaching. Among his numerous works are *Traité du microscope* (Paris, 1871); *Anatomie et physiologie cellulaire* (Paris, 1873); *Nouveau dictionnaire abrégé de médecine* (Paris, 1886). D. Oct. 6, 1885. S. T. ARMSTRONG.

Robin Goodfellow: a famous personage in English folklore; reputed to be a son of Oberon, king of the fairies, by a mortal mother; noted for his roguish tricks, his fondness for disturbing the peace of families, and his power of assuming various shapes, the "shrewd and knavish sprite" whose characteristics are fully given by Shakspeare in a well-known passage of *A Midsummer Night's Dream*. Shakspeare identifies him with the Puck or Hobgoblin, a domestic sprite who answers to the Knecht Ruprecht of Germany and the brownie of Scotch superstition. He is the "lubber fiend" of Milton's *L'Allegro*, who pinches sluttish maids, but rewards the clean-swept floor and the "cream-bowl duly set" for him, by threshing corn, grinding meal, breaking flax, etc., and sometimes leaves a silver sixpence in the good housemaid's shoe. (See Keightley's *Fairy Mythology*.) A popular volume entitled *The Mad Pranks and Merry Jests of Robin Goodfellow* appeared in 1628, and was reprinted by the Percy Society 1841. Revised by H. A. BEERS.

Robin Hood: See HOOD, ROBIN.

Robins, BENJAMIN: mathematician; b. at Bath, England, in 1707; devoted himself to mathematics, which he taught in London; invented the ballistic pendulum; made experiments on the resisting force of the air to projectiles, and studied fortification in Flanders; became engineer-in-chief to the East India Company 1749; fortified Madras, where he died of fever July 29, 1751. He prepared for the press in the name of Rev. Richard Walter, chaplain of the Centurion, the narrative of Anson's *Voyage around the World* (1748), and was author of *New Principles of Gunnery* (1742), besides other scientific writings.

Robin Snipe: See KNOT.

Robinson: city; capital of Crawford co., Ill.; on the Cleve., Cin., Chi. and St. L., and the Ind. and Ill. S. railways; 25 miles N. N. W. of Vincennes, and 44 miles S. of Paris (for location, see map of Illinois, ref. 8–G). It is in a fruit, corn, and wheat growing region, and has large wool interests, a private bank and three weekly newspapers. Pop. (1880) 1,380; (1890) 1,387; (1900) 1,683.

Robinson, BEVERLEY: soldier; b. in Virginia in 1723; was a major under Wolfe at Quebec 1759; married a daughter of Frederick Phillipse, thereby coming into possession of immense tracts of land on the Hudson; was opposed to the measures of the British ministry, but was loyal to the Government; removed into New York at the outbreak of the Revolution; recruited and commanded the Loyal American Regiment, of which he was colonel; was concerned in the negotiations preliminary to the treason of Arnold (who at that time occupied Robinson's country-seat); lost his property by confiscation; at the conclusion of the war went to New Brunswick, and then to England, and died at Thornbury in 1792.

Robinson, Charles Seymour, D. D., LL. D.: clergyman and hymnologist; b. in Bennington, Vt., Mar. 31, 1829; educated at Williams College and Union and Princeton Seminaries; pastor of Presbyterian churches—Park, in Troy, N. Y., 1855–60; First, in Brooklyn, 1860–68; American chapel in Paris 1868–70; Madison Avenue church, New York, 1870–87; Thirteenth Street 1890–92; New York Presbyterian church 1892–97. He published *Songs of the Church* (1862); *Songs of the Sanctuary* (1865); *Songs for Christian Worship* (1866); *Short Studies for Sunday-school Teachers* (1868); *Chapel Songs* (1872); *Bethel and Penuel* (1873); *Church Work* (1873); *Calvary Songs for Sunday-schools* (1875); *Psalms and Hymns* (1875); *Spiritual Songs* (1878); *Studies in the New Testament* (1880); *Spiritual Songs for Social Worship* (1881); *Spiritual Songs for Sunday-schools* (1881); *Studies of Neglected Texts* (1883); *Laudes Domini* (1884); *Sermons in Songs* (1885); *Sabbath Evening Sermons* (1886); *Simon Peter: Early Life and Times* (1887); *The Pharaohs of the Bondage and Exodus* (1887); *Studies in Mark's Gospel* (1888); *Laudes Domini for the Sunday-school* (1888); *Laudes Domini for the Prayer Meeting* (1889); *From Samuel to Solomon* (1889); *Studies in Luke's Gospel* (1889); *New Laudes Domini* (1892); *Annotations upon Popular Hymns* (1893); *Simon Peter: Later Life and Labors* (1894). D. Feb. 1, 1899.

Robinson, Christopher: See the Appendix.

Robinson, Edward, D. D., LL. D.: biblical scholar; b. at Southington, Conn., Apr. 10, 1794; graduated at Hamilton College 1816; was tutor there 1817–18; remained in Clinton, engaged in classical studies, till the autumn of 1821, when he went to Andover, Mass., to publish an edition of eleven books of the *Iliad* (the first nine, the 18th, and the 22d); was instructor in Hebrew in Andover Seminary 1823–26, under Prof. Stuart, whom he assisted in preparing the second edition (1823) of his *Hebrew Grammar*, publishing meanwhile (1825) his translation of Wahl's *Clavis Philologica Novi Testamenti*; studied in Europe, mostly at Halle and Berlin, 1826–30; in 1828 married, as his second wife, Therese Albertine Luise von Jakob, daughter of a distinguished professor at Halle (see Robinson, Therese); returned to the U. S., and was professor extraordinary at Andover 1830–33; broke down in health, and resided in Boston 1833–37; was professor in Union Theological Seminary, New York, from 1837 till his death Jan. 27, 1863. In 1838, and again in 1852, he traveled in Palestine with Rev. Eli Smith, the learned missionary. Besides the works already mentioned, he published Taylor's *Calmet* (1832); *A Dictionary of the Bible for the use of Schools and Young Persons* (1833); Buttman's *Greek Grammar* (1833; 2d ed. 1839; 3d ed. 1851); Gesenius's *Hebrew Lexicon* (1836: 5th ed. 1854); *Greek and English Lexicon of the New Testament* (1836; 2d ed. 1847); *Greek Harmony of the Gospels* (1845; 2d ed. 1851); *English Harmony of the Gospels* (1846); *Memoir of the Rev. William Robinson* (1859). In 1831 he founded *The Biblical Repository*, which he edited for four years, and in 1843 the *Bibliotheca Sacra*, for which he continued to write till 1855. His greatest work was *Biblical Researches* (1841, 3 vols.; compressed into two, and a third added 1856), for which, in 1842, he received the gold medal of the Royal Geographical Society. He also received the degree of D. D., previously (1831) conferred by Dartmouth College, from the University of Halle in 1842, and that of LL. D. from Yale College in 1844. His *Physical Geography of the Holy Land* was edited by Mrs. Robinson in 1864, and published in 1865. See *The Life, Writings, and Character of Edward Robinson*, by R. D. Hitchcock (New York, 1863).

Robinson, Sir Frederick Phillipse: soldier; son of Col. Beverley Robinson; b. on the Phillipse Manor, New York, in Sept., 1763; became an ensign in his father's Loyal American Regiment Feb., 1777; was wounded and taken prisoner at Stony Point; served in the West Indies, and with great distinction under Wellington in the Peninsular war, rising to be general; was commander-in-chief of the British forces in Canada 1812; participated in the campaign on Lake Champlain Sept., 1814; was knighted 1815; was governor of Upper Canada 1815–16; removed to the West Indies, where he commanded the forces; became full general 1841. D. at Brighton, England, Jan. 1, 1852.

Robinson, Henry Crabb: lawyer and man of letters; b. at Bury St. Edmunds, England, May 13, 1775; was articled to a lawyer at Colchester, and afterward in London; studied several years (1800–05) at Jena and other German universities, where he acquired a very thorough knowledge of modern German literature and philosophy; enjoyed the intimate friendship of Goethe, Wieland, Schiller, the Schlegels, and other eminent people; furnished data to Madame de Staël for her work on Germany; was correspondent of *The Times* in Spain at the beginning of the Peninsular war 1808–09; was engaged on his return to London as a regular writer for that journal; was called to the bar at the Middle Temple 1813; became a highly successful and prosperous lawyer on the Norfolk circuit, from which he retired with a fortune in 1828, and for the remainder of his life devoted himself to society and literary leisure, being prominently known as the intimate friend of Wordsworth, Blake, Clarkson, Flaxman, Lamb, Coleridge, Southey, and their compeers. He was one of the first members of the Athenæum Club, one of the founders of University College, London, and of the Flaxman Gallery, to which latter institution he left liberal bequests. D. in London, Feb. 5, 1867. He published little, but left a copious *Diary and Correspondence*, from which interesting selections were published in 1869. Revised by H. A. Beers.

Robinson, John: clergyman; b. in England, probably in Lincolnshire, 1575; entered Cambridge University 1592; pursued his studies in Corpus Christi College, and there became attached to Puritan doctrines; took preliminary orders in the Church of England; obtained a benefice near Great Yarmouth, Norfolk; was suspended by the bishop for nonconformity in ecclesiastical ceremonies 1602; gathered an Independent congregation at Norwich; formally separated from the Church of England 1604; resigned his fellowship at Cambridge; became assistant, and soon after sole, pastor of a Dissenting congregation (1604) gathered at Scrooby, Nottinghamshire (near the borders of Yorkshire and Lincolnshire), where the Brewsters, Bradfords, and Mortons were among his flock; suffered a persecution which led many of his congregation to emigrate with him to Amsterdam, Holland, 1608; removed to Leyden 1609; gathered there a numerous church, constantly re-enforced by arrivals from England; attended lectures at the university, of which he afterward became a member; held a public discussion with the Dutch professor Episcopius, the successor of Arminius, upon the Calvinistic doctrine of predestination, 1613; entered into the plans for colonization in New England about 1617; was active in promoting the negotiations, through Cushman, Carver, and Brewster, with the Plymouth Company of capitalists; dismissed a portion of his congregation with a memorable sermon on their embarkation for America July 22, 1620, intending to follow them the next year; but before the negotiations were completed he died at Leyden about Mar. 1, 1625. He was buried in St. Peter's church, the members of the university and the ministers of the city attending his funeral. Among his numerous controversial publications were *A Justification of Separation* (1610); *Of Religious Communion* (1614); *Apologia Justa et Necessaria* (1619); *A Defense of the Doctrine propounded by the Synod of Dort* (1624); *Essays or Observations, Divine or Moral* (1628); *A Treatise of the Lawfulness of Hearing of the Ministers in the Church of England* (1634); and *An Apology for Certain Christians no less contumeliously than commonly called Brownists or Barrowists*. His complete *Works*, with a memoir, appeared in London and Boston in 3 vols., 1851. In 1891 a bronze tablet to his memory, placed on an outer wall of St. Peter's, was dedicated by representatives of the National Council of the Congregational Churches of the U. S. Revised by G. P. Fisher.

Robinson, John Cleveland: soldier; b. at Binghamton, N. Y., Apr. 10, 1817; entered the U. S. Military Academy 1835, but without graduating began the study of law in 1838. In 1839, however, he accepted a second lieutenancy in the Fifth Infantry, and served in the war with Mexico and in Florida against the Indians. In Sept., 1861, he was appointed colonel of the First Michigan Volunteers, and in Apr., 1862, brigadier-general of volunteers, serving in command of a brigade with the Army of the Potomac in the Virginia peninsular campaign of 1862, at the second battle of Bull Run, Chantilly, and Fredericksburg. At Gettysburg and in the Richmond campaign of 1864 he commanded a division with great bravery, losing a leg on the fourth day of fighting in the latter campaign, near Spottsylvania Courthouse, while leading the advance of the army; was appointed brevet brigadier-general and major-general for gallantry. In 1866 he attained the colonelcy of the Forty-third Infantry, and in 1869 was retired from active service on the full rank of major-general. In 1872 he was elected Lieutenant-Governor of the State of New York, and in 1894

received from the Secretary of War a medal of honor for distinguished gallantry in action near Spottsylvania Courthouse. D. in Binghamton, N. Y., Feb. 18, 1897.

Robinson, Lucius, LL.D.: Governor of New York; b. at Windham, Greene co., N. Y., Nov. 4, 1810; educated at the academy at Delhi; studied law, and was admitted to the bar in 1832; appointed master in chancery in 1843, and reappointed in 1845; joined the Republican party on its formation; elected to Legislature in 1859, and appointed comptroller of the State in 1861, and again in 1863; nominated by the Democrats in 1865 to the same office, but was defeated; was a member of constitutional commission 1871–72; elected comptroller of the State on the Democratic ticket in 1875, and Governor in 1876; nominated for Governor of New York by the Democrats in 1879, but was not elected. D. at Elmira, N. Y., Mar. 23, 1891.

Robinson, Robert: preacher; b. at Swaffham, Norfolk, England, Oct., 1735; studied in the grammar school at Scarning; was apprenticed in his fifteenth year to a London hair-dresser; began preaching as a Calvinistic Methodist 1755; soon became a Baptist and formed a congregation at Cambridge, eking out his small stipend by selling grain and coals; applied himself to the study of languages; acquired a deservedly high reputation for eloquence, wit, goodness, and liberality (being the Sydney Smith of the time); made a translation of Saurin's *Sermons* (5 vols., 1775–84); published *A Plea for the Divinity of our Lord Jesus Christ* (1776), popular hymns and tracts, and left a learned *History of Baptism* (1790), posthumously published. D. in Birmingham, June 8, 1790. He was said to have become a Socinian (i. e. Unitarian) in his later years. His *Life*, by George Dyer (1796), is a valuable work.

Revised by W. H. Whitsitt.

Robinson, Therese Albertine Luise (*von Jakob*); author; daughter of Prof. Ludwig H. von Jakob; b. at Halle, Prussia, Jan. 26, 1797; translated Scott's *Old Mortality* and *Black Dwarf* into German (1822); published *Psyche*, *Original Tales* (1824), under the *nom de plume* of *Talvj* (the initials of her name), and *Servian Songs* (2 vols., 1825–26); married Prof. Edward Robinson 1828 (see Robinson, Edward); contributed largely to *The Biblical Repository*, edited by her husband; published in Germany *Characteristics of the Popular Songs of the German Nations* (1840) and a treatise *On the Authenticity of the Poems of Ossian* (1840). In 1850 appeared her chief work (in English), *An Historical View of the Languages and Literature of the Slavic Nations* (New York and London). D. in Hamburg, Apr. 13, 1869. A posthumous work appeared under the title *Fifteen Years, a Picture from the Last Century* (New York, 1870).

Robinson Crusoe: See English Literature (*Defoe*).

Robitaille, rō′bi-taal′, Theodore: senator; b. at Varennes, P. Q., Canada, Jan. 29, 1834; graduated M. D. at McGill College in 1858. He represented Bonaventure in the Canadian Assembly 1861–67; the same constituency in the Parliament of the Dominion 1867–78; and was receiver-general from Jan. 30, 1873, until Nov. 5, same year, when he resigned with the other members of the cabinet, on the Pacific Railway matter. He was Lieutenant-Governor of Quebec 1877–84, and was called to the Senate Jan. 29, 1885. N. M.

Rob Roy: the popular name of a Scotch outlaw (*Roy* or *ruidh* meaning "red" in Gaelic), whose true name was Robert MacGregor; b. in Scotland about 1660; changed his name to Campbell on the outlawry of the clan MacGregor 1693; became a partisan of the Pretender in 1715, and for many years thereafter continued to make depredations, chiefly upon the retainers of the Duke of Montrose. D. near Aberfoyle, Dec. 28, 1734. His exploits, long traditional in Scotland, formed the basis of a novel by Sir Walter Scott. See the *Lives* by Macleay (1818; new ed. 1881) and Miller (1883).

Robson, Stuart: actor; b. at Annapolis, Md., Mar. 4, 1836. He made his first appearance in Baltimore Jan. 5, 1852, in *Uncle Tom's Cabin as It Is*. In June, 1855, he played small parts at the Washington Varieties. He was afterward engaged as second low comedian at the Troy Museum. On Sept. 15, 1862, he made his first appearance in New York at Laura Keene's theater as Bob in *Old Heads and Young Hearts*. He became popular and added to his repute by his engagements at the Arch Street theater in Philadelphia. From 1868 to 1870 he played in Boston; in the season of 1873–74 he made his most pronounced metropolitan hit as Hector in *Led Astray* at the Union Square theater, New York. He did not, however, repeat his success in London, where he went with Dion Boucicault at the end of 1874. In 1877 he entered into partnership with W. H. Crane and successfully produced *Our Boarding House* at the Park theater, New York, Jan. 29, 1877. *Our Bachelors* and *Sharps and Flats* also proved successful. Robson and Crane's conspicuous success in *The Henrietta* ended after two years, Robson playing alone in the piece and making it the principal one in his repertory. B. B. Vallentine.

Robusti, rō-boos′tĕĕ, Jacopo, called **Tintoretto**: painter; b. at Venice in 1512 or 1518. He was the son of a dyer (*tintore*, hence *il tintoretto*, the young or little dyer). He is said to have been a pupil of Titian for a very short time only, and no other teacher is named, except that he had Andrea Schiavone as a fellow worker, who, however, was younger than he. He lived poor and unknown for several years, exercising his surprising natural gift for painting, studying also the art of modeling in wax and clay and arranging groups and compositions of figures so made. Among his earlier pictures are two, now in the Academy of Fine Arts at Venice, but painted for the ancient Scuola (charitable society) della Trinità; these are the *Fall of Man* and *The Death of Abel*, noble pictures. The *Abel* in particular is a beautiful piece of warm color, and in character quite different from the work of Titian or of any other Venetian. Cole, who made on the spot a wonderful wood-engraving from this picture, speaks of it as "a Venetian Rembrandt" in its depth and softness. In this and in the *Fall of Man* appears a tendency toward the unusual in composition; the main lines are strongly diagonal in one and twisted or involved in loops in the other. The one is the scene of violent action, the other of repose, but in each the unusual power of drawing the human body in movement is very visible. A very remarkable love of landscape is also evident in these pictures. All these gifts and peculiarities are marked throughout the artist's career. The *Bacchus and Ariadne* of his later life is very similar in composition to the *Fall of Man*, and something of the same thought is in the *Three Graces with Mercury*. About 1546 he seems to have undertaken the two very large pictures in Santa Maria dell' Orto, the *Last Judgment* and *Moses on Mt. Sinai*, or the *Golden Calf* as it is sometimes called, and from that time he was always busy, and generally upon large and important pictures. Strange stories are told of his eagerness to work on the largest scale, indoors or on house-fronts, at the lowest prices or for nothing. He is said to have painted a large picture during the few days allowed for making sketches in competition for the Scuola di San Rocco, and in this way to have secured the employment he desired, though at a very low rate of payment, at least at first. The largest picture in Europe is Tintoretto's *Last Judgment*, in the hall of the Greater Council in the ducal palace, given as 75 feet long." It is only at very favorable times that any clear view of this picture can be had; it is faded and smoked, and has been repainted in many places, and opinions of competent persons differ widely as to the value of what is left. Another very large painting is *The Crucifixion*, in the Scuola di San Rocco, which must be 45 feet long, as it fills all the upper wall of the Sala del Albergo. This picture is famous; it has been engraved on a large scale by Agostino Caracci, and it is called Tintoretto's masterpiece. In color and in the highest artistic qualities it is not his best work, but it shows, as well as any, some of his excellences as a designer and as an executant. Thus the event of the Crucifixion is taken before it is complete, and it is evident that the whole series of acts making up the public execution of three persons by the cross has been seen with the eye of imagination. In full harmony with this power of perception and interpretation is the artist's power of drawing the human form in vigorous action. All in the picture is movement and stir, and every figure in the enormous panoramic scene is busied in some special way, but nowhere does the skill and knowledge of the draughtsman fail him for a moment. It is evident that this is not at all the way in which the events of the New Testament history were generally represented by the great Italians; this is the modern way of proceeding, the story is told as the event might actually have taken place. Now it is probable that the very highest artistic qualities, as beauty of composition in line and mass and beauty of color, are incompatible with such vigorous narrative; but if Tintoretto's large paintings had not suffered so cruelly from fading and from candle-smoke and from repainting

we should know more than we do of what graphic art is capable. The best and best-preserved specimen of his historical or descriptive work is the *Miracle of St. Mark*, in the Academy at Venice, which is splendid and deeply satisfying in color, while full of strenuous action; and if its composition in line and mass is not altogether of the highest order, it only misses this excellence by a little. Still, for many art lovers, such smaller and more simple pictures, as the *Death of Abel*, mentioned above, or the *Bacchus and Ariadne*, or the *Pallas defending Peace and Abundance*, in the Antieollegio of the ducal palace, or even the not uncommon portraits of robed senators, are more precious than the large pictures of action.

Little is known of the details of this artist's life, for it was filled with hard work in Venice, which city he seldom left. The work in the Scuola di San Rocco was begun in 1560, and soon after this time his first paintings in the ducal palace were undertaken. After the fire which destroyed half the palace in 1577 he undertook other works there, and the San Rocco work was also continued during all those years. The great *Paradise* was painted about 1586. D. at Venice, May 31, 1594.

Of his numerous pictures the following may be mentioned: In the Scuola di San Roeco, eight large pictures on the walls of the lower hall, thirteen on the walls of the upper hall, and thirteen on the ceiling of the same, all of biblical subject except two or three, which deal with the legend of St. Roch (S. Rocco); also, in the Albergo, *The Crucifixion* and another large picture. In the ducal palaee, ten historical pictnres, besides the great *Paradise*, on the wall of the Greater Council, and, in the smaller halls of the upper story, fifteen large pictures, mostly of Venetian historical and emblematic subject with several mythological subject and two of the Bible history, besides many portraits. In the Academy of Fine Arts, besides the three already named, there are a *Crucifixion with the Three Marys*, a *Descent from the Cross*, a *Virgin and Child*, each of these having portraits of Venetian nobles introduced, an *Assumption of the Virgin and Mary*, and portraits of extraordinary value. In the Church of Madonna del Salute is *The Marriage of Cana*, a noble work. In the Madonna dell' Orto are the pictures described above and three others, of which the *Last Judgment* has been much described and commented on. In the Carmini, or Church of the Carmelite friars, is a *Presentation in the Temple*. In S. Giorgio Maggiore are the *Last Supper*, *The Israelites gathering the Manna*, and several other important pictures. Perhaps a dozen other churches in Venice have works which should be studied. Pictures of his hang in the galleries of the Uffizi and the Pitti Palace at Florence, in the British Museum, in the Old Pinakothek at Munich, in the Louvre, and in the National Gallery of London.

Little has been published about Robusti except the notices in biographical dictionaries and guide-books, probably because the interest of his career lies in his art alone. A biography by W. R. Osler in the Great Artist Series was published in 1879. See Janitschek, *Kunst und Künstler*.

RUSSELL STURGIS.

Roby, HENRY JOHN: educator; b. at Tamworth, England, Aug. 12, 1830; graduated at Cambridge 1853; became fellow of St. John's College 1854; was assistant tutor 1855–56, and reappointed 1860; was university examiner in law, classics, and moral sciences 1859–61; member of, and secretary to, the local examination syndicate 1858–59; took a prominent part in urging university reform: was assistant master of Dulwich College 1861–65; Professor of Jurisprudence at University College, London, 1866–68; was appointed by the crown secretary to the schools inquiry commission Dec., 1864, to the endowed schools commission Aug., 1869, and was a member of that body 1872–75. He was elected member of Parliament for Eccles Oct., 1890. He edited the *Report* of the school commissioners and the numerous volumes of documents thereto appended (Mar., 1868); author of an *Elementary Latin Grammar* (1862; 2d ed. 1882); and a valuable *Grammar of the Latin Language, from Plautus to Suetonius* (2 vols., 1871–74; 5th ed. 1887); *Introduction to Study of Justinian's Digest* (1884).

Revised by BENJ. IDE WHEELER.

Roca, JULIO A.: general and statesman; b. at Tucuman, Argentine Republic, July, 1843. He studied in the military school at Paraná, joined the army, and became general in 1874. He was Minister of War under President Avellaneda 1878–80, and in this capacity headed the expedition by which the Indians of Patagonia were finally reduced to subjection. He was president Oct. 12, 1880, to Oct. 12, 1886, and was again chosen in 1898. Specie payments were suspended in 1885, marking the beginning of the great Argentine crisis which soon after convulsed the financial world. H. H. S.

Rocafuerte, rō-kaă-fwār'tā, VICENTE: statesman; b. at Guayaquil, Ecuador, May 3, 1783. He was educated in France and England, where he derived republican ideas from Miranda, Bolivar, and their associates. In 1812 he was elected deputy for Guayaquil to the Spanish Cortes. After his country became a part of Colombia he held diplomatic positions in North America and Europe, and he resided several years in Mexico, where he was a prominent journalist. Returning to Guayaquil in 1833 he was elected to congress, but his liberal opinions caused him to be exiled. The same year the liberals revolted at Guayaquil and proclaimed him supreme chief, but he was defeated and captured by Flores. The latter magnanimously offered to co-operate with him in the reorganization of the republic, and under this arrangement Rocafuerte was president from 1835 to 1839. This period was the most prosperous in the history of Ecuador, and the president won universal respect. Subsequently he held various civil and diplomatic positions. He published many works on political subjects. Rocafuerte was unquestionably the greatest statesman of Ecuador. D. at Lima, Peru, May 16, 1847. HERBERT H. SMITH.

Roc'ambole [= Fr., from Germ. *rockenbolle*, rocambole, liter., rye-bulb; so called because it grows among rye]: the *Allium scorodoprasum*, a plant of the garlic family, much resembling garlic, but larger and milder. It is cultivated in European kitchen-gardens, and is a native of northern regions.

Rochambeau, rō'shăń'bō', JEAN BAPTISTE DONATIEN DE VIMEUR, Count de: marshal of France; b. at Vendôme, France, July 1, 1725; entered the army 1742; was distinguished in the campaigns of the Seven Years' war; was made lieutenant-general Mar. 1, 1780; commanded the French forces in the U. S. during the war of independence 1780–82; took a prominent part in the campaign of Yorktown 1781; became governor of Picardy 1783; was made marshal 1791; commanded the Army of the North from Mar. to June, 1792; was imprisoned during the Reign of Terror, and escaped the guillotine only through the death of Robespierre; was appointed by Napoleon, when First Consul, grand officer of the Legion of Honor (1804). D. at Thoré, May 10, 1807. His *Mémoires* were published in 1809, and translated into English in 1838.

Rocha Pitta, SEBASTIÃO, da: author; b. at Bahia, Brazil, May 3, 1660; educated at Bahia and at Coimbra, in Portugal, he married early and settled on his property, living a life of studious leisure. He wrote there some mediocre verse and a now forgotten romance. Late in life he determined to write a history of Brazil, and undertook the most extensive preparations for the task. He even went to Lisbon in search of documents. In 1728 he completed the work, calling it *Historia da America portugueza desde o seu descobrimento até o anno 1724* (Lisbon, 1730). His success was great, and brought him many honors. His last years were spent in retirement on his estates near Cachoeira, Brazil. D. Nov. 3, 1738. His book was the first real history of Brazil, and though he was often over-credulous in his use of documents, he gathered a vast mass of material for his successors. A. R. MARSH.

Rochdale: town; in Lancashire, England; on both sides of the Roch; 11 miles N. by E. of Manchester (see map of England, ref. 7–G). St. Chad's parish church (twelfth century, restored 1885) is a Perpendicular building, approached by a flight of 122 steps. The town-hall (1866–71) is a fine example of the Gothic style. Rochdale has large manufactures of woolen goods, such as baize, flannels, blankets, and kerseys, cotton goods, especially calicoes, and iron and steel ware. It is distinguished as having made the first successful attempt at CO-OPERATION (*q. v.*). It returns one member to parliament. Pop. of parliamentary borough (1891) 76,161; (1901) 83,112.

Rochefort, rōsh'fōr', or **Rochefort-sur-Mer**, -sür-mār' (anc. *Rupifortium*): town; in the department of Charente-Inférieure, France; on the right bank of the Charente, 9 miles from its mouth. It has a port and a naval arsenal, is surrounded by walls and ramparts planted with trees, and is defended by forts at the entrance into the river (see map of France, ref. 6–D). Outside is a roadstead protected by the

islands of Ré, Oleron, and Aix. Its two harbors are spacious and safe, able to accommodate the largest ships of war, and lined with wharves, docks, arsenals, ropewalks, cannon-foundries, etc. It has a large naval hospital and schools of navigation. It was founded as a naval station by Colbert in 1665, and fortified by Vauban. Pop. (1896) 34,392.

Rochefort, Victor Henri, Marquis de Rochefort-Luçay: journalist; b. in Paris, France, Jan. 30, 1830; educated at the college of St. Louis; became one of the editors of *Figaro*, and was removed from that position because of his satires on the imperial Government. In June, 1868, he founded *La Lanterne*, in which he so bitterly attacked the empire that in August of the same year the journal was suppressed and its editor condemned to one year's imprisonment and a fine of 10,000 francs. He fled to Belgium, and there resumed the publication of *La Lanterne*, which was circulated surreptitiously in France. In 1869 he was elected a member of the Corps Législatif. Later in the same year he founded a radical journal, *La Marseillaise*, and in Jan., 1870, was sentenced to six months' imprisonment and fined 3,000 francs for violent language. He remained in prison until the fall of the empire at Sedan, Sept. 4, 1870. In that month he became a member of the government of national defense and member of the committee on barricades. In 1871 he founded another journal, *Le Mot d'Ordre*, and was chosen a member of the National Assembly, from which he resigned after voting against the proposed basis of peace. He declined to be a member of the Commune, but violently opposed the Government. On the entrance of the national troops into Paris he fled toward Belgium, but was arrested, tried for complicity in the acts of the Commune, sentenced to imprisonment for life in a fortress, and sent to the penal settlement of New Caledonia, whence he and several of his associates escaped in the spring of 1874, and returned to Europe by way of the U. S. He resided at Geneva until the amnesty of July 11, 1880, allowed him to return to Paris, where he founded a new radical paper, *L'Intransigeant*. He was elected to the Chamber in 1885, but resigned a few months later, and devoted himself to his paper, which became notorious for the virulence of its language in attacks on the leading politicians of the time. He was an ardent champion of Boulangism in 1888, and was condemned by the high court of justice in the following year, but he escaped imprisonment by fleeing to London. Profiting by an amnesty in 1895 he returned to Paris. In his long and turbulent career he has been involved in many lawsuits and duels. He is the author of a number of farces, vaudevilles, comic romances, etc. Revised by F. M. Colby.

Rochefoucauld: See La Rochefoucauld.

Rochefoucauld-Liancourt, Duc de la: See La Rochefoucauld-Liancourt.

Rochejacquelein: See La Rochejacquelein.

Rochelle: city; Ogle co., Ill.; on the Burl. Route and the Chi. and N. W. railways; 27 miles S. of Rockford, 75 miles W. of Chicago (for location, see map of Illinois, ref. 2–E). It is the geographical and trade center of a large agricultural and stock-raising region, and contains a national bank with a capital of $50,000, a private bank, and two weekly newspapers. Pop. (1890) 1,789; (1900) 2,073.

Rochelle Salt (named from La Rochelle in France, where it was first prepared in 1672): the double tartrate of sodium and potassium, an efficient cathartic, considered more palatable than most preparations of the kind. It is chiefly used in preparing seidlitz powders.

Rochester: city; in Kent, England; on the Medway; 29 miles E. S. E. of London (see map of England, ref. 12–K). It is continuous with Chatham, and connected with Strood by an iron swing-bridge. Near the bridge is a castle founded in 1126; the wall overlooking the river is a fine specimen of Norman architecture of an earlier date. The bishopric was founded in 604, and the foundations of the cathedral then built have been brought to light. Another cathedral was built about 1100. This has been rebuilt and restored several times. Features of interest are the Early English choir and the Norman nave. Rochester has some trade in coal and hops. Pop. (1891) 26,170.

Rochester: town; capital of Fulton co., Ind.; on the outlet of Lake Manitou, and the Erie and the Lake Erie and West. railways; 24 miles N. by E. of Logansport, 90 miles N. of Indianapolis (for location, see map of Indiana, ref. 3–E). It has large water-power from the lake, and contains several flour and grist mills and other manufactories, a State bank with capital of $50,000, 2 private banks, a high school, and a daily and 3 weekly newspapers. It ships large quantities of flour, grain, and produce. Pop. (1890) 2,467; (1900) 3,421. Editor of "Republican."

Rochester: city; capital of Olmsted co., Minn.; on the Zumbro river, and the Chicago and N. W. Railway; 40 miles S. of Red Wing, 90 miles S. by E. of St. Paul (for location, see map of Minnesota, ref. 11–G). It is the center of a great grain-growing region, and has large dairying and horse-breeding interests. Excellent water-power is derived from the river and utilized in manufacturing. There are several flour and grist mills, elevators, foundries, and machine-shops, a high school, the Second Minnesota Hospital for the Insane, 4 libraries (the Public, High School, Insane Hospital, and German) containing over 7,000 volumes, the Notre Dame de Lourdes Academy (Roman Catholic, opened 1877), 3 national banks with combined capital of $200,000, and a monthly, 3 daily, and 5 weekly periodicals. Pop. (1880) 5,103; (1890) 5,321; (1900) 6,843.

Rochester: city (settled in 1728, incorporated as a township in 1737, chartered as a city in 1891); Strafford co., N. H.; on Salmon Falls, the Cocheco river, and the Boston and Maine Railway; 10 miles N. N. W. of Dover, and 30 miles E. by N. of Concord (for location, see map of New Hampshire, ref. 8–G). It has exceptional water-power, manufactories of shoes and woolen goods, 6 churches, a national bank with capital of $100,000, 2 savings-banks, a library (founded in 1792), and 3 weekly newspapers. Pop. (1890) 7,396; (1900) 8,466. Editor of "Courier."

Rochester: city, port of entry, and capital of Monroe co., N. Y.; 229 miles W. of Albany; lat. 43° 9′ 22″ N., lon. 77° 36′ 51″ W. (for location, see map of New York, ref. 4–D). The site is upon a level plain on both banks of the Genesee river, 7 miles from, 263 feet above, Lake Ontario, and 510 feet above sea-level. Within the city limits there are three falls of 96 feet, 26 feet, and 83 feet respectively, below the last of which the stream becomes navigable for lake vessels. From the upper fall, near the center of the city, N. nearly to the lake, the river banks are of precipitous rock, varying in height from 100 to 210 feet. The fine bridges spanning this gorge afford a view that is especially attractive to visitors. On the banks of the river, both to the N. and S., beautiful parks, embracing 615 acres, have been laid out, and the lake shore, where there are numerous and attractive summer resorts, is accessible by spacious boulevards and by both steam and electric cars on either side of the river. The main line of the New York Central and Hudson River Railroad crosses the city at the upper fall upon elevated tracks, and there are three branches of the road entering here—one to Syracuse viâ Auburn, one to Niagara Falls, and one to the mouth of the Genesee. Other railways having termini here are the Rochester Division of the Erie, the Northern Central, running to Baltimore, the Buffalo, Rochester and Pittsburg, the Western N. Y. and Penn., the Lehigh Valley, the Rome, Watertown and Ogdensburg, the West Shore, and a belt line connecting all the other lines with one another and with the port of Genesee. The Erie Canal crosses the river by a fine stone aqueduct, 848 feet long, on seven arches. The city has an average length of 5 miles, by about the same breadth. It is laid out in broad streets, generally well paved and lighted, and abounding in fine shade trees. The dwellings are, to a much greater degree than is usual in cities of its size, detached and surrounded by lawns and shrubbery. The business portion contains an unusually large number of fine buildings.

Public Buildings.—The court-house, city-hall, and adjacent buildings form a striking architectural group in the center of the city. Other notable edifices are the Government building and the State arsenal, with the Soldiers' Monument in front of it. The Lyceum theater, the Genesee Valley Club-house and the Eureka Club-house compare favorably with similar structures in other cities. The Y. M. C. A. has a fine building, and there are 118 churches, of which several have new and very attractive houses of worship. The Presbyterians report 7,940 communicants; the Lutherans, 7,990; the Baptists, 4,945; the Episcopalians, 3,667; the Methodists, 4,150. Rochester is a cathedral city and the Catholics are numerically very strong.

Schools and Colleges.—In the matter of education Rochester has for many years been prominent. The university (see Rochester, University of) has taken high rank among the colleges of the U. S. There is also a flourishing Baptist Theological Seminary that maintains a German as well as

an English department; Wagner College, supported by the Lutherans; and St. Bernard's Seminary, designed to educate candidates for the Catholic priesthood. The Western New York Institute for Deaf Mutes has achieved a world-wide reputation by its improved methods of instruction; and the Mechanics' Institute, with a fine new building, is placing technical instruction and familiarity with the homelier arts of life within reach of the masses. There is a young but vigorous Historical Society, and an Academy of Science. There are 38 public schools, 5 schools connected with orphan asylums but supported and supervised by the city, and a High School, in all of which 24,765 pupils are instructed by 698 teachers, at an expense of $26.77 per annum for each pupil. It is estimated that 8,000 pupils attend the parochial and other private schools. In the High School building there is a public library of 35,000 volumes; in the court-house there is a valuable law library of 25,000 volumes; the Reynolds Free Library contains 45,000 volumes, and is especially complete in books of reference; the library of the university contains 37,000 volumes, and that of the Theological Seminary 30,000 volumes.

Public Institutions.—There are four hospitals (City, St. Mary's, Homœopathic, and Hahnemannian) with spacious buildings, capable of providing for 700 patients. The State Industrial School is situated in the northern part of the city, and occupies an inclosure of 42 acres, on which there are nine large buildings. Juvenile offenders are received from all parts of the State except New York and Kings County, and the school numbers about 650 boys and 150 girls. The Monroe County penitentiary, almshouse, and asylum for the insane are situated just S. of the city. Mt. Hope Cemetery, one of the oldest of its kind in the U. S., was established 1838, has a naturally beautiful site, and has been laid out with much care and taste. The Catholic Cemetery of the Holy Sepulchre, established 1872, is located on a fine site of 140 acres upon the river bank N. of the city; and near this is the new and beautiful Riverside Cemetery. A gas and electric company, with a capital of $4,300,000 and 200 miles of mains, supplies the city with light. The Rochester Street-railway Company, with a capital of $5,000,000, maintains 12 lines of electric cars, with a trackage of 86 miles. A magnificent system of water-works was constructed in 1874, with two sources of supply—one from the river, the water being forced through 10 miles of mains in the business center by the Holly patent, and used for suppressing fires and running light machinery; the other from Hemlock Lake, 29 miles S. and 400 feet above the city. The water from this source is distributed through 273 miles of mains, which can furnish 23,000,000 gal. daily. The total cost of the system was $7,000,000.

Business Interests.—There are in Rochester 7 banks of discount, with a capital and surplus of $2,830,000 and deposits of over $13,000,000; 4 savings-banks and 4 trust companies, with deposits of over $50,000,000 and a surplus of over $5,500,000. Owing to the surpassing fertility of the Genesee valley and its fine water-power, flour was formerly the chief product of Rochester. There are still 16 flouring-mills in operation, with an aggregate capacity of 5,000 barrels a day. The nursery business has, however, become of far more importance, and in this line Rochester outranks every other city. In the manufacture of clothing Rochester ranks third among the cities of the U. S., with an annual output of $10,000,000. In the manufacture of shoes it ranks fourth. Several large breweries send out 538,000 barrels of beer per annum. A single tobacco-factory employs 450 hands, and the value of the city's output in that line of business is $4,500,000. The largest carriage-factory in the U. S., employing 800 hands, is situated here; also, the largest button-factory, and the largest manufactory of optical instruments. The kodak camera business originated here, and there is $5,000,000 invested in it. Several large establishments are engaged in the manufacture of perfumery. Rochester locks, microscopes, and vacuum oil-products have a worldwide celebrity, and contribute much to the prosperity of the city. According to the U. S. census of 1890 Rochester had 1,892 manufactories, employing 37,720 persons, and yielding products valued at $65,091,156. From its proximity to the coalfields of Pennsylvania, it has become a great distributing center for coal, which is loaded from railways on the banks of the river into vessels that convey it to all points on the lakes. In 1900 Rochester ranked sixth in exports and fourth in imports of the lake ports of the U. S.

History, etc.—The first house was erected in 1812, and the place was incorporated as the village of Rochesterville in 1817 and as a city in 1834. From the first there has been a steady growth in wealth and population, which lately, through the influence of an energetic chamber of commerce, have increased with phenomenal rapidity. The assessed valuation is $127,935,545. From the "Rochester rappings" (1848–49) the city may be regarded as the birthplace of modern Spiritualism; it was also the center of the anti-Masonic excitement (1827–29). Pop. (1820) 1,500; (1880) 89,366; (1890) 133,896; (1900) 162,608. J. H. Gilmore.

Rochester: borough; Beaver co., Pa.; at the confluence of the Ohio and Beaver rivers, and on the Pitts., Ft. Wayne and Chi. and the Cleve. and Pitts. railways; 26 miles N. W. of Pittsburg (for location, see map of Pennsylvania, ref. 4–A). It is in a fire-clay, coal, oil, and building-stone region, and is connected by electric street-railway with New Brighton, Beaver, and Beaver Falls, and by a bridge across the Beaver river with Bridgewater. There are 11 churches, 2 graded public schools, 2 hotels, 22 societies and lodges, Masonic temple, a national bank with capital of $50,000, a private bank, and a weekly newspaper. The manufactures include tumblers, bottles, stoves, brick, flour, and lumber. Pop. (1800) 2,552; (1890) 3,649; (1900) 4,688.

Rochester, John Wilmot, Earl of: b. at Ditchley, Oxfordshire, England, Apr. 10, 1648; succeeded to the title 1659. He became a favorite at the court of Charles II.; wrote poems in accordance with the prevailing taste; was famous for his wit and infamous for his vices. He had Dryden beaten by a gang of hired bullies in 1679 in revenge for a passage lampooning Rochester in Dryden's alleged *Essay on Satire*. His death-bed repentance was described by Bishop Burnet in a pamphlet which had an extraordinary sale. D. July 26, 1680. His *Poems* and *Familiar Letters* were posthumously published. See his *Life*, by Dr. Johnson. Revised by H. A. Beers.

Rochester, University of: a college established at Rochester, N. Y., in 1850. At that time the whole of Western New York was without any important institution of this kind. The founders were principally Baptists, although the charter contains no denominational restriction. The university has had three presidents, Martin B. Anderson, who served from 1853 to 1888; David J. Hill, elected in 1888; and Rush Rhees, 1900. Among the local benefactors have been Hiram Sibley, who gave $100,000 for the erection of Sibley Hall, a fire-proof building containing the library and museum; Mortimer F. Reynolds, who built a chemical laboratory; and Don Alonzo Watson, who established a professorship in history and political science with an endowment of $50,000. The original campus, afterward enlarged to 24 acres, was the gift of the Hon. Azariah Boody. The assets of the university in 1899 were $1,193,812, of which $724,301 was invested in productive funds yielding an annual income of $33,368, and the remainder, $469,511, in buildings, books, and appliances. In 1900 the faculty was composed of 18 professors and instructors, and the students numbered 230. There are four courses of study leading to a degree, embracing 100 courses of instruction. The library contains nearly 36,000 bound volumes, and several thousand pamphlets. The reputation of the institution has rested chiefly upon the character of its work as a classical college, but within recent years the natural sciences have occupied a larger place in the curriculum. Since Sept. 8, 1900, women have been admitted to all courses on the same terms as men. The geological museum is one of the finest in the U. S., being the original Ward collection amplified.

Rochet, rō'shā', Louis: sculptor; b. in Paris, Aug. 24, 1813; studied under Pierre Jean David, called David d'Angers, and began to exhibit in 1835, his first statue being a *Boy Extracting a Thorn from his Foot*. Among his most prominent works are the *Statue of Marshal Drouet*, at the Versailles Museum; *William the Conqueror*, a statue at Falaise in Normandy; a life-size statue of *Napoleon*, and another, *Napoleon as a Scholar at Brienne* (1853); *Madame de Sévigné*, at Grignan (1857); a colossal equestrian statue of Pedro I., at Rio de Janeiro (1861); and a similar statue of Charlemagne (1867). D. in Paris, Jan 21, 1878.

Rockall Islet: See the Appendix.

Rock-butter: See Butter.

Rock-crystal: See Quartz.

Rocker: an instrument used in mezzotint engraving. See Engraving (*Mezzotint*).

Rocket: See Dyers' Weed.

Rocket [from O. Ital. *rochetta*, rocket, dimin. of *rocca*, distaff]: a projectile known from remote antiquity in China and India, but first introduced into Europe about A. D. 900. Its distinguishing characteristic is that it is set in motion by a force within itself, and therefore combines the functions of gun and projectile. Rockets were employed at first chiefly in fireworks for popular amusement; were subsequently utilized in war for igniting an enemy's citadel; and were also used for signals. About the beginning of the nineteenth century Sir William Congreve gave them greater precision, and prepared them for extended military employment as weapons of offense. Their chief use, however, remains that of pyrotechnic display.

Rock Falls: city; Whiteside co., Ill.; on the Rock river, and the Chi., Burl. and Quincy Railroad; 20 miles W. by N. of Amboy, 77 miles W. of Aurora (for location, see map of Illinois, ref. 2–D). It has good water-power, contains a public high school, a private bank, and a weekly newspaper, and is principally engaged in the manufacture of agricultural implements, barbed wire, wagons, furniture, flour, and paper. Pop. (1880) 894; (1890) 1,900; (1900) 2,176.

Rockfish, or **Rock**: a name under which the *Roccus lineatus* (striped bass) is known along the Atlantic seaboard of the U. S. from Southern New Jersey southward to Virginia. See Bass and Fisheries.

Rockford: city (settled in 1836, incorporated as a city in 1852, enlarged by annexations in 1890); capital of Winnebago co., Ill.; on both sides of the Rock river, and the Burlington Route, the Chi. and N. W., the Chi., Mil. and St. P., and the Ill. Cent. railways; 28 miles E. of Freeport, and 92 miles W. of Chicago (for location, see map of Illinois, ref. 1–E). A dam across the river creates excellent water-power for manufacturing, and 3 railway and 3 highway bridges facilitate communication. Water for domestic and fire-extinguishing purposes is provided by a system which utilizes five artesian wells, and has a reserve main from the river. The city contains 28 churches, 14 public-school buildings, high school, Rockford Seminary (non-sectarian, chartered in 1847), business college, public library containing over 20,000 volumes, city hospital, 6 national banks with combined capital of $725,000, a State bank with capital of $125,000, and 4 daily, 9 weekly, and 2 monthly periodicals. The census of 1890 showed 246 manufacturing establishments with a combined capital of $7,715,069, employing 5,223 persons, paying $2,474,703 for wages and $4,248,001 for materials, with products valued at $8,888,904. The principal industry is the manufacture of agricultural implements, 10 establishments with a combined capital of $1,456,798, and products valued at $776,862. In 1893 the city had an assessed valuation of $6,531,265, and in 1894 a bonded debt of $309,600. Pop. (1880) 13,129; (1890) 23,584; after annexations, estimated, 27,000; (1900) 31,051.

Rockhampton: town of County Livingstone, Queensland, Australia; second in size in the colony; 320 miles N. W. of Brisbane; on the right bank of the Fitzroy river and at the head of navigation, 45 miles from its mouth; terminus of a railway passing W. to the interior plains (see map of Australia, ref. 4–I). It is separated by mountains from the sea and has a hot climate. It is bare and unattractive in appearance, but it is the chief center for the wool industry in the colony. Large vessels discharge and load at Port Alma, at the mouth of the Fitzroy, but small craft ascend to the town. Important gold mines are worked in the vicinity, and that of Mt. Morgan, 25 miles S. S. E., is considered the richest in Australia. Pop. (1891) 11,629. M. W. H.

Rock Hill: town; York co., S. C.; on the Charleston, Cin. and Chi. and the Southern railways; 19 miles N. N. E. of Chester, 26 miles S. S. W. of Charlotte, N. C. (for location, see map of South Carolina, ref. 4–D). It is in an agricultural and cotton-growing region, and has a national bank with capital of $75,000, a State bank with capital of $50,000, and a semi-weekly newspaper. Pop. (1880) 809; (1890) 2,744; (1900) 5,485.

Rockingham, Charles Watson Wentworth, Marquis of: statesman; b. in England, May 13, 1730; was educated at Eton; became Earl of Malton in the peerage of Ireland 1750, and succeeded to the marquisate in December of the same year; became Premier in 1765, acquiring popularity in the American colonies on account of the repeal of the Stamp Act Mar., 1776; retired from office July 12, 1766, and again became Premier on the resignation of Lord North Mar. 22, 1782. D. at Wimbledon, Surrey, July 1, 1782.

Rock Island: city; capital of Rock Island co., Ill.; on the Mississippi river, and the Burlington Route, the Chi., Mil. and St. P., the Chi., Rock Is. and Pac., and the Rock Is. and Peoria railways; 91 miles N. W. of Peoria, 182 miles W. by S. of Chicago (for location, see map of Illinois, ref. 3–C). The city derives its name from an island in the river, about 3 miles long, based on limestone, belonging to the U. S. Government, and the site of its central arsenal and armory. The river on the west side of the island is navigable and on the east side was dammed by the U. S. Government, giving the city, the island, Milan, and Moline great water-power for manufacturing. A combined railway and highway bridge, built by the U. S. Government and the Chi., Rock Is. and Pac. Railway Company at a cost of over $1,000,000, connects the island with the city of Rock Island and with Davenport, Ia., and another bridge connects the island with Moline. The city is lighted by electricity; is supplied with water for domestic and fire purposes from the river by the Holly system, completed in 1871 and rebuilt in 1881; and has electric street-railways, 15 churches, 8 public-school buildings, public library containing over 10,500 volumes, 2 national banks with combined capital of $200,000, a State bank with capital of $100,000, a private bank, and 2 daily, a semi-weekly, 5 weekly, and 3 monthly periodicals. The railway and river shipping facilities give the city large commercial importance, and the excellent water-power has greatly promoted manufacturing. The industrial establishments include flour and lumber mills, sash, door, and blind factories, glass, stove, and agricultural-implement works, carriage and wagon factories, etc. Rock Island contains Augustana College and Theological Seminary (*q. v.*). The island was the site of a series of block-houses, known as Fort Armstrong, prior to and during the Black Hawk war of 1832, and was the place of confinement of many Confederate prisoners in the civil war. Pop. of city (1880) 11,659; (1890) 13,634; (1900) 19,493.

Rockland: city (incorporated in 1848, chartered as a city in 1854); capital of Knox co., Me.; on the west shore of Penobscot Bay, 10 miles from the ocean, and on the Maine Cent. Railroad; 40 miles E. S. E. of Augusta, 49 miles E. N. E. of Bath (see map of Maine, ref. 9–D). It has a water front of nearly 5 miles and an excellent harbor protected by a granite breakwater; is a stopping-point of the Bangor and Boston steamboats, and has a large trade in granite and lime. The city contains gas, electric-light, water, and sewerage plants, a U. S. Government building which cost $175,000, a county court-house (cost $80,000), a public library, 10 churches, 12 public-school buildings, 3 national banks with combined capital of $355,000, a savings-bank with capital of $100,000, a loan and trust company, and 3 weekly papers. The principal industries are granite-quarrying, lime-burning, ship-building, and the manufacture of clothing. The post-offices in New York and Cincinnati and the U. S. custom-house in St. Louis were built of granite from the county quarries. Pop. (1880) 7,599; (1890) 8,174; (1900) 8,150. Editor of "Courier-Gazette."

Rockland: town; Plymouth co., Mass.; on the N. Y., N. H. and Hart. Railroad; 19 miles S. of Boston (for location, see map of Massachusetts, ref. 4–J). It is noted for its extensive boot and shoe and tack factories, and has a national bank with capital of $50,000, a savings-bank, a public library, and two weekly newspapers. Pop. (1880) 4,553; (1890) 5,213; (1900) 5,327.

Rockport: city; capital of Spencer co., Ind.; on the Ohio river, and the Louisv., Evansv. and St. Louis Consolidated Railroad; 17 miles S. of Lincoln, 106 miles S. W. of Louisville, Ky. (for location, see map of Indiana, ref. 12–C). It is built on a hill 100 feet above high water, is in a tobacco, grain, fruit, and hard-wood region, and is a popular summer resort. There are water-works, electric lights, 2 State banks with combined capital of $70,000, the Ohio Township Library (founded in 1855), 2 weekly newspapers, geometrical block factory, foundry, machine-shops, flour, grist, and planing mills, tobacco-stemmeries, brick-yards, creamery, wagon and carriage shops, and chain, furniture, vinegar, stirrup, hoop, and basket factories. Pop. (1880) 2,382; (1890) 2,314; (1900) 2,882.

R. W. May, editor of "Democrat."

Rockport: town; Essex co., Mass.; on the Atlantic Ocean, and the Boston and Maine Railroad; 32 miles N. E. of Boston (for location, see map of Massachusetts, ref. 1–I). It is in an agricultural region, has extensive quarries of granite, and its northeast part, at the extremity of Cape

Ann, known as Pigeon Cove, is a popular summer resort. The town has a public high school, public library, national bank (capital $100,000), a savings-bank, a weekly newspaper, and manufactories of cotton goods, isinglass, shoes, and organs. The Boston post-office was built of Rockport granite. Pop. (1880) 3,912; (1890) 4,087; (1900) 4,592.

Rockport: town; capital of Aransas co., Tex.: on Live Oak Point peninsula in Aransas Bay, Gulf of Mexico, and on the San Ant. and Aran. Pass Railway; 10 miles N. E. of Aransas Pass (for location, see map of Texas, ref. 7–I). It is in an agricultural, fruit-growing, and stock-raising region; has considerable oyster, fish, and turtle interests, exports large quantities of cattle and hides, and is a popular summer and winter health resort. There are several large hotels, a national bank with capital of $60,000, and two weekly newspapers. The vicinity abounds in wild game of many varieties. Pop. (1880) not separately returned; (1890) 1,069; (1900) 1,153.

Rock Rapids: town (founded in 1872); capital of Lyon co., Ia.; on the Rock river, and the Chi., St. P., Minn. and Omaha, the Burl., Cedar Rap. and N., and the Ill. Cent. railways; 22 miles W. of Sibley, 60 miles N. of Sioux City (for location, see map of Iowa, ref. 2–C). It is in an agricultural and stock-raising region, has good water-power for manufacturing, and contains 5 churches, several graded public schools, a national bank with capital of $50,000, a private bank, and 2 weekly newspapers. Pop. (1890) 1,394; (1900) 1,766. EDITOR OF "REVIEW."

Rock-roses: See CISTUS.

Rocks [M. Eng. *rokke*, prob. blending O. Fr. *roke* (> Fr. *roche*, rock) and O. Eng. **rocc* in *stōn-rocc*, stone-rock]: natural masses of solid mineral matter. The term is used in various ways. Popularly and in general literature a rock is characterized as hard and unyielding, and is placed in antithesis to sand, clay, or mud, and in almost all instances where it is used in a figurative sense this is the prominent idea. Modern geological usage extends the term so as to embrace any natural mass of solid mineral matter, whether compact or incoherent. Thus granite, limestone, sandstone, chalk, and deposits of sand, clay, and soil are all considered under the general head of rocks. A third usage arises from the closer discriminations of petrography, which has in effect defined a rock as any natural mass of solid mineral matter that possesses nearly uniform structure, texture, and composition. Thus masses which may have like composition but different structure and texture are called different rocks, viz., granite, gneiss, porphyry, rhyolite, etc.; and rocks with similar textures but with different compositions are different rocks, as granite, diorite, gabbro. A fourth usage springs from the petrological idea of the individuality of a rock-mass as a geological body which has been brought into place by one act, as a continuous lava-stream, or which is the result of the continued action of any set of forces upon a given kind of material, as a continuous bed of sand and gravel. One rock-body may consist of several kinds of rocks, as a stratum whose basal portion is conglomerate and upper portion sandstone; a lava-stream which is partly rhyolite, obsidian, and pumice. The language has not yet discriminated between these ideas, hence the uses of the term rocks are confusing.

Formation of Rocks.—Conclusions regarding the formation of rocks are partly a matter of observation, partly a matter of inference. 1. Lavas flow out from craters and crevices in the earth in a highly liquid condition and, upon cooling, solidify into rocks. Similar material is thrown into the air in dust-like particles and larger fragments, and accumulates upon the surface in more or less compacted masses, as tuffs, breccias, etc.; or the lavas may remain within fissures and openings in the earth's crust where their solidification can not be observed. Similarity in composition and analogies in texture and in mineralogical characteristics between surface lavas and intratellural rock-bodies, as well as their disposition toward surrounding rocks, permit logical inferences to be drawn regarding the original nature of intratellural bodies as molten lavas or magmas. All such rocks are classed as *igneous* or *eruptive*. 2. Sand, silt, and soil are washed down slopes by water and carried along by streams, or as sand and dust are blown about by winds to be deposited when the force of the current lessens. They accumulate in layers or beds, horizontal or inclined, and by drying or cementation may become more or less coherent masses. Mineral springs deposit layers of calcium-carbonate, silica, etc., sometimes acquiring great thickness. These observed processes result in the formation of rocks similar in composition, texture, and structure to others whose formation may be inferred to have been occasioned by similar agencies. All such deposits are known as *sedimentary* rocks. 3. Alterations in rocks of the two first categories may affect their composition, texture, or structure. Changes that cause the rock to disintegrate are classed as weathering or decomposition. Changes that convert it into a mass still possessing great durability are classed as metamorphism. Such metamorphism may be occasioned by heat, by solutions, or by dynamic forces, and the results may be recrystallization, the production of new minerals, fracturing, and rearrangement of the fragments. All rocks resulting from the metamorphism of igneous or sedimentary rocks, and those resembling them whose original nature may not be determinable, are called *metamorphic* rocks. See METAMORPHISM.

IGNEOUS or eruptive rocks which solidified on or near the surface of the earth are called *volcanic*, if considerably below the surface *plutonic* or *abyssal*. If lavas reached the surface they are *extrusive* or *surface lavas*, if not they are *intrusive*. The latter often metamorphose adjacent rocks by heating or by impregnation with hot solutions and vapors, and in turn often exhibit modifications in structure, texture, and composition resulting from cooling produced by surrounding rocks. Intrusive igneous rocks form dikes, sheets, laccolites, batholites, stocks, or necks. Extrusive rocks form lava streams and sheets, domes, breccias, agglomerates, and tuffs. The last may be stratified and bedded, and if deposited in water are not distinct from sedimentary rocks.

Chemical and Physical Characters.—All igneous rocks consist of oxygen, silicon, aluminium, with sodium and potassium, or calcium, magnesium, and iron in variable proportions. Usually all eight are present. Besides these elements are small amounts of titanium, phosphorus, hydrogen, and often traces of manganese, nickel, cobalt, lithium, barium, strontium, chlorine, sulphur. These are usually expressed in analyses as oxides, but are mostly combined in silicate minerals, together with some that are oxides. The molten magmas must be considered as solutions of compounds of these elements at high temperatures, their exact molecular character being unknown. Those with more than 65 per cent. silica are called acid magmas; those between 65 and 55 per cent. silica, intermediate; and those with less than 55 per cent. silica, basic. The extreme limits are about 80 and 35 per cent. silica. Molten magmas are often very liquid at the time of eruption, especially those with less than 60 per cent. silica. The more siliceous ones are more viscous at like temperatures. As the temperature falls the magmas become more viscous, and crystallization usually sets in. If cooling is very sudden, the magma forms an amorphous mass (glass) without crystals. With slower cooling crystals form more or less perfectly, their shape and chemical composition depending upon the physical as well as the chemical condition of the magma, molecular shifting and arrangement being more easily accomplished in more liquid magmas, which, however, must be below the fusion-point of the minerals crystallizing. Slowest cooling permits most perfect molecular adjustment, resulting in fewer but larger crystals. Other agencies affecting crystallization are absorbed vapors, and possibly pressure. The size and arrangement of the crystals control the texture of the rock, which may be glassy or *vitreous*, stony or *lithoidal*, and *crystalline*. When the grains are visible to the naked eye the texture is *phanerocrystalline*; if not, then *aphanitic*. Rocks are *porphyritic* when they consist of a groundmass of any texture bearing larger, prominent crystals (*phenocrysts*). Particular textures have special names, as *granitic*, *poikilitic*, *ophitic*, *trachytic*, *rhyolitic*, etc. Structures due to the physical continuity of the mass are *compact*, *porous*, *vesicular*, *pumiceous*, *jointed*, *columnar*, *laminated*, etc. The commonest minerals that crystallize from molten magmas (pyrogenetic) are quartz, potash-feldspar or orthoclase, lime-soda-feldspars, the feldspathic minerals (nephelite or eleolite, leucite, and sodalite), and certain ferromagnesian minerals (amphiboles, pyroxenes, micas, and olivine); among others are titanite, magnetite, ilmenite, apatite, zircon, and less often garnet, tourmaline, allanite, and spinels. Minerals prominent in the most acid rocks (granites) are quartz, alkali (potash, soda) feldspars; less abundant lime-soda-feldspars, with muscovite, biotite, and hornblende. As we pass to less acid rocks quartz diminishes; feldspars increase to a certain point, and then diminish and disappear in the most basic rocks (peridotites). Alkali-feldspars increase

to a maximum in syenite and in eleolite-syenite, and are accompanied by nephelite and sodalite. Lime-soda-feldspars become richer in lime from acid to basic rocks, and predominate in diorites, as oligoclase and andesine, and in gabbros, as labradorite and anorthite. The range of the ferromagnesian minerals is from biotite through hornblende, augite, hypersthene, to olivine, the first being most prominent in acid rocks, the last in most basic rocks. One rock-body may vary in chemical and mineral composition in different parts, and may exhibit variable structures and textures.

Genetic relationships exist between igneous rocks of one district or about one center of eruption. They appear in chemical and mineral characteristics common to such a group of rocks, which distinguish them from rocks of some other region. Regions so distinguished are called *petrographical provinces*. These characteristics, together with geological ones, prove that varieties of igneous rocks in one region originated from a parent molten magma by chemicophysical differentiation, lime-iron-magnesia-silicates tending to separate from alumina-alkali-silicates and free silica. Magmas may be erupted at any stage of differentiation, hence igneous rocks have no fixed chemical composition, and the distinctions attached to the definitions of various kinds of rocks must be arbitrarily chosen, there being no natural lines of demarkation between them. The consanguinity, so to speak, of igneous rocks about one eruptive center is one of their most essential characteristics.

Classification of igneous rocks may be accomplished in different ways owing to the number of their variable features. Each method proposed has developed inherent weaknesses. The one here adopted classes together all rocks with similar chemical composition and then subdivides them on a basis of texture, and further on one of mineral composition, choosing certain coarse-grained granular rocks as the standards for the chemical groups. These are granite, diorite, gabbro, peridotite, syenite, and eleolite-syenite, whose special characters may be learned under their separate headings. Under each of these groups are chemically similar rocks having fine-grained and usually porphyritic texture, commonly called porphyry, besides lithoidal to glassy forms. They have been variously named, and only a general sketch of them can be given.

To the *granite* class belong granite, granite-porphyry, quartz-porphyry, quartz-keratophyre, rhyolite, rhyolitic obsidian, perlite and pumice, quartz-pantellerite, dacite and its glassy forms. Granites are subdivided on a basis of the predominant ferromagnesian minerals—muscovite, biotite, hornblende, augite, etc. The fine-grained and aphanitic, porphyritic varieties are subdivided on a mineralogical basis in part, when the feldspars are included as of chief importance, potash-feldspars predominating in quartz-porphyries and rhyolites, soda-feldspars in quartz-keratophyre and quartz-pantellerite, and lime-soda-feldspar (oligoclase, andesine) in dacite. Other subdivisions are based on the character of the groundmass and the relative abundance of phenocrysts.

To the *diorite* class belong diorite, diorite-porphyry, andesite-porphyry (porphyrite), andesite and andesitic glasses. These rocks are subdivided on a mineralogical basis, the minerals involved being quartz, mica, hornblende, hypersthene, and augite. These names are placed as prefixes to the rock-names to designate varieties.

To the *gabbro* class belong gabbro, gabbro-(augite-) porphyry, dolerite, diabase, basalt, tachylyte (basaltic glass). These are subdivided mineralogically.

To the *peridotite* class belong peridotite, pikrite-(peridotite-) porphyry, limburgite. The class is distinguished by the absence of feldspar, or its presence in very small amounts, and is subdivided mineralogically according to predominant ferromagnesian silicates.

To the *syenite* class belong syenite, syenite-(orthoclase-) porphyry, keratophyre, trachyte, pantellerite, and trachytic glasses. They are subdivided according to the presence of quartz, nephelite, leucite, sodalite, and the ferromagnesian silicates.

To the *eleolite-syenite* class belong eleolite-syenite and its porphyries and phonolite; mineralogical subdivisions according to the presence of nephelite, leucite, and certain ferromagnesian minerals.

Other classes of rocks not represented by coarse-grained forms include the porphyries (minettes and kersantites), the lavas (leucite-basalt and nephelite-basalt), and the highly alkaline rocks (leucitite and nephelinite). These are basic rocks, more or less rich in alkalies.

Sedimentary rocks, as already said, may be composed of particles of other rocks when they are *fragmental* or *clastic*, or they may consist of fragments of organic remains, both animal and vegetable. They may be precipitations from aqueous solutions—*crystalline*. The composition and character of clastic rocks depend on the mineral character of the rocks from which they were derived, and on the transporting currents which deposited them. The mechanical effect of the stream is to assort the material according to its gravity and surface resistance, the heaviest fragments settling soonest. The process is one of separation, tending to differentiate the particles according to their mineral character, the ultimate extremes having the simplest composition, and the more soluble portions going into solution. Such rocks may approximate closely to the composition of igneous ones, or they may differ so widely from them as to consist of but one of their constituent minerals, as quartz. The texture of fragmental rocks may be due to the aggregation of the minutest particles, or of grains varying in size up to that of gravel and bowlders. The fragments are usually rounded, and the resulting mass, if sandy, is fine sand, gravel, or shingle; and when indurated or cemented by interstitial material, is sandstone or conglomerate. These rocks are largely quartz. If other minerals, as feldspar, and various rock-fragments accompany quartz, the rock is graywacke. When the fragments are angular it is breccia. Rocks consisting of extremely minute particles have been derived largely from the more easily decomposable minerals, feldspars, micas, etc. These are largely aluminous, and are more or less impure clays, indurated to different degrees—clays, clay-slate, and shale. Fragmental material derived directly from volcanic explosions, and deposited by currents of air or water has already been alluded to. The finest-grained aggregates are tuffs.

Fragmental rocks of organic origin are chiefly *calcareous*, as calcareous ooze (foraminiferal), chalk, shell-sand and marl, coral-rock and limestones; *siliceous*, as diatomaceous earth, and siliceous ooze (radiolarian); *phosphatic*, as guano, phosphatic limestone and marls, and deposits of bone phosphates; *carbonaceous*, including coals and their natural distillation products. It is questionable whether this last group does not properly belong to the series of metamorphic rocks.

Sedimentary rocks formed by precipitation or crystallization from solutions may be from large bodies of water, as many limestones and dolomites; or from smaller bodies, as certain iron ores, salt, etc.; or from springs, as travertine (calcareous) and calcareous onyx, oölite, sinter (siliceous), or geyserite; and in subterranean cavities, as various vein-stones, quartz, etc. Vein-stones, with their associated metallic minerals, are generally treated apart from other rocks on account of their special economic importance, and are known as metallic veins or ore-deposits. Ice as geological bodies, glaciers, etc., is a sedimentary rock formed by precipitation or crystallization.

Metamorphic rocks are of three categories: those demonstrably produced by the alteration of igneous rocks; those proved to be metamorphosed sedimentary rocks; and all rocks resembling these two groups, whose original character can not be determined. Since the petrographical features of the rocks of the third category are so nearly identical with those of the first two groups, it is probable that they also were either igneous or sedimentary originally. When stages of metamorphism can be traced from slightly altered to extremely altered forms, it is found that the final products of metamorphism, both of igneous and of sedimentary rocks, may in some cases be identical, so that highly metamorphosed rocks may possess no petrographical characteristics suggestive of the original nature of the rock. Thus the structure, texture, and mineralogical composition of highly metamorphosed rocks may shed no light on the nature of the original rock. It is customary to name and classify metamorphic rocks according to the most prominent petrographical features, regardless of the origin of the rock, or of the processes by which metamorphism has been brought about. Most metamorphic rocks exhibit a foliation, either in the ability of the mass to separate in thin plates, or in the arrangement of the minerals in parallel planes. This fissile or schistose structure is so universally present in all series of these rocks that they are commonly called the Crystalline Schists (*q. v.*). However, it does not occur throughout all bodies of metamorphic rock, some of which are massive, but these are related to the schistose rocks so intimately in geological position, being usually intercalated

between layers of schist, and have so nearly identical mineralogical composition and characters that they are generally considered together, and the whole series is classified on a basis of mineral composition—that is, rocks having similar mineral constituents are grouped together with little or no regard to the relative proportions of these minerals. At present this seems justifiable because of the lack of constancy in the composition of any considerable body of metamorphic rock, and because of the abrupt and frequent changes in the proportions in which the minerals occur together. The principal kinds of metamorphic rocks are—

I. *Feldspar-quartz Rocks* are those rocks whose predominant minerals are feldspar and quartz. They include:

Gneiss, a crystalline rock composed of potash-soda-feldspar and lime-soda-feldspar with quartz, and one or more minerals of the mica, amphibole, pyroxene groups, besides other minerals, and having a banded or laminated structure, produced by the parallel arrangement of some of the mineral constituents. It varies from quite massive forms to finely schistose ones. It bears a close analogy to granite in texture and composition, in some cases being scarcely distinguishable from it. When lime-soda-feldspars predominate over alkali-feldspars, the rock corresponds closely to quartz-diorite. According to the ferro-magnesian mineral prevalent, gneisses are subdivided into mica-gneiss (biotite, muscovite, or both), hornblende gneiss, augite gneiss, sericite-gneiss, etc.

Granulite, schistose rock consisting of feldspar, quartz, and garnet, with other minerals subordinate, according to which the rock is subdivided into cyanite-granulite, tourmaline-granulite, etc.

Hälleflinta and Adinole, dense, aphanitic or felsitic rocks, composed of minute particles of feldspar and quartz, and sometimes mica.

II. *Mica-rocks*, *chlorite-rocks*, or *talc-rocks* are:

Mica schist, laminated rock consisting of mica and quartz in variable proportions. According to the kind of mica, or of the other prominent constituents, they are muscovite-schist, biotite-schist, sericite-schist, paragonite-schist, and numerous other mica-schists depending on the accessory mineral, as staurolite, andalusite, epidote, etc. With increase of quartz it passes into micaceous quartzite; with more feldspar, into gneiss; with calcite, into micaceous limestone.

Chlorite-schist, laminated rock composed of chlorite and quartz, with other minerals subordinate.

Phyllite, *Argillaceous Schist*, *Argillite*, micaceous, argillaceous, schistose or slaty rock intermediate between clay-slate and mica-schist. Subdivisions are chiastolite-slate, staurolite-slate, ottrelite-slate, sericite-phyllite, etc.

Talc-schist, laminated rock composed of talc, with quartz or feldspar and other minerals.

III. *Amphibole-rocks.*—Rocks whose predominant mineral is amphibole, either schistose or massive; the former is *amphibole-schist*, the latter *amphibolite*. With amphibole may be associated feldspar, quartz, garnet, etc. According to the variety of amphibole present the rock is hornblende-schist, or hornblendite, actinolite-schist, glaucophane-schist. Nephrite, a variety of jade, is a compact microfibrous variety. Subdivisions are also established upon the character of the accessory mineral, as epidote-amphibolite, etc. When lime-soda-feldspar becomes prominent, the rock grades into diorite-schist; by increase of quartz and feldspar, into gneiss.

IV. *Pyroxene-rocks* are augite-schist, when laminated; augitite, when massive; enstatite-rock, jadite (jade). As lime-soda-feldspar increases, and the augite becomes more like diallage, the rock passes into schistose gabbro.

V. *Other rocks* are eclogite, crystalline massive rock, seldom schistose, composed of omphacite (light-green pyroxene), and garnet, with other minerals subordinate. Olivine-rocks are essentially olivine, with pyroxenes, hornblende, or mica in varying amounts, corresponding closely in mineral composition to the peridotites.

Epidote-schist and tourmaline-schist are schists in which epidote and tourmaline are prominent minerals, in combination with others less characteristic. Greenstone-schists are schistose and green, and generally very fine-grained. The color is due to fibrous amphibolite (actinolite), chlorite, or serpentine with epidote, combined with other minerals.

Quartz-rocks are chiefly composed of quartz, quartzite when massive, quartz-schist when schistose, usually with mica.

Calcite-rocks are crystalline limestone and MARBLE (*q. v.*).

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JOSEPH P. IDDINGS.

Rock-salt: See SALT.

Rock-snake: See BOA.

Rock Springs: town; Sweetwater co., Wyo.; on the Bitter creek, and the Union Pac. Railway; 258 miles W. of Laramie (for location, see map of Wyoming, ref. 12–G). It is in an extensive coal-mining region, and has 2 national banks with combined capital of $110,000, and 2 weekly newspapers. Pop. (1880) 763; (1890) 3,406; (1900) 4,363.

Rockville: city (set off from the town of Vernon and chartered as a city in 1889); Tolland co., Conn.; on the Hockanum river, and the N. Eng. Railroad; 15 miles E. N. E. of Hartford (see map of Connecticut, ref. 7–I). The river, which is the outlet of Lake Snipsic, has here a series of falls aggregating 280 feet, and affords abundant power for manufacturing. The principal industries are the manufacture of woolens, envelopes, silk goods, satinets, ginghams, and warps. There are 8 churches, a fine high school, a public library, 2 national banks with combined capital of $500,000, 2 savings-banks with aggregate deposits of over $1,750,000, and 2 weekly newspapers. Electric cars connect the city with Hartford and Ellington. Pop. (1880) 5,902; (1890) 7,772; (1900) 7,287.

Rockweeds: the popular name of the brown seaweeds of the genera *Fucus* and *Ascophyllum*, common on rocks between tide-marks along the U. S. coasts. See FUCOIDS.

Rockwood: town; Roane co., Tenn.; on the Queen and Cresc. Route and the Rockw. and Tenn. Rivers railways; 6 miles N. of the Tennessee river, 45 miles W. S. W. of Knoxville (for location, see map of Tennessee, ref. 6–H). It is in a coal and iron mining region, and contains several blast furnaces, a national bank with capital of $50,000, and two weekly newspapers. Pop. (1890) 2,305; (1900) 2,899.

Rocky Mountain Goat [so called on account of its goat-like appearance]: a species of antelope (*Mazama montana*)

Rocky Mountain goat.

with short legs, round, black, decurved horns, long, white, woolly hair, and a short beard on the chin. It is very much

larger than the domestic goat. It is found from Northern Idaho S. into Colorado, in the higher parts of the Cascade and Saw-tooth Mountains. It extends northward for some distance into the Kootenai district of British Columbia, and thence ranges in some places down to the coast. The horns and hide are used extensively by the Indians of some parts of British Columbia. F. A. L.

Rocky Mountains: all the mountains of North America between the Great Plains and the Pacific Ocean. The term Stony Mountains was originally applied, but was finally replaced by the name Rocky Mountains.

Usage is not entirely consistent in the application of this name. To some extent, both by geographers and popular writers, it is restricted in its application to parts only of the western mountain system. Some apply it only to the ranges of Montana, Wyoming, and Colorado; others include, in addition, the ranges of Idaho, Utah, and New Mexico; while still others would add the desert ranges of Oregon, California, Nevada, Utah, New Mexico, and Arizona, excepting from it only the Cascades, the Sierra Nevada, and the Coast Ranges; but its application to all the mountains of North America W. of the Great Plains is the only clear and definite one. The name Cordilleras of North America has been proposed as a substitute for Rocky Mountains as comprising the entire mountain system, but has not received general acceptance.

The name Rocky Mountains is very appropriate. On the mountains and plateaus of the greater part of the region naked rocks are seen to an extent rarely known elsewhere on the globe. Chief among the causes of this are extreme aridity and great elevation, the lack of moisture preventing the growth of vegetation, and great elevation promoting rapid denudation of the rock-material disintegrated at the surface. The mountains are composed of crags and peaks of naked rock, and the mountain streams run at the feet of towering cliffs in deep gorges beset with rocks. The hills, unprotected by vegetation, are swept clean of sands and soil by the winds. The water-courses rarely have flood-plains, and the steep sides of the valleys are strewn with fragments of rock. In the plateau region the streams run in deep cañons, whose walls rise hundreds or thousands of feet above the waters, and the channels below are choked with rocks which tumble from the cliffs. By reason of unequal erosion of the general surface, due to petrologic structure under conditions of great aridity, long lines of cliffs or towering escarpments of rock stand athwart the plateaus.

In very late geological time the whole region has been the scene of much volcanic activity. Extinct volcanoes are found on high plateaus and on the flanks of great mountain ranges; broad mesas are covered with sheets of lava; great valleys have been filled with extravasated matter, and scoria and ashes are scattered over the land. Some of this extravasation is so recent that the congealed floods are yet preserved in all their forms of stream and wave, and these naked rocks often appear without soil, and without even mosses and lichens. Extreme aridity is not a characteristic of the entire country. Those ranges near the Pacific coast N. of the 42d parallel of N. lat. are abundantly supplied with water, and here the indurated beds are greatly masked by dense forests and deep overplacement.

This great mountain system extends through the U. S. from its southern border, through British America and Alaska, to the Arctic Ocean, or from the 30th to the 70th parallel N. lat. Its greatest development in longitude is between the 38th and 42d degrees of N. lat.; here the system has a breadth of about 1,000 miles. Its highest peak is Mt. Logan, lat. 60° 30′ and lon. 140° 24′, which rises to an altitude of 19,500 feet above sea-level, as determined by the U. S. Coast and Geodetic Survey. In the same system are included the mountains of Mexico and Central America, though the term Rocky Mountains has rarely been applied to them. The mountains of Central America are composed of cordilleras and volcanoes, the geological characteristics of which are little known. The system is connected with the Andes of South America by the narrow Isthmus of Panama, where the elevation does not exceed a few hundred feet, and where a pass is found from Atlantic to Pacific waters, having its summit not more than 180 feet above the level of the sea. The mountains of Mexico are usually termed by geographers the Mexican Cordilleras, but locally the term cordilleras is applied only to certain ranges; the other great mountain-masses, whether their origin be by extravasation or upheaval and degradation, have their special names. They consist of many ranges trending in general parallelism with the coast, and of enormous volcanic peaks, a few of which are active. Among the celebrated mountains of this country are Orizaba, altitude 18,300 feet; Popocatepetl, altitude 17,887 feet; and Ixtaccihuatl, altitude 17,343 feet.

Passing from Mexico to the U. S. the Rocky Mountains proper are reached; and here the geography and geology of the region have been studied to such an extent as to warrant a partial classification of the system into minor groups or systems. The mountain system in the U. S. is extremely broad and complex, composed of hundreds of ranges and ridges, and covering a vast extent of country.

The general plateau or upland on which the ranges stand in Mexico extends across the U. S. from N. to S., widening westward nearly to the Pacific coast. Its maximum elevation is in Colorado, where it reaches an extreme altitude of 10,000 feet; thence northward its summit descends, entering Canada at an elevation of perhaps 4,000 feet. It descends also westward into the basin of the Colorado river, but rises again in Nevada, where it reaches an altitude of about 6,000 feet, descending thence westward to the foot of the Sierra Nevada in California. On the E. it descends to the low country traversed by the Mississippi river, by a long, undulating, treeless slope, known as the Great Plains. In the U. S. are the following systems: The Desert Ranges, the Park Ranges, the Plateaus, the Sierra Nevada, the Coast Ranges, the Cascade Mountains, and provisionally the Geyser Ranges.

The Desert Ranges occupy Southern Oregon and Idaho, Western Utah, all of Nevada, Southeastern California, Southern Arizona, and Southwestern New Mexico, extending southward into old Mexico. This region is limited on the E. by the plateau region drained by the Colorado river, and on the W. by the Sierra Nevada and Cascade Range. The northern and greater part is known as the Great Basin, since it has no outlet to the ocean. Though known collectively as the Great Basin, it is in fact a group of many large and small basins. Owing to the fact that this region has a very slight rainfall, nowhere exceeding 20 inches and in some parts not greater than 2 or 3 inches, its drainage system is in an extremely undeveloped condition. The rains which fall upon these mountain ranges and flow down their gorges are absorbed by the thirsty soil of the valleys or by the equally thirsty atmosphere. The detritus carried down the mountain-sides by these (and the amount is not inconsiderable when they are in flood) collects in the valleys as the streams disappear, thus filling them to a great depth with the ruins of the mountains.

The greater of the basins composing the Great Basin are (1) that of the Great Salt Lake, upon the eastern side of the basin in Utah, receiving drainage from the Wasatch Range, which limits this region on the E.; (2) the Humboldt-Carson Basin upon the W. in the shadow of the Sierra Nevada. Into this basin flow and sink the streams from the Sierra Nevada and from the ranges of the basin. Other basins are those of the Malheur and Harney Lakes in Oregon, Owens Lake in California, and Sevier Lake, Utah.

The ranges of this region are narrow and simple in structure. They are separated by broad level desert valleys filled with detritus from their sides. The trend is commonly N. to N. W. So far as their geological structure is known, they are of one type—i. e. a monoclinal ridge of displacement, or a displacement due to a fault on one side and a flexure on the other, which may otherwise be described as the half of an anticlinal fold. The typical ridge is composed of strata dipping one way, the front or face of the range being the escarped edges of the strata, and the back of the ridge conforming to some extent with the dip of the strata. Very few of the ranges are as simple as the type described, as they are complicated by secondary faults and flexures, transverse, oblique, and sometimes even longitudinal with the principal structure. Simple anticlinals are rarely found. The ridges described are composed of granites, schists, and Palæozoic sandstones and limestones; but these rocks and the monoclinal structure are often masked by extravasated beds found on the flanks or sometimes partly burying the ranges, and many of the mountains are chiefly of eruptive origin. It is probable that this region has been above the level of the sea since Jurassic time, and some portions of it longer, but the great orographic displacement which produced the present ranges is of very late date, and it is probable is yet in progress. One of the characteristics of these ranges is that they usually rise abruptly from the desert plain without intervening foot-hills, and rarely do

the ranges coalesce. Of the age of the dry land there is no certain knowledge, but the mountain forms due to upheaval and atmospheric degradation, and also the mountain forms due to extravasation, are of very late geological origin.

There are about 100 ranges in this group. The highest, broadest, and most massive is the Wasatch. In this are found the principal geological formations of the other ranges of the system, and also some of the sedimentary beds of the Plateau System. The escarpment faces the W., and the highest peak, Mt. Nebo, is found at the southern extremity. The streams which are used to fertilize the Great Salt Lake and Utah valleys have their sources in these lofty mountains.

PRINCIPAL SUMMITS OF THE DESERT RANGE SYSTEM.

NAME.	Range or group.	Feet.
Authority, King.		
Clayton Peak	Wasatch	11,889
Twin Peaks	"	11,560
Lone Peak	"	11,295
Lewiston Peak	Oquirrh	10,623
Tooele Peak	"	10,396
Mt. Bonneville	Aqui	11,050
Pilot Peak	Ourbe	10,900
Gosiute Peak	Egan	10,491
Spruce Mountain	Peoquap	10,411
Tenabo Peak	Cortez	9,240
Dalton Peak	"	9,232
Shoshoni Peak	Shoshoni	9,760
Mt. Poston	Toyabe	12,143
Bunker Hill	"	11,735
Globe Peak	"	11,237
Mt. Moses	Fish Creek	8,725
Signal Peak	Havallah	9,387
Mt. Bonpland	East Humboldt	11,321
Star Peak	West Humboldt	9,925
Peavine Mountain		8,217
Authority, Thompson.		
Mt. Nebo	Wasatch	11,680
Beaver Dam Mountains	Virgin	8,100
Virgin Peak	"	8,000
Mt. Bangs	"	7,950
Pine Valley Mountain	Pine Valley	10,250
Craggy Head	" "	9,750
Mt. Delano	Tushar	12,240
Mt. Belknap	"	12,200
Midget Crest	"	11,414
Mt. Katheriue	Pavant	10,000

The Park System extends from Southern Wyoming through Central Colorado into New Mexico; bounded on the N. by the Laramie Plains, on the E. by the Great Plains, and on the W. by the plateaus; the southern limits can not yet be defined. There are a great number of ranges in New Mexico, on either side of the Rio Grande del Norte, having a N. and S. trend, the general structure and geological relations of which are unknown. They may constitute a system or sub-system by themselves, or they may be considered as a part of the Park System, probably the latter. The general trend of the Park Ranges is a few degrees W. of N., but there are exceptions. These mountains are drained by the Platte and Arkansas, which flow into the Mississippi; by the Rio Grande del Norte, which flows into the Gulf of Mexico; and by the Colorado river of the West, which flows into the Gulf of California. The axial ridges of the system—i. e. those which separate the Atlantic from the Pacific drainage—constitute a part of the continental divide. The system is composed of ranges and irregular groups which stand as walls about the great parks. In North Park heads the North Platte; in Middle Park heads the Grand, a tributary of the Colorado; in South Park heads the South Platte; and the Rio Grande del Norte drains the San Luis Park. These parks are elevated valleys, nearly or completely surrounded by mountains. Besides the larger parks mentioned, there are many of smaller extent—mountain-valleys of great beauty in midsummer, but mantled with snow during many months of the year. Most of the ranges are known to be of the Uinta type—i. e. broad, plateau-like masses carved from blocks upheaved in part as integers and in part as bodies of many parts—a structure more fully described below. Many of the park-spaces are zones of diverse displacement. These mountains are composed of granites, schists, Palæozoic, Mesozoic, and Tertiary sediments, and the sedimentary groups are separated by many and well-defined unconformities, giving evidence of alternating periods of dry-land condition and oceanic sway; but the last great orographic movement which upheaved the great masses from which the mountains have been carved began in Tertiary time. These ranges are arranged *en échelon*, the eastern mountain-front running N. and S., while the ranges trend somewhat E. of S. Hence, proceeding southward, one finds the front range dropping down and disappearing, while its place is taken by that behind, which in turn comes to the front. The following are the principal ranges and groups of this system in succession from E. to W.: Rising from the plains in full view of Denver is the Front Range, which on the N. is nearly continuous with the Medicine Bow Range, the latter being the eastern wall of North Park. To the S. it becomes broken and spreads out into a mass of short ranges and hills, through which the South Platte makes its way to the plains. Just N. of Pueblo, on the Arkansas, it gathers itself and rises suddenly into the great mass of Pike's Peak, and then drops down to the level of the plains. Between North and Middle Parks is the Park View Mountain, an eruptive mass which, with its spurs and outliers, separates the two parks. Next in order to the westward is the Park Range, which extends from Buffalo Peaks northward nearly to the junction of the Sweetwater with the North Platte river. This range forms the western wall of South, Middle, and North Parks. The South and Middle Parks are separated by a series of eruptive mountains, among them Silverheels and Mt. Guyot. From the north end of this range, W. of North Park and the north end of Middle Park, long spurs and irregular mountains extend westward to the plateaus. W. of the south end of the Park Range is the valley of the Arkansas, and W. of the valley is the Sawatch Range, with the Mount of the Holy Cross at its northern extremity. This range trends 30° W. of N. Still farther W. is the Elk Mountain Group, which consists of a series of short, parallel ranges closely massed, trending in the same direction as the Sawatch Range.

Returning to the border of the plains, the first range S. of the Arkansas is the Wet Mountain, a short range, fronting the plains for a few miles only. Its trend is the same as the last. To the W., and parallel with this range, is the Sangre de Cristo, called in one portion of its course the Sierra Blanca. This is a long, high range, fronting the plains for hundreds of miles, and breaks up near Santa Fé. To the W. of it lies San Luis Park, and beyond the park is the enormous irregular rugged mass known as the San Juan Mountains, and beyond are the plateaus.

PRINCIPAL MOUNTAINS OF THE PARK RANGE SYSTEM.

Authority, Gannett, U. S. G. G. S.

NAME.	Range or group.	Feet.
Gray's Peak	Front Range	14,341
Torrey Peak	" "	14,336
Mt. Evans	" "	14,330
Long Peak	" "	14,271
Mt. Guyot	" "	13,565
Cheyeune Mountain	" "	9,948
Platte Mountain	" "	9,343
Park View Mountain	" "	12,433
Mt. Lincoln	Park Range	14,297
Buffalo Peak	" "	13,541
Mt. Powell	" "	13,598
Pike's Peak	Pike's Peak Group	14,147
Mt. Harvard	Sawatch Range	14,375
Mt. Elbert	" "	14,351
La Plata Mountain	" "	14,311
Massive Mountain	" "	14,298
Mt. Autoro	" "	14,245
Mt. Princeton	" "	14,196
Mt. Yale	" "	14,187
Holy Cross Mountain	" "	14,176
Mt. Shavano	" "	14,093
Mt. Ouray	" "	14,043
Grizzly Peak	" "	13,956
Castle Peak	Elk Mountain Range	14,115
Maroon Mountain	" " "	14,003
Capitol Mountain	" " "	13,997
Snowmass Mountain	" " "	13,970
Pyramid Peak	" " "	13,885
White Rock Mountain	" " "	13,357
Italian Peak	" " "	13,350
Treasury Mountain	" " "	13,200
Mt. Day	" " "	13,193
Lopus Peak	" " "	12,823
Gothic Mountain	" " "	12,570
Crested Butte	" " "	12,052
Greenhorn Mountain	Wet Mountain	12,230
Blanca Peak	Sangre de Cristo	14,464
Garland Peak	" " "	14,300
Crestone	" " "	14,233
Mt. Rito Alto	" " "	12,989
Hunt Peak	" " "	12,333
Mt. Wilson	San Juan Mountains	14,200
Uncompahgre	" " "	14,235
Mt. Sneffels	" " "	14,158
Mt. Eolus	" " "	14,054
Handie Peak	" " "	13,997
Rio Grande Pyramid	" " "	13,773
Mt. Osa	" " "	13,640

The Plateaus.—The great plateaus stretch from Southern Wyoming through Western Colorado and Eastern Utah far into New Mexico and Arizona. They are bounded on the N. by the Wind river and Sweetwater Mountains, on the E. by the Park Mountains, and on the S. and W. by the Desert Range region. The region is drained chiefly by the Colorado of the West; on the S. W. by the Sevier river, and a small portion on the S. E. by the Rio Grande del Norte. The general elevation is about 7,000 feet above sea-level, but the range in elevation is great. The ascent from the low desert plains on the S. is very abrupt, in many places by a steep and almost impassable escarpment. Geologically, the plateaus are separated into blocks by faults or their homologues, monoclinal flexures—a structure to which the name Kaibab has been given, where the blocks are displaced as integers. These geological features serve in part to divide the region into many topographic blocks. The streams which traverse the plateaus have their sources in the Wind River Mountains on the N., in the Park Mountains on the E., and in the Wasatch on the W., and in their courses through the plateaus they run in profound gorges or cañons, further dividing the area into blocks; and this division is completed by lines of cliffs due to the unequal erosion of harder and softer beds under conditions of aridity. Thus, by faults and monoclinal flexures, by deep cañons, and by lines of cliffs, this region is cut into a great number of plateaus. Some of the larger or more important of these plateaus are as follows: The Colorado Plateaus, lying S. of the Grand Cañon of the Colorado—general elevation, 7,500 feet; Shiwits Plateau, N. of the Grand Cañon, W. of the Grand Wash, E. of the Hurricane Cliffs, and S. of the Vermilion Cliffs—general elevation, 6,000 feet; Uinkaret Plateau, N. of the Grand Cañon, E. of the Hurricane Cliffs, W. of Kanab Cañon, and S. of the Vermilion Cliffs—general elevation, 6,000 feet; Kaibab Plateau, N. of the Grand Cañon and W. of the Marble Cañon—general elevation, 7,500 feet. The last three plateaus extend from Northern Arizona into Utah. Farther to the N., on the west side of the Sevier river, the Markagunt Plateau—general elevation, 8,500 feet; on the east side of the Sevier the Paunsagunt Plateau—general elevation, 8,000 feet; the Aquarius Plateau, N. of the Paunsagunt—general elevation, 11,000 feet. S. W. of the Paria river, near the head of the Marble Cañon, are the Paria Plateau—general elevation, 6,000 feet; the Kaiparowits Plateau, N. of the Paria and E. of the Paunsagunt—general elevation, 7,500 feet. The Tavaputs Plateau is in Eastern Utah, bounded on the N. by the Uinta and White river valleys, and on the S. by the Book Cliffs, and is cut in twain by the Green river—general elevation, 7,000 feet. There are many other plateaus of nearly equal importance.

On these plateaus stand buttes, lone mountains, and groups of mountains. The buttes are of cameo structure—i. e. mountains of circumdenudation, with horizontal strata and escarped sides. The mountains, composed in whole or in part of extravasated matter, exhibit many interesting types of structure. The grand structure-lines of these plateaus have a N. and S. trend, but with important and diverse exceptions. In addition to the plateaus proper, there are many mountains due to upheaval and degradation, some of which are found in zones of diverse displacement, others are of simple anticlinal structure, and still others of the Uinta structure. The more important of these mountains of diverse type are the Zuñi Range, far to the S., and the Uinta Range, far to the N. The Uinta Range is carved from a broad upheaval having an E. and W. axis. On either flank of the upheaval there is a line or zone of maximum displacement, where the upheaval is by flexure or by faulting. Between these zones there is a gentle flexure either way to the axis. Thus the upheaval is in part by general flexure from the axis as an anticlinal, and in part by faulting and monoclinal flexure, as in the Kaibab structure, thus behaving in part as an integer and in part as a body of many parts. The Uinta Range, as before mentioned, has been taken as a type of this structure.

The plateaus have been continuously above the sea since the close of the Cretaceous period, but during earlier Tertiary times the region was an area of lacustrine sedimentation, and during late Mesozoic and early Tertiary time the basin province was the dry land that fed the sea and lakes of the plateau province. The great displacements by which the region was broken into blocks began in early Tertiary time, and is probably yet in progress. The plateaus are composed of Tertiary, Mesozoic, and Palæozoic sediments. Crystalline schists and granites are found in some of the deep cañons.

Herewith is presented a table containing the principal mountains of the different ranges, groups, etc., of the plateaus, giving their name, location, height, and the authority for the measurements:

PRINCIPAL MOUNTAINS OF THE PLATEAUS.

NAME.	Location.	Height.	Authority.
Mt. San Francisco	Colorado Plateau	12,794	Thompson, U. S. G. G. S.
Mt. Dellenbaugh	Shiwits Plateau	6,750	Do.
Mt. Trumbull	Uinkaret Plateau	8,360	Do.
Mt. Logan	" "	7,950	Do.
Mt. Emma	" "	7,700	Do.
Mt. Briau	Markagunt Plateau	11,260	Do.
Little Creek Peak	" "	10,010	Do.
Bear Valley Peak	" "	10,500	Do.
Monroe Mountain	Sevier Plateau	11,240	Do.
Blue Mountain	" "	10,000	Do.
Mt. Dalton	" "	10,480	Do.
Marysvale Peak	" "	10,359	Do.
Adam's Head	" "	10,360	Do.
Musinia Peak	Musinia Plateau	10,940	Do.
Kaiparowits Peak	Kaiparowits Plateau	9,180	Do.
Mt. Ellen	Henry Group	11,410	Do.
Mt. Pennell	" "	11,335	Do.
Mt. Hillers	" "	10,645	Do.
Mt. Ellsworth	" "	8,150	Do.
Navajo Mountain	" "	10,416	Do.
Mt. Marvine	Uukarpagu Range	11,598	Do.
Fish Lake Mountain	" "	11,578	Do.
Mt. Hilgard	" "	11,453	Do.
Terrill Ridge	" "	11,380	Do.
Gilson Crest	" "	11,000	Do.
Thousand Lake Mountain	" "	11,229	Do.
Emmons Peak	Uinta Mountains	13,694	King.
Mt. Hodges	" "	13,500	Do.
Mt. Tokwana	" "	13,500	Do.
Dawes Peak	" "	13,300	Do.
Gilbert Peak	" "	13,250	Do.
Wilson Peak	" "	13,235	Do.
Barro Peak	" "	12,834	Do.
Marsh Peak	" "	12,410	Do.
Leidy Peak	" "	12,410	Do.
Mt. Peale	La Sal Group	13,089	Gannett, U. S. G. G. S.
Mt. Waas	" "	12,586	Do.
Escudilla Mountain	" "	10,691	Wheeler.

The Sierra Nevada is one great range, stretching from the 35th parallel of N. lat. to about 41° 35′, where the range topographically terminates at Mt. Shasta, or perhaps S. of this, at Lassen Peak. These mountains are carved from a great plateau more than 400 miles in length and 100 miles in breadth. The axis of the range is near the eastern side, and trends about 30° W. of N. Here the streams head, the greater number running westward into the Pacific, the remainder running eastward and rapidly descending into desert valleys where they are lost in the sands. On the eastern side a bold front rises abruptly from the desert plains, presenting a grand façade of storm-carved rocks. On the western side, though the descent to the Sacramento and San Joaquin rivers is greater, the general slope is more gentle, but is broken by many profound gorges or deep cañons, some of which are due to faults; others are cut by streams and fashioned by glaciers. At the southern extremity the range is broken into small subsidiary ranges and spurs. At the northern end, from Lassen Peak to Mt. Shasta, the plateau-like character is much broken by volcanic masses, and there the general topographic characteristics are greatly changed. On the western flank of the range there are many table-mountains, covered with sheets of lava. This broad, massive range is crowned with peaks which rise to higher altitudes than any other in the U. S.

PRINCIPAL PEAKS OF THE SIERRA NEVADA SYSTEM.

NAME.	Feet.	Authority.
Mt. Whitney	14,898	Whitney.
Mt. Tyndall	14,386	U. S. G. S.
Castle Peak	12,500	Whitney.
Mt. Silliman	11,623	"
Mt. Kaweah	14,000	"
Mt. Brewer	13,886	U. S. G. G. S.
Mt. Shasta	14,350	"
Mt. Dana	12,992	"
Mt. Lyell	13,042	"
Lassen Peak	10,437	"

The Coast System is composed of the low, narrow ranges near the Pacific Ocean, and separated from the Sierra Nevada by the valleys of the Sacramento and San Joaquin rivers, which, after uniting, burst through the ranges, di-

viding them into two sub-systems, the Northern and Southern Coast Ranges. To the N., beyond the head-waters of the Sacramento, the Coast Ranges topographically coalesce with the Cascade Mountains, and to the S., beyond the head-waters of the San Joaquin, with the Sierra Nevada; but here the geological separation is plain, as shown by Whitney. The general trend of these ranges is 30° W. of N. The Coast Ranges are composed of more or less closely oppressed folds of strata degraded by rains and rivers—i. e. they have the Appalachian structure, but complicated and more or less masked by extravasated matter. The summits or axial planes are in general tipped westward or toward the Pacific. The Appalachian type is not known to occur elsewhere in the Rocky Mountain region. The upheaval of these mountains began in the late Tertiary times, and may yet be in progress.

PRINCIPAL MOUNTAINS OF THE COAST RANGE SYSTEM.

NAME.	Feet.	Authority.
San Carlos Peak	4,977	Whitney.
Mt. Hamilton	4,440	"
Mt. Diablo	3,856	"
Mariposa Peak	3,700	"

The Cascade Mountains stretch from Southern Oregon northward far into British America. On the E. they are bounded by the great valley of the Columbia river, and on the W. by the Pacific Ocean. The Columbia river, where it bursts through this zone of mountains, plunges to the level of the sea in a series of great cascades, and from these the mountains take their name. They consist of an irregular volcanic plateau, upon which stand many volcanic peaks. They can not be separated topographically, nor is there yet sufficient data to separate them geologically from the northern extremity of the Coast Ranges and Sierra Nevada. Little is known of their general topography and geology, except that the group is characterized by many lofty volcanoes now extinct. The trend of this zone of mountains is a little W. of N.

PRINCIPAL MOUNTAINS OF THE CASCADE SYSTEM.

NAME.	Height.	Authority.
Mt. Logan	19,500	Coast Survey.
Mt. St. Elias	18,101	" "
Mt. Rainier	14,444	" "
Mt. Adams	13,258	Vansant.
Mt. Hood	11,225	Williamson.

In Northern California and Southern Oregon the Coast and Cascade Ranges are united by a mass of mountains having little apparent system, in which heads the Klamath river, and from which the group receives its name. These form apparently no part either of the Coast or Cascade System, but are too little known to enable one to speak definitely concerning their relationship.

N. of the Front and Park Ranges there is a break in the mountain system in Central Wyoming. The Union Pacific Railway traverses this region, a great stretch of barren, elevated plateaus. On the N. the mountains rise again in a complex system which extends into Canada. These ranges will be called provisionally the Geyser Ranges. The easternmost of them, known as the Bighorn Range, separates the head-waters of Tongue river from those of Bighorn river, both being tributaries of the Yellowstone. W. of this is a broad, high range, known as the Wind River Range, in which heads Wind river, the upper waters of the Big Horn, and Green river, one of the two forks of the Colorado. The northward extension of this range, known as the Absaroka, separates the head-waters of the Yellowstone from its main affluent, Bighorn river. W. of this range follows a succession of short, broken ranges, the Tetons, the Gallatin, Madison, Ruby, and others.

In Northern Montana the Front Range, which faces the plains, bears the continental divide, separating the waters of the Missouri from those of the Columbia. This range terminates in latitude 46°, where the divide swings to the westward, following a succession of low passes until it reaches the Bitter Root Range. So far as the limited geographical knowledge concerning this range informs us, this is a long, continuous range forming most of the western boundary of Montana, and bearing for a long distance the continental divide upon its crest, separating the head-waters of the Missouri from those of the Salmon river, a tributary of the Columbia. W. of this range in Central Idaho is a section of ranges separating branches of the Salmon river, a region which is probably as little known as any part of the U. S.

An outlying range to the E., known as the Black Hills of Dakota, is of the Uinta structure, as shown by Newton.

PRINCIPAL MOUNTAINS OF THE GEYSER SYSTEM.

Authority, Hayden Survey.

NAME.	Location.	Feet.
Arrow Peak	Montana	7,420
Mt. Blackmore	"	10,134
Bridger Peak	"	9,106
Mt. Cowan	"	10,351
Crazy Peak	"	11,178
Mt. Delano	"	10,200
Electric Peak	"	11,155
Mt. Ellis	"	8,419
Emigrant Peak	"	11,034
Liberty Peak	"	9,162
Ward Peak	"	10,371
Mt. Chauvenet	Wyoming	13,000
Mt. Chittenden	Yellowstone National Park	10,190
Mt. Dome	" " "	10,713
Dunraven Peak	" " "	9,988
Fremont Peak	Wyoming	13,790
Gros Ventre Peak	"	11,570
Mt. Hayden	"	13,691
Mt. Holmes	Yellowstone National Park	10,528
Index Peak	Wyoming	11,702
Mt. Leidy	"	11,177
Mt. Sheridan	Yellowstone National Park	10,385
Mt. Washburn	" " "	10,346

In Canada the Rocky Mountain System is much narrower than in the U. S., and the platform upon which the ranges stand is much lower. From the boundary as far N. as Peace river three members are distinguished: a front range, comparatively simple, known to Canadian geographers as the Rocky Mountains proper, and bearing the continental divide; a broken volcanic plateau; and, bordering the Pacific coast, a northward extension of the Cascade Range, also of volcanic origin and capped with enormous extinct volcanoes.

Still farther northward the Rocky Mountains continue their northwesterly trend, greatly diminishing in importance as they near the Arctic Circle, and finally disappearing between the Mackenzie and Yukon rivers. The Cascade Range continues through British Columbia and Southeast Alaska, following the coast closely and rising in the latter territory until in the neighborhood of Mt. St. Elias it attains a great altitude, having many peaks exceeding 14,000 feet in height and culminating in the great mass of Mt. Logan, 19,500 feet above the sea. The valleys and gorges among these mountains are filled with numerous glaciers which extend very nearly to sea-level. Thence westward, following the coast-line, this range diminishes in altitude, and finally drops into the sea, appearing above its surface in the chain of the Aleutian islands.

In the U. S. the Rocky Mountains, with the Great Plains that stretch eastward, constitute the great arid region where irrigation is necessary to agriculture. In Northern California and Western Oregon and Washington the precipitation of moisture from the Pacific currents is very great, and hence this region is not embraced in the arid district. The arid region is about two-fifths of the area embraced in the U. S., excluding Alaska. From surveys and careful comparative estimates it is shown that it will not be possible to redeem 4 per cent. of the entire region by irrigation when every brook, creek, and river is utilized. Less than 10 per cent. of the region is forest-clad. These forests are on the sides of the high mountains, and extend over the more elevated plateaus. This does not include large districts of country covered with a scant growth of dwarf cedars and pines which can be used for fuel, but are of no value in mechanical industries. Some portions of this forest region are capable of being cultivated without irrigation, but only such crops can be raised as will mature in the short summers of a sub-arctic climate. Of the remaining lands, a large portion is covered with grasses and other plants which may be utilized to some extent for pasturage. The land most suitable for cultivation lies along the streams, and is confined principally to the little valleys nestling among the mountains. The mountains, hills, and plains can furnish nutritious but scant pasturage for herds and flocks, but altogether the agricultural resources of the region are limited. Gold, silver, iron, copper, lead, salt, coal, and many other minerals are found in abundance, and the region is chiefly valuable for its mines.

J. W. POWELL.

Rocky Mountain Sheep: See Big-horn.

Roco'co: a style of debased and extravagant ornamentation for buildings, interiors, furniture, etc., which has several times prevailed in parts of Europe.

Rodber'tus, Johann Karl, known as **Rodbertus-Jagetzow**: political economist, regarded by many as the founder of scientific socialism; b. at Greifswald, Pomerania, Aug. 12, 1805; was educated at Göttingen and at Berlin, studying law at the latter university; held legal appointments under the Prussian Government, but continued his studies, devoting himself especially to political economy, and finally in 1836 retired to his estate of Jagetzow, in Pomerania. He was returned to the provincial Landtag in 1847, to the National Assembly in May, 1848, and was a prominent figure in Prussian politics in 1848 and 1849, holding office for a short time as Minister for Public Worship and Education. After the failure of the movement for German national unity he retired from public life and resumed his economic studies. Though democratic in his principles he found much to approve in the policy of Bismarck. D. Dec. 6, 1875. The cardinal principle of his economic creed may be summed up in his statement "that all commodities can only be considered economically as the product of labor, and cost nothing but labor." The aim of his work was to increase the share of the working classes in the national income, but this was to be attained by a gradual process of social evolution, and not by political agitation. For this reason, though an admirer and sincere friend of Lassalle, he resisted to the last the latter's appeal for cooperation in his efforts to organize a workingman's party of reform. Rodbertus proposed the establishment of a normal work-day, in which the number of hours of labor and the quality of the work performed should be fixed by the Government, and form a basis for a standard of income. The most important of his writings are *Zur Kenntniss unserer staatswirthschaftlichen Zustände* (1842); *Soziale Briefe an v. Kirchmann* (1850–51, the 4th ed. published in 1884 under the title *Das Kapital*); *Zur Erklärung und Abhülfe der heutigen Kreditnoth des Grundbesitzes* (1868–69); *Der normale Arbeitstag* (1871); *Briefe und sozialpolitische Aufsätze von Dr. Rodbertus-Jagetzow* (1884).

Ro'denberg, Julius: poet; b., of Jewish parentage, June 26, 1831, at Rodenberg, a village in Hesse-Nassau, the name of which he adopted in lieu of his original surname, Levy; studied law at the Universities of Heidelberg, Göttingen, and Berlin, and devoted himself to literature. He traveled extensively and published interesting accounts of his journeys in France, England, Ireland, and Belgium. He is also author of a collection of poems and of several novels. Since 1874 he has been the editor of the *Deutsche Rundschau*, the foremost German literary monthly. J. G.

Roden'tia, or **Glires** [*Rodentia* is Mod. Lat., from Lat. *rodentia*, neut. plur. pres. partic. of *ro'dere*, gnaw]: an order of mammals of the sub-class *Monodelphia* or *Placentalia*, comprising the gnawing animals, such as the rats, mice, squirrels, rabbits, etc. These may be briefly defined as ineducabilian placentiferous mammals, with the incisors in pairs in the upper and lower jaws, rootless and ever-growing, and in their growth describing the segment of a circle or open spiral. The order is the most numerous in species of the class of mammals, between 1,000 and 1,200 being known. Two well-defined sub-orders are recognizable: (1) the *Simplicidentati* and (2) the *Duplicidentati*. The *Simplicidentati* have the incisors strictly limited to two in each jaw, and the enamel is entirely confined to their anterior faces; the skull has a true alisphenoid, as well as an external alisphenoid, canal; the bony palate is well developed; the fibula never articulates with the calcaneum; the testes are abdominal, but descend periodically. This group contains the majority of the order, distributed in from fifteen to twenty families, according to the views of different writers. The *Duplicidentati* are distinguished by the presence of four incisors above, but two below; the external incisors are, however, very small, and situated behind the principal ones; in early life even six incisors are present in the upper jaw; the enamel is developed behind as well as in front, although behind it is in a very thin layer; the skull has no true alisphenoid canal; the bony palate is represented by a simple bridge between the alveolæ; the fibula articulates distally with the calcaneum; the testes are external. Of this sub-order two families are known—viz., (1) *Lagomyidæ* and (2) *Leporidæ*. These are the only groups represented by living species. Several peculiar families have been also constituted for the reception of typical forms of extinct simplicidentate rodents. See also the names of the families.

Revised by F. A. Lucas.

Rod'eric: the last King of the Visigoths in Spain; ascended the throne in 709 in consequence of a revolution by which King Witiza was overthrown. He fell in the battle of Xeres de la Frontera (July, 711) against the Arabs under Tarik, who then took possession of the southern and central parts of Spain. The Spanish and Arab historians disagree very much with respect to the events which raised Roderic to the throne, his death, and his character, and with respect to the causes which brought about the Arab invasion; but it seems most probable that an insurrection of the Roman and Celtic elements of the Spanish population took place against Witiza, followed by a rising of the partisans of Witiza against Roderic, and that the Arabs, after conquering Mauritania, would have crossed over to Spain, even if they had received no invitation from any dissatisfied party there.

Rodgers, Christopher Raymond Perry: rear-admiral; son of George Washington Rodgers, naval officer; b. in Brooklyn, N. Y., Nov. 14, 1819; entered the navy as a midshipman Oct. 5, 1833. He served in the Seminole war and on the east coast of Mexico during the war with that country; commanded the Wabash at the battle of Port Royal, and Battery Sigel at the reduction of Fort Pulaski, and acted as Rear-Admiral Dupont's fleet-captain in the attack on Fort Sumter of Apr. 7, 1863; chief of the bureau of yards and docks from 1871 to 1874, and superintendent of the Naval Academy from then till July 1, 1878. D. at Washington, D. C., Jan. 8, 1892. Revised by C. Belknap.

Rö'diger, Emil: Orientalist; b. at Sangerhausen, Thuringia, Oct. 13, 1801; studied theology and philology at Halle 1821–26; became privat docent there in 1828; Professor extraordinary in 1830; ordinary Professor of Oriental Languages in 1825; transferred in the same capacity to the University of Berlin 1860. D. June 17, 1874. His chief works are: *Commentatio quo vulgata opinio de interpret. arab. libri V. T. histor. refut.* (1828); *De origine et indole arab. libr. V. T. historicorum interpretat. libri duo* (1829); *Locmani fabulæ* (1839; 2d ed. 1839); *Chrestomathia Syriaca* (1838; 2d ed. 1868; 3d ed. 1892); *Versuch über die himjaritischen Schriftmonumente* (1841). Rödiger finished and brought out Gesenius's *Thesaurus philologicus criticus* (1853–58), and editions 14–21 of the same author's *Hebräische Grammatik* (1845–72). He likewise edited Wellsted's *Reisen in Arabien* (1842); wrote two articles on the Neo-Syriac dialect of Urmia (*Zeit. f. Kunde des Morgenl.*, vols. ii., iii.); a number of papers on Semitic palæography (*Zeit. d. Deutsch. Morgenl. Gesell.*, vols. iii., ix., x., xi.), and five yearly *Literaturberichte* in the same journal (vols. v., viii., ix., x.). Richard Gottheil.

Rodin, rō'dăń', Auguste: sculptor and etcher; b. in Paris, France, 1840. He began as marble-worker under Albert Ernest Carrier-Belleuse. For a long time he remained in subordinate positions, working under the direction of or in company with Antoine Louis Barye in Paris and the sculptors employed on the new bourse at Brussels. He exhibited in the Salon for the first time in 1875. Since that time a considerable number of large and small sculptures have been exhibited by Rodin, though more commonly in private or separate collections than in the Salon, each one exciting vigorous discussion as to its value as fine art, and exciting both warm praise and severe blame from critics and from other artists. This work is all exceedingly unusual; it is unacademical, and that means more in Paris than elsewhere; it is at once as expressive of emotion and of action as if the artist were willing to sacrifice everything else to expression, and as sculpturesque as the work of Michelangelo, which it somewhat resembles. He has received several medals and other rewards, and was made chevalier of the Legion of Honor in 1888. Some of his best-known productions are the following: *The Brazen Age* (*Âge d'airain*), exhibited in 1877 in plaster, and after a long discussion cast in bronze for the Government and set up in the gardens of the Luxembourg in Paris; *John the Baptist Preaching*, in the Luxembourg Museum; a large door, of which the reliefs are of subjects taken from Dante's *Inferno*; a group of the *Burghers of Calais*; a group of Francesca di Rimini and her lover, known as *The Kiss*; several portraits of great and peculiar interest, such as the statue of *Jules Bastien-Lepage*, the painter, and busts of *Victor Hugo*, *Henri Rochefort*, and *Jules Daloux*, the sculptor.

Russell Sturgis.

Rodman, Thomas Jefferson: soldier; b. at Salem, Ind., July 30, 1815; graduated at the U. S. Military Academy and commissioned brevet second lieutenant of ordnance July, 1841; promoted through consecutive grades up to lieutenant-colonel Mar., 1865. His whole life was devoted to the interests of his profession. To him is due the honor of inventing the method of hollow casting and, from the results of his experiments upon metal for cannon and cannon powder, the design and construction of the 15 and 20 inch cast-iron cannon, with their projectiles and suitable powder. The principles involved in giving to the gun its correct exterior form, the proper distribution of strains in the metal, and the regulation of the interior pressure by the progressive burning of the powder were developed by him largely through the use of his pressure-gauge. The path he marked out has been followed by other investigators, and has resulted in the development of modern guns. He was the author of a valuable *Report of Experiments on Metals for Cannon and Cannon Powder* (1861). D. at Rock Island, Ill., June 7, 1871.
Revised by James Mercur.

Rodney, Cæsar: signer of the Declaration of Independence; b. at Dover, Del., Oct. 7, 1728; inherited a large landed property; was sheriff of Kent County 1755–58; member of the Legislature many years, and its Speaker 1769–73; delegate to the Stamp Act congress at New York 1765; was chairman of the Delaware popular convention 1774; elected to the Continental Congress Mar., 1775; was soon afterward elected brigadier-general; signed the Declaration of Independence; served under Washington in the New Jersey campaign 1776–77; appointed judge of the Supreme Court, but refused the office; defended Delaware from British invasion; was made major-general of Delaware militia; was president or executive officer of Delaware 1778–82, and was again elected to Congress, but did not take a seat in that body. D. at Dover, June 29, 1784.

Rodney, Cæsar Augustus: jurist; nephew of Cæsar Rodney; b. at Dover, Del., Jan. 4, 1772; graduated at the University of Pennsylvania; studied law; was a prominent member of Congress 1803–07; Attorney-General of the U. S. 1807–11; commanded an artillery company 1813; went to South America 1817 as member of a commission to report upon the insurrection against Spain; was member of Congress 1821–22, U. S. Senator 1822–23, and in the latter year became first minister to the Argentine provinces. Author, with J. Graham, of *Reports on the Present State of the United Provinces of South America* (London, 1819). D. in Buenos Ayres, June 10, 1824.

Rodney, George Brydges Rodney, Lord: admiral; b. at Walton-upon-Thames, Surrey, England, Feb. 19, 1718; entered the British navy in his twelfth year; was governor of Newfoundland 1748; re-entered the navy 1752, rear-admiral 1759; in 1762 he captured Martinique, St. Lucia, and Grenada; vice-admiral 1762, baronet 1764, master of Greenwich Hospital 1765, commander-in-chief in Jamaica 1771, admiral and commander-in-chief at Barbados in Dec., 1779, when he sailed from England with a fleet of 30 vessels; defeated a Spanish squadron off Cape St. Vincent Jan. 16, 1780, and broke through the French fleet near Martinique Apr. 17, 1780, for which achievement he received the thanks of both houses of Parliament and a pension of £2,000. In the war against Holland (1781) he captured Dutch Guiana; as commander-in-chief of the West India squadron engaged the French fleet under Count de Grasse Apr. 9, and again Apr. 12, 1782, capturing seven ships of the line and two frigates; was thanked and pensioned by Parliament, and created Baron Rodney of Rodney Stoke, Somersetshire, 1782. D. in London, May 23, 1792. See Hannay's *Rodney* (Men of Action Series, 1891).

Rodos'to (anc. *Rhœdestus*, Turk. *Tekirdagh*): town of European Turkey; in the vilayet of Adrianople, on the Sea of Marmora; 77 miles from Constantinople (see map of Turkey, ref. 4–D). Rising upon hills and surrounded by thriving gardens and orchards, it presents an enchanting spectacle as seen from the water. It exports grain, cotton, silk cocoons, wool, skins, and wine, and largely supplies the capital with vegetables, fruit, and fish. Pop. estimated at 25,000, of whom 14,000 are Ottomans, 5,500 Armenians, 4,000 Greeks, and 1,000 Jews. E. A. Grosvenor.

Rodrigues Lobo, Francisco: See Lobo, Francisco Rodrigues.

Rodriguez, rō-dree'ges: an island in the Indian Ocean; the easternmost of the Mascarene group and of the African islands, lat. 19° 41′ S., lon. 63′ 23′ E.; 365 miles E. N. E. of Mauritius, of which it is administratively a dependency. Area, 42·5 sq. miles. It is of volcanic origin, and consists of a mountain ridge running E. and W., with considerable plains N. and S. The highest point (Le Piton) is 1,160 feet high. It is surrounded by a coral reef through which there are only two passages, each leading to one of the two ports. It is relatively arid, with a maritime tropical climate, and is subject to hurricanes during the northwest, or winter, monsoons. It is devoted to agriculture and fishing. The turtles which once formed an important article of export have disappeared. Rodriguez was not permanently inhabited until 1691, when it was occupied by a Protestant refugee. In time it had a considerable population, mostly slaves, but, on their emancipation, they emigrated, leaving in 1843 a population of only 250. In 1893 it was 2,068, mostly blacks or of mixed Negro blood. The island is of strategic importance and belongs to Great Britain. The language is French.

Roe, Charles Francis: See the Appendix.

Roe, Edward Payson: novelist; b. at Moodna, Orange co., N. Y., Mar. 7, 1838. He studied at Williams College, and one year at Auburn and part of a year in Union Theological Seminary; in 1862 became chaplain of Second New York Volunteers; was subsequently a hospital chaplain at Fortress Monroe; at the close of the civil war became pastor of a Presbyterian church at Highland Falls, N. Y.; in 1874 removed to Cornwall, N. Y., and began the cultivation of small fruits, publishing *Success with Small Fruits* (1880). He wrote many novels, including *Barriers Burned Away* (1872); *Opening of a Chestnut Burr* (1874); *A Knight of the Nineteenth Century* (1877); and *Miss Lou* (1888). D. July 20, 1888.

Roe, Francis Asbury: See the Appendix.

Roe, Henry: See the Appendix.

Roe, Sir Thomas: diplomat, traveler, and author; b. at Low Leyton, Essex, England, about 1568; educated at Magdalen College, Oxford; was knighted 1604; explored the river Amazon in Brazil 1609; was sent as envoy to the Great Mogul, Jahangir, and penetrated to Delhi 1614–18; was ambassador to Constantinople 1621–28, to Poland and Sweden, charged with negotiating a peace between those kingdoms, 1629; sat in Parliament for Oxford University 1640; was sent to the Diet of Ratisbon 1641. He brought from Constantinople a valuable collection of Oriental MSS., which he presented to the Bodleian Library, and procured the Alexandrian MS. of the Greek Bible, now in the British Museum. D. in England, Nov., 1644.

Roebling, rō'bling, John Augustus: civil engineer; b. at Mulhausen, Prussia, June 12, 1806; graduated at the Royal Polytechnic School in Berlin, the subject of his thesis being suspension bridges. In 1831 he emigrated to the U. S., locating near Pittsburg, Pa., and began the practice of his profession on the slack-water improvement of the Beaver river, and later made surveys for a railroad route across the Alleghany Mountains from Harrisburg to Pittsburg. Having begun the manufacture of wire rope at Pittsburg, he obtained the contract for replacing the wooden aqueduct of the Pennsylvania Canal across Allegheny river by a suspension aquednct, which was opened in May, 1845. This aqueduct consisted of seven spans, each 162 feet in length, the wooden trunk which held the water being supported by two continuous wire cables 7 inches in diameter. The construction of the Monongahela suspension bridge next followed, and in 1848–50 four suspension aqueducts were completed on the line of the Delaware and Hudson Canal. In 1851 the great suspension bridge at Niagara river was begun, and in Mar., 1855, the first locomotive crossed. This structure was erected in the face of most critical opposition by British engineers, who then regarded the suspension system as inapplicable to heavy traffic. (See Bridges.) The elegant bridge over the Allegheny at Pittsburg and that over the Ohio at Cincinnati were his next works. His last and greatest undertaking was the bridge across the East river, connecting Brooklyn and New York, which at the time of its erection was the longest bridge in the world. (See Brooklyn.) The reports, plans, and specifications for this work were all completed and operations begun when he was severely injured in the foot; lockjaw succeeded amputation, and he died in Brooklyn, July 22, 1869. His *Long and Short Span Bridges*, in press at the time of his death, treats of the advantages of combined suspension and arched bridges.—His son, Washington A. Roebling, succeeded him as engineer of the East river bridge, and under his direction it was completed in 1883. Revised by Mansfield Merriman.

Roebuck [*roe* < M. Eng. *ro* < O. Eng. *rāh*: Icel. *rā*: Germ. *reh*, roe]: a small species of the deer family (*Cervidæ*), the *Capreolus capræa*, found in Europe. It is more nearly related in some respects to the small common deer (*Cariacus*) of the U. S. than to any other of the European forms, agreeing with the former in the structure of the legs. It is characterized, however, by the antlers being destitute of an interior basal snag, the first branch arising considerably above the burr, and the tail being very rudimentary or wanting. The muffle is broad and naked; the color in summer is reddish brown, and in winter olive; there is a large white spot surrounding the anus; the height is about 2¼ to 2½ feet at or near the shoulder, and the length is about 4 feet. The species is generally distributed throughout Europe, and frequents woods and copses. F. A. L.

Roemer, Ole: See Römer.

Roentgen, Wilhelm Conrad: See Röntgen.

Rogation Days [*rogation* is from Lat. *roga're*, ask, supplicate]: the Monday, Tuesday, and Wednesday of Rogation Week, which contains Ascension Day. In the Roman Catholic Church the recital of the Litany of the Saints is a special feature of these days, and public processions are held in some countries. The second and third Rogation Days are *feriæ*, and not holy days of obligation. Tuesday is a *feria* of the first and Wednesday of the second class.

Roger: the name of the first two rulers of the Norman dynasty in Sicily. Roger I., the twelfth son of Tancred of Hauteville, born in Normandy about 1031; joined in 1058 his elder brother, Robert Guiscard, who had made large conquests in Southern Italy; participated in the conquest of Calabria, and received a part of that country; crossed over to Sicily; took Messina in 1060, Palermo in 1071, was then invested with the countship of Sicily, and completed the conquest of the island by the year 1090. His other great exploit was the abolition of the Greek Church in Sicily and the introduction of the Roman, for which the pope, Urban II., rewarded him by making him apostolic legate, with permission to appoint bishops, etc. D. at Mileto, Calabria, in 1101.—His son, Roger II., born about 1095, became Duke of Apulia and Calabria in 1127 on the extinction of the elder line, and in 1130 received the title of King of Sicily, and was crowned at Palermo by his brother-in-law, Anacletus, whom he established in Rome as antipope and sustained against Innocent II. The latter was captured in 1139 and forced to recognize Roger as King of Sicily. Subsequently Roger made war successfully on the Greek emperor and on the Saracens in Africa. His internal administration was also successful. Commerce and industry, poetry, art, and science flourished, and Sicily was one of the richest and happiest states of Europe. D. in Feb., 1154.
Revised by F. M. Colby.

Roger of Wendover: an early Latin chronicler of English history, of whom little more is known than that he was a monk in the abbey of St. Albans and died prior of Belvoir 1237. He was author of the part of *Historia Major* which is called *Flores Historiarum* and goes from 1189 to 1235. This was continued by Matthew of Paris (*q. v.*). It was edited by Henry O. Coxe (1841–44), and translated into English by J. A. Giles (Bohn's Antiquarian Library, 1849).

Rogers, Franklin Whiting: See the Appendix.

Rogers, Henry: essayist; b. in England, Oct. 18, 1806; educated at Highbury College; was for some years pastor of an Independent church; was chosen Professor of the English Language and Literature in University College, London, 1839; was afterward Professor of Philosophy in Spring Hill Independent College, Birmingham, and became in 1858 president of the Lancashire Independent College at Manchester; author of *Life and Character of John Howe* (London, 1836); *General Introduction to a Course of Lectures on English Grammar and Composition* (1838); *The Eclipse of Faith, or a Visit to a Religious Skeptic* (1853); *Vindication of Bishop Colenso* (1863); *Reason and Faith* (1866); *The Superhuman Origin of the Bible* (1873); and two series of *Essays*, reprinted from *The Edinburgh Review* and from *Good Words*, besides other works. D. in North Wales, Aug. 20, 1877. Revised by H. A. Beers.

Rogers, Henry Darwin, LL. D., F. R. S. E.: geologist; brother of William B. Rogers; b. in Philadelphia, Pa., Aug. 1, 1808; became Professor of Physical Sciences in Dickinson College, Carlisle, 1830; studied science in London in 1831; was many years Professor of Geology in the University of Pennsylvania; was employed on the geological survey of New Jersey, of which he published a report and geological map 1836, and the final report 1840; was occupied from 1836 to 1855 as director of the geological survey of Pennsylvania, making five annual reports (1836, 1838, 1839, 1840, 1841), and issued his final report under the title *The Geology of Pennsylvania* (3 vols., Edinburgh and London, 1859). In 1858 he was appointed Regius Professor of Natural History in the University of Glasgow. He published an *Atlas of the United States* (Edinburgh, 1857, 1861), prepared other American maps for the atlases of the Messrs. Johnston, published many papers in the *Transactions* of learned societies, and was one of the editors of the Edinburgh *New Philosophical Journal*. D. near Glasgow, May 29, 1866.
Revised by G. K. Gilbert.

Rogers, Henry Wade, LL. D.: lawyer and educator; b. at Holland Patent, N. Y., Oct. 10, 1853; graduated at the University of Michigan in 1874; admitted to the bar 1877; became Professor of Law in the University of Michigan 1883, and dean of the law school there 1885; was elected president of Northwestern University in 1890; Professor of Law at Yale in 1901. He edited *The American Law Register* (Philadelphia, 1887–89), and is author of *Illinois Citations* (Chicago, 1880); *Expert Testimony* (St. Louis, 1883; 2d ed. 1891), besides the introduction to a work on *Constitutional History* (New York, 1889).

Rogers, James Edwin Thorold: economist; b. in Hampshire, England, in 1823; graduated at Oxford with honors in 1846; took holy orders, but subsequently renounced them. In 1862 he was elected Professor of Political Economy at Oxford, but though a successful teacher he failed of a re-election in 1868, owing to the opposition of the Conservatives in the university to his radical views. He sat in Parliament as member for Southwark 1880–85 and for Bermondsey 1885–86. On the death of Prof. Bonamy Price, who had been chosen to the chair of Political Economy in place of Rogers, the latter was reinstated in 1888. D. at Oxford, Oct. 13, 1890. His chief work is the *History of Agriculture and Prices in England* (6 vols., 1866–88), of which *Six Centuries of Work and Wages* (1885) is an abridgment. Among his other writings are *Cobden and Modern Political Opinion* (1873); *The First Nine Years of the Bank of England* (1887); *The Economic Interpretation of History* (1888); and *The Industrial and Commercial History of England* (1892), edited by his son. F. M. C.

Rogers, John: the first of the Marian martyrs; b. at Deritend, a suburb of Birmingham, England, about 1505; graduated at Pembroke Hall, Cambridge, 1525; was rector of the Church of the Holy Trinity, London, 1532–34; chaplain to the Merchant Adventurers at Antwerp 1534–48; embraced Protestant opinions; compiled, by the aid of the translations of Tyndale and Coverdale, a revised edition of the English Bible, which he published under the assumed name of *Thomas Matthew*, probably at Antwerp (1537); returned to England 1548; became canon of St. Paul's; preached a sermon in denunciation of Romanism after the accession of Mary in 1553; was burned at the stake at Smithfield in 1555. See his *Life*, by Chester (London, 1861).

Rogers, John: sculptor; b. at Salem, Mass., Oct. 30, 1829; was two years a commercial clerk at Boston; began the study of civil engineering, but, having strained his eyes, went into a machine-shop at Manchester, N. H., 1848, and was ultimately put in charge of a railway repair-shop at Hannibal, Mo., 1856. Having amused himself at spare intervals with modeling in clay, he acquired a thirst for art, which led him to make a tour in Europe in 1857, and to spend some time at Paris and at Rome. On his return, learning of a peculiar mode of casting intricate figures, he modeled the groups of the *Checker-player* and the *Slave Auction*, with which, in Dec., 1859, he went to New York, where they attracted notice. He produced in 1861 his *Picket Guard*, followed by a succession of small groups of war-subjects, which soon gained popular favor. Among them were *Taking the Oath*; *One More Shot*; *The Wounded Scout*; *Union Refugees* (1864); *The Camp Fire*; *The Home Guard*; *The Returned Volunteer*; also *The Country Post-office* and *The Town Pump*. Among his later works are *The Fugitive's Story* (1869); *The Favorite Scholar* (1872); a series illustrative of Irving's *Legends of Sleepy Hollow* and *Rip Van Winkle* (1868–71); an equestrian statue of Gen. John F. Reynolds (1881–83); and a bronze group, *Ichabod Crane and the Headless Horseman* (1887).
Revised by Russell Sturgis.

Rogers, Randolph: sculptor; b. at Waterloo, N. Y., July 6, 1825; was in early life engaged in mercantile pursuits at Ann Arbor, Mich., and in New York; became a sculptor in Rome; returned to New York after a few years with the statues of *Nydia, A Boy and Dog*, and others, which procured him reputation; designed and modeled the bronze doors representing scenes in the life of Columbus, for the eastern entrance to the Capitol extension at Washington (1858); was several years engaged in finishing the designs for the Washington Monument at Richmond, Va., including statues of Mason, Nelson, and the two Marshalls; executed a statue of John Adams, now in Mt. Auburn Cemetery; *The Angel of the Resurrection*, for Col. Colt's monument at Hartford, Conn.; a colossal memorial monument, 50 feet high, for the State of Rhode Island, erected at Providence 1871, and one still larger for Michigan, erected at Detroit 1873, surmounted respectively by statues representing America and Michigan. He designed, among other works, the colossal bronze statue of Lincoln unveiled at Philadelphia 1871, and a *Genius of Connecticut* for the State Capitol at Hartford, Conn. He presented the entire collection of casts taken from his clay models to the University of Michigan. D. in Rome, Italy, Jan. 15, 1892. Revised by Russell Sturgis.

Rogers, Richard: clergyman; b. in England about 1550; became a Puritan minister 1575. His *Seven Treatises* (London, folio, 1605; also 1610, 1616, 1627, and 1630) constituted a kind of theological manual much used by the Brownists, and highly esteemed by Wilson, Hooker, and the early divines of New England. D. at Weathersfield, Essex, Apr. 21, 1618.

Rogers, Robert: soldier and author; b. at Dunbarton, N. H., in 1727; commanded during the "old French war" (1755–63) the celebrated corps of frontiersmen known as Rogers' Rangers, distinguishing himself in the campaigns on Lake George, and taking a prominent part in the defense of Detroit against Pontiac; went to England and published *A Concise Account of North America* (London, 1765) and *Journals of Major Robert Rogers* (1765; new ed. Albany, N. Y., 1883); was appointed governor of Mackinaw, Mich., but was soon accused of plotting to deliver that post to the French, and was sent in irons to Montreal and tried by court martial. On a visit to England in 1769 he was presented to the king; after imprisonment for debt went to North Africa, where he fought two battles in Algiers under the dey; was in Philadelphia 1775, and on suspicion of being a spy was imprisoned by order of Congress; was paroled, but again arrested by Washington, Jan., 1776; was sent to New Hampshire, where he raised a company of loyalists known as the Queen's Rangers, of which he became colonel. He went to England about 1777; was proscribed and banished in 1778; returned to England, where he died in 1800. Besides the works already mentioned, Rogers wrote *Ponteach, or the Savages of America*, a tragedy in blank verse (1766), and left in MS. a *Diary of the Siege of Detroit in the War with Pontiac* (Albany, 1860; new ed. 1883).

Rogers, Robert Vashon: See the Appendix.

Rogers, Robert William, M. A., Ph. D., D. D.: educator; b. in Philadelphia, Feb. 14, 1864; educated at the University of Pennsylvania, Johns Hopkins University, and at the Universities of Leipzig and Berlin; was Professor in Haverford College 1887–90; Professor of English Bible, Dickinson College, Carlisle, Pa., 1890–93; Professor of Hebrew and Old Testament Exegesis in Drew Theological Seminary, Madison, N. J., since 1893. He has published *Two Texts of Esarhaddon* (Cambridge, England, 1889); *Catalogue of Manuscripts (chiefly Oriental) in the Library of Haverford College* (Cambridge, England, 1890); *Unpublished Inscriptions of Esarhaddon* (Cambridge, England, 1891); *The Inscriptions of Sennacherib* (London, 1892). A. Osborn.

Rogers, Samuel: poet; b. at Newington Green, London, July 30, 1763; son of a London banker, whose counting-house he entered in boyhood; published some poetical trifles in *The Gentleman's Magazine* about 1780, and issued a small volume of verse 1786, but attracted no attention until the appearance of his best poem, *The Pleasures of Memory*, in 1792. Succeeding to his father's large estate 1793, he soon retired from active business, published another volume of verse 1798, and in 1803 established himself in the house No. 22 St. James's Place, London, which he made for half a century a kind of headquarters of literary society. He was the intimate (and often the useful) friend of nearly all the noted literary men in Great Britain, and his wealth, liberality, and social qualities gave his productions a vogue to which they intrinsically had no claim. He issued editions of his own works which are much prized for their illustrations, among them *The Voyage of Columbus* (1812); *Jacqueline* (1813); *Human Life* (1819); and *Italy* (1822); D. Dec. 18, 1855. See his *Table-talk* (1856), by Rev. A. Dyce, and *Recollections of Rogers* (1859), by William Sharpe.

Rogers, William A.: See the Appendix.

Rogers, William Barton: geologist and physicist; brother of Henry Darwin Rogers; b. in Philadelphia, Pa., Dec. 7, 1804; gave scientific lectures at the Maryland Institute 1827; succeeded his father, Dr. Patrick K. Rogers, as Professor of Natural Philosophy and Chemistry at William and Mary College, Virginia., 1829; filled a similar position in the University of Virginia 1835–53; organized the Virginia geological survey 1835, and conducted it until its discontinuance in 1842; removed to Boston, Mass., 1853; lectured before the Lowell Institute on the application of science to the arts; aided in founding the Massachusetts Institute of Technology, and was its first president 1862–68; was president of the American Association for the Advancement of Science 1876, and of the National Academy of Science from 1878. Among his physical papers are *Strength of Materials* (Charlottesville, Va., 1838) and *Elements of Mechanical Philosophy* (Boston, 1852). In conjunction with his brother, he published an essay *On the Physical Structure of the Appalachian Chain, as Exemplifying the Laws which have Regulated the Elevation of Great Mountain Chains Generally* (in *Transactions* of the Association of American Geologists and Naturalists, 1842). His geological writings are reprinted in *Geology of the Virginias* (1884). D. in Boston, May 30, 1882. Revised by G. K. Gilbert.

Rogersville: village; capital of Hawkins co., Tenn.; on the Tenn. and Ohio Branch of the Southern Railway; 3 miles N. W. of the Holston river, 50 miles E. N. E. of Knoxville (for location, see map of Tennessee, ref. 5–J). It is in an agricultural region, and contains McMinn Academy, Synodical Female College (Presbyterian, chartered in 1848), several quarries of variegated marble, a roller flour-mill, furniture-factory, a national bank with capital of $75,000, a private bank, and three weekly newspapers. Pop. (1880) 740; (1890) 1,153; (1900) 1,386. Editor of "Herald."

Roget, rō-zhā', Peter Mark, M. D., F. R. S.: physician; b. in London, England, Jan. 18, 1779; graduated in medicine at Edinburgh 1798; became physician to the infirmary at Manchester 1804; settled in London 1808; was an esteemed lecturer in several scientific institutions, and the first Fullerian Professor of Physiology at the Royal Institution; for twenty years secretary of the Royal Society 1827–47; became a member of the senate of London University 1826; was president of the Medical and Chirurgical Society 1829–30, and became examiner in physiology to London University 1839. D. at Malvern, Sept. 17, 1869. He published *Animal and Vegetable Physiology* (Bridgewater Treatises, No. v., 1834); *Physiology and Phrenology* (1838); and *A Thesaurus of English Words and Phrases* (1852; 12th ed. 1881).

Rogue River Indians: See Athapascan Indians; also Takilman Indians.

Rohilkhand': a division of the Northwestern Provinces, British India; bounded E. by Oude, W. by the Ganges. Area, 10,884 sq. miles. It is traversed by the railway from Saharanpur to Lucknow. It received its name from the Rohillas, an Afghan tribe, which settled here in the middle of the eighteenth century. Pop. (1891) 5,345,740. M. W. H.

Rohlfs, Anna Katharine (*Green*): novelist; b. in Brooklyn, N. Y., Nov. 11, 1846. She was married in 1884 to Charles Rohlfs, and afterward removed to Buffalo, N. Y. Her first novel, *The Leavenworth Case* (1878), was a very successful "detective" story, somewhat after the school of Gaboriau. This was followed by others of the same sensational character, including *A Strange Disappearance* (1879); *The Sword of Damocles* (1881); *Hand and Ring* (1883); *The Mill Mystery* (1886); besides a volume of verse, *The Defense of the Bride* (1882), and a drama, *Risifi's Daughter* (1887). H. A. Beers.

Rohlfs, Gerhard: explorer; b. at Vegesack, near Bremen, Apr. 14, 1831; studied medicine at Heidelberg, Würzburg, and Göttingen; served in the foreign legion of the French army in Algeria; went in 1860 to Morocco, where he lived for some time at Fez, and traveled widely in Mohammedan attire. In 1862 he explored the oases of Tafilet. He explored (1863) the eastern part of the Greater Atlas, and pushed south to Tuat in the desert. In 1865 he started on his famous journey from Tripoli to Lake Tchad, crossed the Sudan

states of Bornu and Sokoto, reached the Benue branch of the Niger, and descended to the mouth of that river. This journey ranks among the greatest of African explorations. He took part in the British expedition against Abyssinia (1867). He traveled (1868) across the northern part of the Libyan desert, and discovered the depressions below sea-level S. of the Mediterranean coast plateau. The years 1873 and 1874 were also spent in researches in the Libyan desert at the expense of the Khedive of Egypt. He was the bearer of a letter (1880) to King John of Abyssinia from the Emperor of Germany. In 1885 he was appointed German consul-general for Zanzibar, but soon resigned and settled in Weimar. D. near Godesberg, Rhenish Prussia, June 3, 1896. His writings are voluminous, and among them are *Reise durch Marokko* (Bremen, 1869); *Im Auftrage des Königs von Preussen in Abessinien* (1869); *Land und Volk in Afrika* (1870); *Von Tripolis nach Alexandria* (2 vols., 1871); *Mein erster Aufenthalt in Marokko* (Bremen, 1873); *Quer durch Afrika* (2 vols., 1874–75); *Drei Monate in der Libyschen Wüste* (1875); *Beiträge zur Entdeckung und Erforschung Afrikas* (1876); *Neue Beiträge zur Entdeckung und Erforschung Afrikas* (1881); *Kufra, Reise von Tripolis nach der Oase Kufra* (1881); *Meine Mission nach Abessinien* (1883); *Angra Pequena* (1884); *Quid novi ex Africa?* (1887). His *Adventures in Morocco* were published (1874) in London. C. C. Adams.

Rojas y Zorrilla, rō′*kh*aas-ee-thō-reel′yăă, Francisco, de: dramatist; b. at Toledo, Spain, Oct. 4, 1607. There is practically no information as to his life, and the difficulties in the matter are much increased by the appearance in the seventeenth century of several other persons of the name Francisco de Rojas. From certain of his works it has been conjectured that he studied in the Universities of Toledo and Salamanca. He had already become famous in 1632, for Montalván speaks of him in his *Para todos* of that year as *poeta florido, acertado y galante*. He was a member of the group of great Spanish dramatists of his time, and not only produced plays of his own, but also wrote in collaboration with Calderón, Montalván, Vélez de Guevara, and others. A curious rumor was afloat in Apr., 1638, to the effect that he had been assassinated in a quarrel; but this must have been wholly untrue, or an exaggerated account of a real disaster, for in 1644 he obtained the honor of the mantle of the Order of Santiago, a sign of court favor. The date of his death is unknown, but he may have lived till 1680. He wrote a large number of plays (*comedias*) and sacred pieces (*autos*), but, with the customary carelessness of the dramatists of his time, was at slight pains to collect and preserve his works. He did indeed publish two *Parts* of his dramas (1640 and 1645), and announced a third. The latter never appeared, and many of his best plays were printed in a scattered and probably piratical way. His most famous piece is undoubtedly that entitled *Del Rey abajo ninguno* (None below the King), in which the peculiarly Spanish motive of personal honor seeking redress, but held in check by loyalty to the king, is admirably developed. Excellent also are the comedies of intrigue, *Entre bobos anda el juego* (The Simpleton's Sport), and *Lo que son mujeres* (What Women Are). Like so many of his Spanish contemporaries, Rojas was freely pillaged by the French dramatists—among others by Thomas Corneille and Scarron. Le Sage also plundered his *Casarse por vengarse* for the story of *Le Mariage de Vengeance* (*Gil Blas*, iv., 4). There is no complete edition of the plays of Rojas, but a good selection is given in vol. liv. of Rivadeneyra's *Biblioteca de Autores Españoles* (Madrid, 1866). A. R. Marsh.

Rokitan′sky, Karl, Baron von: anatomist; b. at Königgrätz, Bohemia, Feb. 19, 1804; studied medicine at Prague and Vienna; was appointed Professor of Pathological Anatomy in the University of Vienna in 1834, and retired in 1875. In 1869 he was made president of the Austrian Academy of Sciences. His *Handbuch der pathologischen Anatomie* (5 vols., 1842–46; 3d ed. 1855–61) was translated into English at the expense of the Sydenham Association (4 vols., 1849–52), and is considered the foundation of the science of pathological anatomy. D. in Vienna, July 23, 1878.

Roland: the name of one of the principal representatives of mediæval chivalry, but whether he is an entirely fictitious personage, or whether he was one of Charlemagne's paladins and fell at Roncesvalles in 778, is doubtful. His life and exploits form the subject-matter of numerous ballads, epics, romances in prose, rhymed and unrhymed chronicles in French, Spanish, English, Italian, German, and Danish.

Roland, Manon Jeanne Philipon, Madame: wife of Jean Marie Roland de la Platière, whom she married in 1780; b. in Paris, Mar. 17, 1754, daughter of an engraver. From her reading of classical literature and from Rousseau she imbibed republican ideas, and greeted the Revolution with enthusiasm. Her salon in Paris was a gathering-place for the Girondist party. She bore an equal share in her husband's labors, and was active, even after his arrest and flight, in support of the moderate cause. She was suspected of treasonable correspondence, imprisoned in June, 1793, and executed Nov. 8, 1793, meeting her end with great courage and fortitude. Her *Mémoires*, written in prison, were edited by Dauban (4 vols., Paris, 1864), as also her *Lettres* (2 vols., Paris, 1867). See Dauban, *Étude sur Madame Roland* (Paris, 1864). A. G. Canfield.

Roland de la Platière, rō′lăăṅ′de-lăă-plăă′ti-ār′, Jean Marie: author and statesman; b. at Villefranche, Rhône, France, Feb. 18, 1734. By study and wide observation he became an authority on the industrial arts, and wrote a *Dictionnaire des manufactures et des arts qui en dépendent* (3 vols., 1785). He was inspector-general at Lyons when the Revolution broke out, and was chosen in 1791 to represent the Lyons workmen in the National Assembly, where he allied himself with the Girondists. He became Minister of the Interior under Dumouriez in 1792, was removed because of his attitude toward the king, but restored after the fall of the throne Aug. 10; he opposed the Jacobins, was arrested May 31, 1793, escaped, and fled to Rouen, where he killed himself Nov. 15, 1793, on hearing of the execution of his wife. A. G. Canfield.

Rolf: See Rollo.

Rolfe, Robert Monsey: See Cranworth.

Roll, Alfred Philippe: genre and portrait painter; b. in Paris, Mar. 10, 1847; pupil of Bonnat and Gérome; third-class medal Salon 1875; first-class 1877; officer Legion of Honor (1889); one of the strongest painters of the younger school of French artists. His *In Normandy* (1883) is in the Luxembourg Gallery, Paris. *The Festival of Silenus* (1879), in the museum at Ghent, and *The Strike of the Miners* (1880), in the museum at Valenciennes, are two of his most important works. Studio in Paris. W. A. C.

Rolla: city; capital of Phelps co., Mo.; on the St. Louis and San Fran. Railway; 50 miles S. S. E. of Jefferson City, 111 miles S. W. of St. Louis (for location, see map of Missouri, ref. 6–H). It is in an iron-mining region, is the seat of the Missouri School of Mines and Metallurgy (a branch of the State University, organized in 1871), and contains several smelting furnaces, flour and grist mills, a national bank with capital of $50,000, and three weekly newspapers. Pop. (1880) 1,582; (1890) 1,592; (1900) 1,600.

Rollers: birds of the family *Coraciidæ*, many species of which have the habit of rolling over in the air like tumbler pigeons. The family, which is related to the *Alcedinidæ* (kingfishers) and *Caprimulgidæ* (goatsuckers), includes the genera *Coracias*, *Eurystomus*, and their allies. The rollers are birds of moderate size with stout beaks, wide gape, weak legs, and short toes. Most are of brilliant plumage, in which blue, green, reddish brown, and dark red predominate, and thousands are used in the millinery business. They nest in holes in trees and lay white eggs. They feed largely upon insects, which they dart upon like bee-eaters, but mice, small reptiles, eggs, young birds, and fruit also form part of their diet. The rollers are restricted to the Old World; Asia and Africa are their headquarters, a number are found in Malaysia, a few in Australia, and one species ranges into Europe. This, the blue roller, *Coracias garrula*, is about a foot long; the back is cinnamon brown, head, neck, and wing-coverts pale blue, rump ultramarine, this color also appearing on the under side of the primaries; upper tail-coverts greenish blue, tail-feathers blackish brown, blue at the base; under parts pale greenish blue. A monograph of the family has been published by H. E. Dresser. F. A. Lucas.

Rolleston, rōls′tŭn, George, M. D., F. R. S.: anatomist and physiologist; b. at Maltby, Yorkshire, England, July 30, 1829; graduated at Oxford; studied medicine; became physician to the Radcliffe Infirmary and Lee reader in anatomy at Christ Church, Oxford, 1857; Linacre Professor of Anatomy and Physiology in Oxford University 1860. His principal published treatise was *Forms of Animal Life* (1870). He was reputed one of the ablest modern investigators of comparative physiology. D. June 9, 1881. See his *Scientific Papers and Addresses* (2 vols., 1884).

Rollin, rō'lăn', CHARLES: historian; b. in Paris, France, Jan. 30, 1661; studied theology at the Sorbonne, but did not take orders; was appointed professor in the Collège de France in 1688; became the rector of that university in 1694, and two years later was appointed coadjutor at the Collège de Beauvais. He lost his position in 1712 because he was believed to hold Jansenist opinions, but was reinstated in 1720. D. in Paris, Sept. 14, 1741. His best-known work is *Histoire ancienne* (13 vols., 1730–38), which has often been reprinted both in French and in English. His other works include *Histoire romaine* (9 vols., 1738–48), continued by Crevier, Lebeau, and Ameilhon, and *Traité des études*.

Revised by F. M. COLBY.

Rollin, LEDRU: See LEDRU-ROLLIN.

Rolling-mills: establishments provided with machinery for rolling metal (generally in a heated state) into sheets, bars, rails, rods, or wire. The most important are for iron and steel, and it is these that are described in this article; but in general the processes are the same for other metals. In such establishments the typical machine, also called rolling-mill, is an apparatus consisting of two or more cylindrical rolls, with smooth, rough, or grooved surfaces, so constructed and operated as to reduce a billet or pile of heated iron from an initial form as received from the heating furnace to an intermediate or a final shape called for by the market or by the operations to which the metal is to be submitted.

This reduction of a mass to forms of smaller cross-section is performed with great ease and rapidity, and at comparatively small cost where the alternative is hammering or the use of the hydraulic press. The introduction of the rolling-mill by Henry Cort in 1783 was the most effective step in the production of cheap wrought iron and malleable steel, with the exception of the Bessemer process, which has signalized the progress of invention in that important field. The first operation preparatory to the manufacture of wrought iron is that of puddling (see IRON), or the removal of the carbon and silicon from the cast iron, and the production of a puddle-ball, or a bloom, which is then sometimes given a preliminary shaping under the hammer, but is more often taken directly to the rolls. In steel-making, preliminarily to the use of the rolling-mill, the oxidizable constituents of the cast iron are removed by burning out, in the Bessemer converter or in the Siemens-Martin furnace (open-hearth furnace), and the resulting ingot or bloom is treated as is wrought iron.

The first milling operation is that of roughing down, in the roughing-mill (a pair of rolls with roughened surfaces); the second reduces the slabs thus formed to muck-bars, between smooth-surfaced rolls, and these bars are then rolled into the forms required for the market by a third set of rolls. The speed of rotation of the rolls is the greater as the size of bar, rod, or wire is less, or as the sheet is thinner. In making heavy armor-plate rolls 3 feet or more in diameter, turning at the rate of fifty revolutions per minute, are used; thin plates and small rods are often rolled at speeds several times as great, in mills having rolls 8 or 10 inches in diameter. In merchant mills a number of stands of rolls are arranged in such manner as to permit the convenient passing of the metal from the larger to the smaller, the ingot being gradually reduced to the finished rod, sheet, or wire. Tires of iron are rolled from a ring, which is made by first forging a disk of proper dimensions and punching out its center by a heavy press or hammer, and then rolling the rim thus left in a mill made especially for the purpose. If made of steel, the ingot is cast in the desired form for introduction into the mill.

Mills for cold-rolling are given exceptional strength, and reduce rods and bars very slightly, in the cold state, thus greatly increasing their strength and still more their elasticity. The effect of this process was found by Fairbairn, Whipple, and Thurston, who made a long and complete study of the subject, to raise the tenacity of the metal 50 to 100 per cent., to elevate the elastic limit in still higher proportion, and greatly to reduce the ductility and malleability of the iron and steel. (*Engineering*, 1878, p. 347.) A slitting-mill consists of a set of rolls with deep collars and grooves alternating, the upper collars fitting the grooves in the lower roll. Between these rolls sheets of thin metal are passed, and by them divided, by slitting, into a number of rods of rectangular section, the collars and grooves acting as shears.

Nearly all the members of machines and structures for which iron and steel are suitable—ships, roofs, boilers, bridges, railways and their rolling stock, and those adapted to the purposes of general engineering—are so designed that they can be rolled or compounded of rolled forms, for this method of manufacture is essential to their uniformity and cheapness, and this condition does not seriously embarrass designers, because the great majority of desirable forms can be rolled. If the direct products of the rolling-mill, the leading types of which are shown in Fig. 1, are of unsuitable

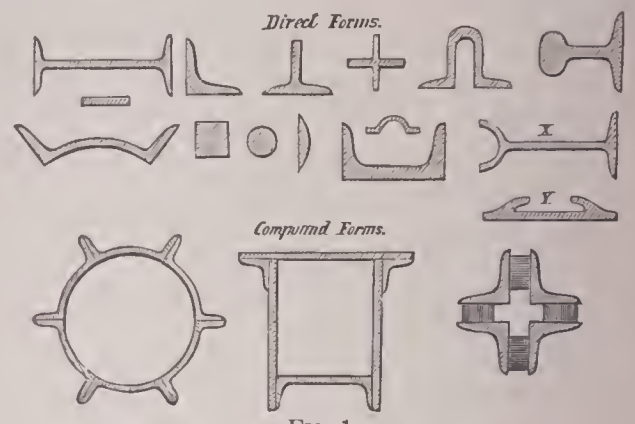

FIG. 1.

figure or size, endless modifications may be produced by compounding them. It is only necessary in any rolled bar that the cross-section shall be uniform throughout its length, and that none of the grooves required in the rolling shall be wider at the bottom than at the top. The chair-bar Y and the form X (Fig. 1) could not be rolled directly; the flanges must be folded down by a subsequent operation.

The leading features of improvement have been (1) increased capacity, due to larger size, better proportions, stronger materials, and notably to better workmanship. (2) The arrangement of the rolls so as to work both ways. In a simple two-high mill (Fig. 2), running constantly in one direction, the bar, after passing between the rolls, must be drawn back by hand over the top roll, and entered again for another compression; thus half the time and a considerable amount of heat are wasted, and unproductive labor is performed. The first remedy was to reverse the motion of the rolls after the bar had passed through, so that they would draw the bar back again, and in so doing compress it.

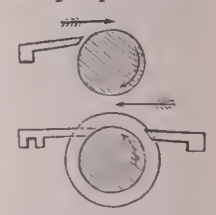

FIG. 2.—Two-high mill.

The reversing is usually effected by gearing and clutches, and sometimes by reversing suddenly a double engine running without a fly-wheel. In any case the reversing machinery is costly to construct, wastes power, and requires many repairs. In the three-high mill (Fig. 3) the bar is entered at the front of the train, between the middle and bottom rolls, and at the rear of the train between the middle and top rolls. The engine runs constantly in one direction, thus avoiding the shock and delay of reversing; and the additional labor, as compared with the reversing mill, is the lifting of the bar on the back of the train through the height of the middle roll. In light work, such as rails, which are in any case passed to and fro by the workmen on hooks or swinging levers, this additional labor is very small, while heavy work is raised by tables moved by steam-power.

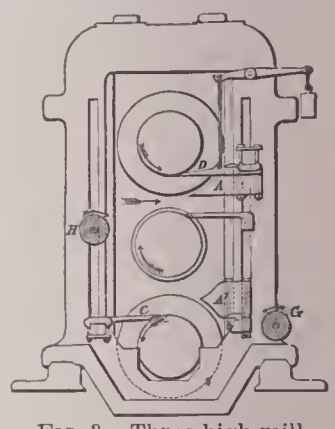

FIG. 3.—Three-high mill.

The other notable means of performing work on the bar at both passes is Brown's double mill (Fig. 4), introduced in England. It consists of two complete and distinct sets of two-high rolls in double housings, the two sets moving in opposite directions. The bar being entered at H, passes between the rolls A A without touching them, deep grooves being cut in the rolls for the purpose. The bar is caught and reduced by the rolls B B. Before the return pass the bar is moved laterally, and then it is entered in another groove and passes between the

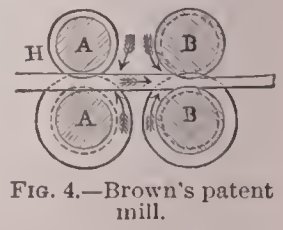

FIG. 4.—Brown's patent mill.

rolls B B without touching, and is caught by the rolls A A. Brown's mill avoids both the shock of reversing and the necessity of raising the bar. It is, however, costly, requiring on many kinds of work more aggregate length of rolls and more bearings than the three-high mill in the proportion of $2\frac{2}{3}$ to 1.

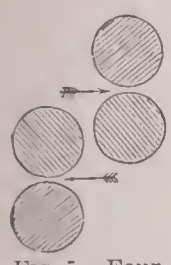

Fig. 5.—Four-high mill.

In the four-high mill (Fig. 5) the passes are made between the two upper rolls and between the two lower rolls, in order to keep the bar constantly the same side up.

The third improvement in rolling-mill practice is the utilization of the waste heat of the iron-heating furnaces for making steam to drive the machinery. A plain cylinder boiler, communicating with the chimney-flue of a heating furnace, will furnish steam-power enough to roll all the iron that the furnace will heat. The temperature of steel-heating furnaces is lower, and multitubular boilers and the highest economics in the transmission and application of steam are necessary to furnish the required power.

The fourth radical improvement is the twofold improvement of the Siemens gas-furnace. (See Furnace.) First, the coal, instead of being wastefully burned in each individual furnace, is converted into gas in a system of producers. The gas is led to the furnace, and there properly mixed with air and perfectly burned. Second, the waste heat of the furnaces is employed in regenerators, to heat the air and gas before they mingle in the furnace, and it is thus fully utilized; 300 lb. of coal will by this means heat a ton of ingots or rail piles, while 800 lb. of coal are used for the same work in the best practice with an ordinary furnace.

The fifth great improvement in rolling-mill arrangements is the application of independent and direct-acting steam-engines, not only to the different trains of rolls, but also to the other machines, such as saws, punches, and shears. For these smaller engines the necessity of carrying steam-pipes all over the mill involves the difficulty of excessive condensation in the pipes; but a more serious objection to the old practice of driving everything by a single engine is the costly maintenance of long lines of belts and shafting. Another objection is the expense of running all this shafting and a large engine in order to drive a single machine if the other machines are not working. Power-distribution by the electric current is sometimes employed with encouraging financial results.

In addition to these principal changes, many valuable improvements have been made in shaping the roll-grooves to do a greater variety and better quality of work. Improvements have also been made in devices for feeding the bar into the mill, in guides and guards for promoting the smooth delivery of the bar out of the mill, and in the arrangements of these and their associated parts.

Let us now analyze the roll-train, considering first, and in its simplest form, a two-high mill with smooth rolls for making plates. There are first laid down two bed-pieces or shoes for supporting the housings. These are bolted to masonry foundations, a strip of oak being laid beneath them to give a close continuous bearing, and to provide a slight but most helpful elasticity. A stratum of oakum three-quarters of an inch thick, driven between the shoe and the masonry, is sometimes used, and it makes a better fit and is more durable. The housings must be of sufficient height and width to permit changing rolls from front or rear; they must be accurately fitted to the movable bolsters that hold the rolls, and must give them firm lateral support; they must be furnished with the screws to receive the thrust of the top-roll and to vary the distance between the rolls; they must sustain the various guiding and feeding machinery; and, while they give room for all these parts and their functions, they must be strong enough to resist all strains and the heavy shocks of rolling. When one roll only is coupled to the engine, the other is turned by the friction of the bar passing between the two. This, however, is practicable only for planishing or finishing rolls, where the work is extremely light. In reducing all ordinary shapes the resistance of the uncoupled roll bends the bar and interferes with smooth working; and for this reason the two pinions, one of which is coupled to the engine, are interposed between the engine and the rolls to impart to them a perfectly uniform rotation. The coupling between a pinion and a roll, or between two stands of rolls—seven or eight stands of rolls being often coupled end to end from one set of pinions—is a form of clutch, consisting of a cast-iron spindle and two cast-iron rings or boxes, fitting partly over the spindle and partly over the roll-necks. Fig. 3 is an end view of a three-high mill, and in this the rolls are held at fixed distances apart. In the plate-mill, the rolls being of uniform diameter, the same part of the rolls may be used for all the passes, the reduction in thickness being produced simply by decreasing the space between the rolls vertically at each pass, and the edges of the plate are not finished at all. In rolling bars, however, it is necessary to preserve a uniform width and a smooth finish on the sides or edges of the bar, and hence the work must be done in grooves.

The simplest form of plate-mill is a pair of smooth rolls, one of which is adjustable vertically by means of a screw, so that the pile may be reduced definitely in thickness at each pass. This mill wastes time and heat, as previously observed, by requiring the plate to be drawn over the top roll after each pass, without receiving any work. A very ingenious means of reducing the plate at both passes is Lauth's system, in which a small roll is interposed between the top and bottom rolls. This roll requires no pinion, because it is powerfully driven by the friction of the roll against which it bears, while the plate passes alternately under and over it. It requires no transverse strength, for that is provided by the large roll, against which it bears from end to end. It may thus be of small diameter, and the plate need only be lifted through its diameter, instead of through the diameter of the large top roll.

In rail-finishing trains the rolls must be rigidly fixed at a definite distance apart, for to screw them together would change only the thickness of the bar, and not its outline. In rolling blooms, however, and some other rectangular or nearly rectangular forms, the same groove may be used over and over again by screwing the rolls together, and a considerable economy in machinery is thus effected. A three-high mill with vertically moving instead of fixed rolls for this class of work and for plate-rolling was erected at the Bessemer steel-works in Troy, N. Y., in 1870, with entire success. Another form, with a fixed middle roll and vertically moving top and bottom rolls, was erected shortly afterward at the Cambria steel-works at Johnstown, Pa., with equal success. The compression of a 2,000-lb. ingot is chiefly a question of the strength of parts, but the handling of the ingot so that the rolls can get hold of it, and the quick adjustment of the middle roll after each pass, involve some new and complex combinations.

Ramsbottom's blooming-mill consists of a pair of reciprocating cams or segments of rolls. The blooms must be short unless the mill is excessively large, and the continuous rotary mill would appear to be the more economical machine.

The universal mill consists of an ordinary two-high mill standing horizontally and another two-high mill standing vertically, so that the four rolls press the bar on all four sides at the same pass. In some cases there are two vertical sets of rolls—one at the front and the other at the rear of the horizontal rolls. This mill is very useful for making uncommon sizes of flat and square bars, for which it would not pay to make special grooved rolls.

The grouping of mill machinery depends, of course, largely upon the locality, the available space, and the direction in which raw materials arrive and finished products depart. These conditions, however, should rarely prevent a good internal arrangement. The important point to be considered is economy in handling the materials used; but in many mills, especially those rambling structures which have grown up little by little, and in which no provision was made for future enlargement, the materials are rehandled three or four times when once should suffice. Another point is to leave room enough for each operation without embarrassing any other. In a well-arranged mill all materials should be received and all the heating done at one end, the rolling machinery should be near the middle, and the finishing and shipping should take place at the other end, the product thus passing as nearly as possible in a direct line.

In reference to the construction of large and costly works, two features are found to be of vital importance: (1) Machinery for making steel and iron must be thoroughly strong, well built, and trustworthy, and in some parts even duplicated, so that it will stand crowding to the utmost limit of endurance. (2) In order to save manual labor in handling the materials—for this is the trying element in nearly all manufacturing—an establishment must be large enough to keep the maximum amount of steam-power employed. Hydraulic feeding-tables and other similar machines, steam-hoists and locomotive engines, and all kindred appliances

must be kept at work in order to be profitable; and this can be done only in extensive works.

Later improvements have included the extensive employment of automatic devices in all departments and of hydraulic transmission of power, and the use of often enormous hydraulic presses in place of the steam-hammer for reducing ingots and shaping heavy plates, as well as in forging large masses of all descriptions.

Revised by R. H. Thurston.

Rollo: the celebrated conqueror of Normandy. According to the saga of Harald Haarfager he was a son of Ragnvald, jarl of More, and was called Ganger Rolf—that is, Walking Rolf—because he was so large and heavy that no horse could carry him. Harald Fairhair drove him into exile, and this led to his crossing the seas and founding Normandy. According to Dudo, of St. Quentin, who wrote the history of Normandy in the eleventh century, Rollo was the son of a Danish chief, and on account of trouble with the Danish king fled from his native country, fought for many years in France, and finally got possession of Normandy. The Icelandic version making him a Norwegian is that most generally accepted. In 912 Rollo made peace with Charles the Simple in St. Clair. He received for himself and his followers the country along the banks of the Seine river, between the little rivers Epte and Eure. He and his men accepted the Christian religion, and Rollo was baptized at Rouen and took the name and title Duke Robert. He is thought to have been over eighty years of age at the time of his death in 930. William the Conqueror was his great-grandson. See Normans. Rasmus B. Anderson.

Rolls, Master of the: See Master.

Romagnosi, rō-măăn-yō'scĕ, Gian Domenico: jurist and philosopher; b. at Salso Maggiore, near Piacenza, Italy, Dec. 13, 1761; in 1786 took his legal degree at Pavia; at thirty years of age published his *La Genesi del Diritto Penale*, which was highly esteemed both in Germany and in Italy. In 1791 he occupied important civil offices in Trent, where he continued to practice as an advocate; in 1803 was appointed Professor of Law at Parma, a position which he retained till 1806, when he was called to Milan to assist in digesting a code of penal procedure, which was afterward adopted. Later a chair was created expressly for him in Milan. Upon the fall of the Bonapartist kingdom of Italy he had to endure poverty and imprisonment. Being set at liberty, he continued his labors under great privations, supporting himself by private lessons. D. in Corfu, June 8, 1835. An edition of his works in 19 vols. was published in Florence (1832–35) and in Milan (15 vols., 1836–45). The most noted of his philosophical writings are *Che cosa e la mente sana?*, *La suprema economia dell' umano sapere*, and *Vedute fondamentali sull' arte logica*.

Romaic: the name applied to the vernacular language of the modern Greeks. See Greek Language.

Romaine, William: clergyman; b. at Hartlepool, Durham, England, Sept. 25, 1714; studied in Oxford; was ordained a clergyman of the Church of England in 1736, and was appointed Professor of Astronomy in Gresham College, and rector of St. Ann's, Blackfriars, London, where he died July 26, 1795. His sermon on *The Lord our Righteousness*, published early in his career, was so strongly Calvinistic that immediately after its delivery he was practically excluded from the pulpit in Oxford, but in London his preaching was much appreciated. He became an acknowledged leader in the evangelical party in the English Church, and his writings have a reputation among the adherents of this school of theological thought.

Roman Archæology: the history of ancient Rome, as illustrated by the remains of its architecture and works of art.

Development of Art in Rome.

The Period of Hellenic and Etruscan Influence.—Before the establishment of Greek colonies in Southern Italy the site of Rome was occupied by Latins of a low civilization. Roman culture first received a higher impulse when the colonies from Magna Græcia began to extend their civilizing influence toward Latium and Etruria. This was felt by Rome, partly in a direct and partly in an indirect way, through the coast towns of Southern Etruria, where in early times a rich industrial art, inspired by Greek models, had been developed. The Etruscan temple, the *templum Tuscanicum*, followed, as far as our knowledge extends, the Grecian Doric type. The ground plan, however, approached more to a square, the pediments were higher, the intercolumniations wider, and the building rested upon a high, oblong terrace, up to the front of which led an open flight of steps. The oldest temple in Rome, the temple of Jupiter upon the Capitol, built by Tarquinius Priscus, was in the Tuscan style. Also, the clay image of the god placed in the temple, and the *quadriga* of the same material over the pediment, were works by an Etruscan artist. The statue held the thunderbolt in its right hand, and in its left probably a scepter. The flesh was painted red, and the color was renewed from time to time. The costume of the figure consisted of a removable wreath, probably of gold, and of the *toga palmata*, a garment decorated with Asiatic designs, in which the statue was draped on festal occasions. On the other hand, the wooden image of Diana placed in the temple dedicated to this goddess by Servius Tullius, on the Aventine Hill, appears to have been a Greek work, or at least a copy of one, for it exactly resembled an idol that the Phocæans had brought with them to Massilia (the modern Marseilles).

Only a few examples of building in stone remain to us from this ancient period. First among these is the Servian city wall, built of colossal blocks of tufa, without cement; then the reservoir (*Tullianum*), at the foot of the Capitol, the covering of which is formed with layers of stone placed over each other, gradually projecting inward as they rise; and finally the vaulted Cloaca Maxima, built by Tarquinius Priscus in order to collect the subterranean springs that percolated through the Roman soil, as well as to drain and dry the morasses of the Velabrum and Forum. The original form of this gigantic work has been greatly modified by later restorations. Other sewers have been discovered which almost surpassed the Cloaca Maxima in size and length of channel and drained almost as vast an area.

Of the first centuries of the republic evidences remain, showing an increase of the direct Greek influence. When it was decided to decorate the temple of Ceres (dedicated 485 B. C.) near the Circus Maximus, two Greeks, Damophilus and Gorgasus, distinguished both as modelers in clay (*plastæ*) and as painters, were called to Rome. The types of the Roman copper coinage (which begins under the Decemvirs, 451–449 B. C.) are formed after Greek patterns. The statue erected upon the Comitium to the interpreter of the Decemvirs, the Ephesian Hermodorus, appears also to have been the work of a Greek hand. Still we must not be blind to the fact that the earliest producers of works in bronze were called by the Romans Volkani (hence Vulcanus), from Vulci their place of origin and center of activity.

Especially indicative of the physiognomy of Rome, as it appeared in the fifth, fourth, and in some quarters of the city also during the two following centuries, is the known fact of the employment of Damophilus and Gorgasus as architects. The manner of ornamentation employed by these artists was that of a polychrome, terra-cotta style, early abandoned in Greece, but long in vogue in Latium and Etruria. The walls, whether of brick or of timber, were incrusted with plates of terra-cotta, upon which were painted ornamental, and sometimes also figurative, representations. Polychrome figures in terra-cotta adorned the pediments of the temples. Fragments of stucco decorations made in this manner have been found as well in the Etruscan cities as in Rome upon the Esquiline. They show the vast extension, and, since they represent a succession of different stages of style following each other, the long duration as well, of this method of ornamentation.

A contrast to this gay variety was offered by the dark-gray blocks of peperino, of which the substructions of the temples and of the public buildings generally were formed, although it is probable that even of these the most prominent architectural members were rendered more conspicuous by the addition of color or of metallic incrustations.

A fact of much significance, in reference to the diffusion of Hellenic views of art among the Romans, occurs at the end of this period. In the year 301 B. C. a Roman patrician, C. Fabius, executed with his own hand paintings in the temple of Salus; and the branch of this distinguished family that descended from him received the surname of "the painters" (*Pictores*). The forms of the designs, however, assumed in many respects a peculiarly Italic character—a different stamp from the true Greek art. This fact is proved by the discovery of a copy from one of the original paintings by Fabius Pictor. This is illustrated by Visconti in vol. xvii. (1889) of the *Bullettino archeologico Comunale*, p. 340. This copy, dating from the seventh century of Rome,

has been found in one of the oldest tombs of the Esquiline. The ornamentation upon the peperino sarcophagus of Cornelius Scipio Barbatus (beginning of the third century before Christ—Vatican) consists of motives from the Doric style.

The Hellenic Period.—The extension of the Roman dominion over Magna Grecia, Sicily, and finally over Greece itself, was productive of most important results. By this means the Romans were brought into intimate relation with Grecian culture. The taking of Syracuse by M. Marcellus (B. C. 212), and the wars waged against Macedonia and Greece, successfully terminating in the conquest of Corinth (B. C. 146), opened the way for the transportation of numerous works of Greek art to Rome. First the public squares and buildings, and then the town and country houses of prominent Romans, were adorned with these treasures of Greek sculpture and painting. The statues were placed on rough stone pedestals, on which a statement of their origin was engraved. Moreover, this new capital of the world offered a better opportunity for remunerative labor than the declining cities of Greece proper and the hopelessly shattered empires of Alexander's successors, and consequently there began at this time an extensive immigration of Greek artists to Rome. As early as the middle of the second century some of them were engaged upon important public works. After the triumph of Q. Metellus over Macedonia (B. C. 146), Hermodorus of Salamis erected a portico which bore the name of that general, and the same architect was commissioned ten years later, by Brutus, to build the temple of Mars lying in the vicinity of the Circus Flaminius. The temples connected with the portico of Metellus were adorned with sculpture by the Greek artists Polycles, Dionysius, Timocles, and Timarchides. Thus Rome became gradually the center of activity for Greek art. In comparison with the high degree of development attained in art in former times, there was now clearly a decline in the creative power; still, Greek art had enough of vitality, even upon Roman ground, to bring to maturity a beautiful aftergrowth. As at this period Roman civilization became more thoroughly Hellenized, and as the literature almost universally assimilated itself to the Grecian type, so also in the realm of the fine arts Greece had almost completely crowded the Italic element out of the field. We have here, in fact, the spectacle of essentially pure Greek art carrying out on Italic soil the same tendency in its exercise which had prevailed in Greece and in the Hellenic East in the third and second centuries before Christ.

Later Years of the Republic and the Empire: Architecture and Architectural Ornamentation.—In architecture the Romans seem to have better preserved their originality against Greek influence, although in this period comparatively few sculptors and painters with Roman names are known, and these few are by no means of great importance. We have strong evidence that even in Greece the merit of Roman architects was acknowledged, in the remarkable fact that when the Syrian king, Antiochus Epiphanes (B. C. 176–169), determined to finish the temple of the Olympian Jupiter at Athens, he intrusted the direction of this undertaking to the Roman knight Cossutius. On the other hand, it is difficult to decide how far in architecture the Romans were really creative in the highest sense—how far they invented new elements in construction and ornamentation. There is a hiatus in the history of art for this period which renders impossible the satisfactory investigation of this interesting question. No period of Greek development was better adapted to influence the Romans, either as to architecture or in other directions, than that of the Diadochi (i. e. successors of Alexander), which was nearest to them in point of time and best suited to their views and requirements. Cities like Alexandria in Egypt, Antioch on the Orontes, Seleucia on the Tigris, founded with the direct object of establishing great centers of intercourse and commerce, must have furnished the Romans with the most suitable models for the reconstruction of their own capital in a manner adapted to its newly attained position of power; but, unfortunately, very little is known concerning the architecture of these Hellenic cities. It can not be positively decided therefore how far the Romans acted independently in the use of the arch, the vaulted roof, and the dome which were favorite elements in the architecture of the empire. The double purpose of use and ornament was served by the arch and vaulted roof in the construction of the fornices, or covered archways, which stood at certain important points as monuments to mark the direction of the main avenues of intercourse. From the time of the republic are known to us the two fornices erected by L. Stertinius (B. C. 196), one on the Forum Boarium, and one in the Circus Maximus; a third was erected by Scipio Africanus (B. C. 190) on the Capitoline Hill; and besides these the Fornix Calpurnius on the slope of the same hill, and the Fornix Fabianus in the Forum. The motive of these structures was Hellenic. A passageway of this kind existed at Antioch as far back as the time of the Seleucidæ. But at the beginning of the time of the emperors this originally Hellenic idea underwent a peculiar ornamental change. It was an old Roman custom on festal occasions to decorate temporarily the façades of the buildings, sometimes even the fornices, near where festivals were to be celebrated. Traces of this custom may be found in Italy on church festivals even at the present day. For such decoration paintings on linen were made use of, which represented scenes appropriate to the festival. During the time of the emperors art gave this temporary decoration a monumental character by substituting relief for painting. In this manner, out of the fornices, decked in their festive attire, grew the triumphal arches of the imperial age. The reliefs upon these clearly show, in their pictorial effects, a relation to the sister art of painting—a relation which becomes all the more apparent when our imagination supplies the polychromy, of which many traces still remain. The Tabularium, a building used for the state archives (finished B. C. 78), is a most majestic combination of the vaulted roof and the arch. This building is situated on the west side of the Forum, directly upon the walls which once surrounded the Capitoline Hill. It rests on a fivefold row of vaults, the outermost of which, still visible, faces the Forum as an open corridor with half columns of the Doric order. The main feature in the construction of the theater and amphitheater was likewise the arch and vault. Of the theater of Marcellus, which Augustus completed B. C. 13, and which was named from his nephew, the son of Octavia, there are still magnificent remains of the exterior, showing the Doric order in the lower and the Ionic in the upper stories. Of this style of building the grandest structure is the amphitheater called the Colosseum (see AMPHITHEATER), built A. D. 80 under the reign of Titus.

Among the buildings with domes, the Pantheon (erected in its present form about 120 A. D.) stands foremost as probably the most beautiful, and certainly the best preserved, structure of ancient Rome. (See PANTHEON.) The domed roof was also especially employed in the construction of vast halls in the public baths or *thermæ*. In the construction of the Roman temples the massive substructure and the steps leading up to the front, which were characteristics of the Tuscan temple, were retained. The architectural and ornamental parts of the temple proper, on the other hand, were thoroughly Greek, although very variously, and not always appropriately, modified. In the construction of the more ancient peperino or travertine buildings the Greek forms were simplified. This arose clearly from the character of the material, which did not admit of delicate ornamental finish. But in the marble structures of a later period these Greek forms were loaded with excessive ornament and intermingled one with another, the ornate Corinthian taking the precedence over the simpler Doric and Ionic orders.

From the time that Rome became the metropolis of the world it was evident that the old Forum was not adequate to the demands of public intercourse. The older Cato, in order to attract the public to the north side, erected there the Basilica Portia (B. C. 184); the Basilicas Æmilia (B. C. 179) and Sempronia (B. C. 169) soon followed. Cæsar carried out the task most energetically, and erected on the south side of the Forum the Basilica Julia, consisting of five aisles. Adjoining the original Forum were built, one by one, the Forums of Augustus, Trajan, and other emperors. See FORUM.

A great deal was done to supply the city with water, and that in a most sumptuous manner. (See AQUEDUCTS.) Agrippa, during his ædileship, constructed in a single year (B. C. 33) 700 basins, 500 fountains, 130 reservoirs, and employed in the decoration of these works 400 marble columns and 300 bronze and marble statues. The Palatine Hill, on which Augustus had dwelt, was adorned on the south side with the palace of Tiberius, of which hardly more than the foundations remain. Caligula extended the work in the direction of the Forum. As is evident from the remains still existing, the hill was enlarged by extensive substructions in order to obtain a larger area for the imperial buildings. Farther to the W. the Flavian emperors erected their palace, the

ruins of which bear witness to the simple grandeur of the work.

Meanwhile the terrible conflagration under Nero (A. D. 64) had occurred. Of the fourteen city wards (*regiones*) three were entirely, and seven well-nigh entirely, destroyed. A countless number of Roman monuments venerable for age, as well as many masterpieces of Greek art, were sacrificed. Yet this misfortune was not without its advantage to the city, for the government, in rebuilding the city after the conflagration in Nero's time, took measures to make the streets wider and straighter. In consequence of the destruction of entire quarters of the city, room was obtained for the erection of large public buildings. Nero's Golden House, on the south side of the Esquiline Hill, with its surrounding houses and parks extending into the valley between the Esquiline and Cælian Hills, requires only a passing notice; for immediately after the emperor's death (A. D. 68), the whole establishment, with all its luxurious appointments, fell into decay. On the site of the artificial lake, within the gardens of the Golden House, Vespasian began to build the Colosseum. The palace itself was utilized by Titus, in part, as a foundation for his baths.

Architecture received a new impulse under Trajan, who employed an excellent Greek architect, Apollodorus of Damascus. Under the direction of this artist the Forum of Trajan was erected to the N. of that of Augustus. The constructive activity of the Emperor Hadrian is exemplified in the double temple of Venus and Roma on the Velia, the plan of which the emperor designed with his own hand (A. D. 135). It was composed of two temples, having a single roof covered with tiles of gilded bronze. The cellæ of the two temples adjoined each other, and the whole was surrounded by a double portico of granite columns. The Mausoleum of Hadrian (Castle of St. Angelo), begun by that emperor and completed (A. D. 140) by Antoninus Pius, consisted of a square substructure, upon which stood a terrace-like superstructure covered with marble and adorned with statues. From the time of the Antonines, besides the column in honor of M. Aurelius, we have remaining only the temple of the elder Faustina, erected A. D. 141, on the north side of the Forum, and afterward likewise dedicated to the memory of Antoninus Pius. The portico, with its ten columns of costly Eubœan (cipollino) marble, left unfluted, is still standing, besides a portion of the cella, which is, however, well-nigh robbed of its marble facing. The back part of the cella has been turned into the Church of S. Lorenzo in Miranda. After the Antonines many sumptuous buildings were erected in Rome. Caracalla strove to surpass all his predecessors in the colossal baths, capable of holding 1,600 bathers, which he commenced on the southeast side of the Aventine Hill, near the Via Appia, but which were not completed until the time of Alexander Severus. Only the brick-faced masonry walls which formed the main body of the building remain. The city wall of Aurelian was constructed in view of the constantly increasing danger from the encroachments of the barbarians. The baths of Diocletian, on the Viminal, were still more extensive than those of Caracalla. Two large halls, which once formed a portion of the baths of Diocletian, are now included in the churches of S. Bernardo and Sta. Maria degli Angeli. The basilica on the Velia, with its three aisles, was built by Maxentius, and remodeled by his successful rival, Constantine. Three of the arches still stand, though robbed of their original ornamentation. They are of an enormous span, and have served as models to many architects of modern times. Constantine presented the city of Rome with baths which were situated on the Quirinal; but the architectural energy of that emperor was mainly expended upon his new capital in the East.

Interior Decoration.—In interior decoration much was done with rare and beautiful colored marbles, and this manner of ornamenting wall-surfaces was maintained to the very end of the imperial epoch. Inlaying of one marble or other fine-veined stone with another was freely used. Glass also, either colored in its body or with the surface moulded in ornamental reliefs, was used for wall-tiles. In the earlier stages of the same period the decoration of interiors was chiefly fresco, and in private houses the Greek manner of the time of Alexander's successors was, for the most part, followed. During this period the spoliation of the Grecian republics, partly by plunder and partly by purchase, brought into the possession of the conquerors a considerable collection of panel-paintings, and the custom was then introduced of using these pictures as the central ornament of the wall. Not every one, however, was able to obtain a sufficient number even to meet the demands of a moderately sized dwelling. It was necessary, then, to call in the aid of the fresco-painter, who supplied the lack of the actual panels by imitations executed on the stucco of the walls. This mode of decoration, originating on the eastern shores of the Mediterranean, was imitated by the Romans even in the the third century before Christ, and continued among the less opulent down to the period of the decline of classical culture. In Rome and Pompeii, the pictures which occupy the center of the walls are clearly imitations of panel-paintings, as may be seen from the simulated frames which surround them. Where more extensive compositions were to be represented, the imitation of panel-paintings would have given a heavy, cumbersome effect; to avoid this the artists resorted to the device of representing the walls with imaginary openings, the pictures appearing as if seen through these openings. In this manner, for instance, the pictures of Io and Galatea on the Palatine Hill were treated. More extensive spaces, such as corridors, courts, and garden-porticoes, were sometimes decorated in fresco with imaginary outlooks upon parks, grounds, and seaports. The best discovery in this line is that of the "painted house" in the Trastevere. It came to light in 1880, near the banks of the Tiber, at La Farnesina. Its magnificent set of frescoes, dating from the age of Augustus, is now exhibited in Michelangelo's cloisters at La Certosa.

Sculpture.—In the Roman sculpture of this period two tendencies, the idealistic and the realistic, may be distinguished. The first occupies itself specially with mythology, but also sometimes takes to the portrait and to the representation of scenes from daily life. Its work is not original, in the highest sense of the word, but is limited, in a greater or less degree, to models from the preceding Greek development. This already shows itself among the artists employed in the service of Metellus Macedonicus. Several evidences lead to the conclusion that these artists sometimes re-treated archaic Greek types in the spirit of free art. Through a series of works that have been preserved we are made acquainted with a group of Athenian artists who lived in the last century before Christ. The most distinguished among these are Apollonius, son of Nestor, the sculptor of the Hercules torso in the Vatican (probably identical with that Apollonius who, after the burning of the Capitoline Jupiter in the time of Sulla, executed the statue of the god designed for the new building); Cleomenes, son of Apollodorus, the artist of the Medicean Venus; Cleomenes, son of Cleomenes, author of the fine portrait-statue in the Louvre mistakenly called *Germanicus*. This last statue repeats the motive of an archaic type of Hermes. The Medicean Venus belongs to those figures which through a series of intermediate stages are gradually derived from the Cnidian Aphrodite of Praxiteles. Glykon, one of the latest artists of the group referred to, in the execution of his statue of Herakles (Farnesian Hercules, Naples), followed a type probably designed by the second Attic school in the fourth century B. C. The naturalistic treatment and the exaggerated expression of physical strength belong only to the artists of the imperial times. We may with entire certainty formulate our judgment concerning these artists, that for the conception they were substantially dependent upon ancient works, but that in the execution they showed independence, and thus lent a new charm to the motives reproduced.

A peculiar direction was taken by the school of Pasiteles, himself a versatile artist of the last century before Christ. There is extant the statue of an Ephebus, with an inscription (Villa Albani), executed by a scholar of Pasiteles, Stephanus; also a marble group (Villa Ludovisi), generally considered to represent the meeting of Orestes and Electra, and shown by the inscription to be the work of Menelaus, a pupil of Stephanus. Eclecticism, which presupposes, in all cases, a dependence upon earlier works, must be considered the essential characteristic of the school of Pasiteles, while the kind and degree of that dependence may in some instances be disputable. The manner of treatment, however, remains as an unquestioned merit of these artists. The same is claimed for Arcesilaus, who wrought the statue of the goddess for the temple of Venus Genetrix, dedicated by Cæsar in 46 B. C.

In other works of sculpture also, belonging to the epoch under consideration, the authors of which are unknown, recent investigations have shown the same dependence upon ancient models. The well-known group representing Venus and Mars, probably connected with a work placed in the

temple consecrated by Augustus to Mars Ultor (2 B. C.), is strictly derived from two types of the earlier development. One is the well-known figure of Aphrodite holding a shield; the artist of the imperial period, omitting the shield, made the arms of the goddess rest upon the shoulders of Mars, who stands before her; this last figure probably originating in a Peloponnesian school. From the same type, the shield-bearing Aphrodite, is derived the Victory writing upon a shield, of which we have examples in an excellent statue in Brescia and in the reliefs of the Column of Trajan. The celebrated statue of the Nile (Vatican) is the reproduction of an original from the Ptolemaic period. We come to a similar conclusion from the investigation of the portrait-statues, of which the early imperial period presents several very prominent examples, as, for instance, that of Augustus from the Villa of Livia near Prima Porta, now in the Vatican, that of the older Agrippina, now in the Capitol, etc. From a considerable series of these portrait-statues it is evident that the clearly thought-out and beautifully expressed motives of the figures belong, in fact, to the earlier development of art, which took place on Greek soil. The merit of these portrait-sculptors of the imperial period is essentially limited to the skill with which they managed to impress the personal likeness upon the heads.

In view of these facts we are justified in saying that the plastic art of this period was rather reproductive than original—that when called to poetic creation in the higher sense, it found itself incapable, and fell back upon older productions. On the other hand it possessed to the fullest extent the power of delicately seizing and reproducing with artistic correctness the forms presented by nature. A considerable decline in this power is first perceptible in the time of Hadrian. Under this emperor arises a peculiarly dry and smooth modeling of forms, and also the custom of brilliantly polishing the surface of the marble. To this early stage of decline belongs the last important type to be seen in the history of classic art, the type of the favorite of the Emperor Hadrian, the Bithynian Antinous, with whose statues and busts the museums are filled.

After the age of the Antonines the decline in plastic art was most precipitous. So far as our positive knowledge of the monuments extends, there exists of this period no worthy representation of any god from the classic Olympus. On the other hand, the statues of Mithras and the repulsive figures of the Ephesian Artemis are everywhere prevalent. A bad tendency is seen in the use of rich colored material, since the costliness of this came to be considered of primary importance, and the artistic treatment was regarded as only secondary. For important and enduring monuments the kinds of stone selected offered, from their very hardness, insuperable obstacles to the development of true form. In the hard, red porphyry, for example, from which the sarcophagus of Helena, the mother of Constantine, and that of Constantia, the sister of the emperor (Vatican), are wrought, it would have been impossible even for a skillful artist familiar with anatomy to bring the human form to any seeming of organic development. Colossal dimension, as well as richness of material, was a great object of admiration. Alexander Severus caused a multitude of gigantic statues to be erected in Rome. A bronze figure, representing the Emperor Gallienus as the sun-god, measured about 240 feet, and the marble statues of the Emperor Tacitus and his brother Florianus at Terni, about 30 feet.

The most pleasing, comparatively, and certainly for the history of art the most interesting, productions of this age of decline are the sarcophagi, adorned with figures in relief, which came into vogue from Hadrian's time. The reliefs, mostly mythological subjects, scenes from the story of Bacchus, the myths of Meleager, Hippolytus, etc., repeat motives from the older Greek art, especially from that development of painting which began in the time of Alexander. These sarcophagi show a reflection, however feeble, of the prominent works of Greek art; and since the originals, especially the paintings, are irrevocably lost, these copies are of the greatest importance in the history of art.

The realistic tendency, which was fostered together with the ideal one, remains secondary and limited to a lower sphere, at least until the time of Hadrian. The realistic portrait of this period is distinguishable from the ideal by certain mechanical methods of producing expression. In the latter, the eyelids are elaborated with a strong feeling for style, and there is no intimation of the eyebrows; the realistic school makes the edges of the lids rest upon the eye, as is the case in nature, and marks the form of the brow. Sometimes the pupils are indicated by grooves, a practice which first became general in the third century after Christ. Traces of a similar tendency in portraiture are already perceptible in the time of Alexander the Great and of the Diadochi. While, judging from the few monuments remaining, art at that time reproduced the elements offered by nature with a certain reserve, and distinguished between that which she intended and that which was accidental, the Roman tendency was to copy faces exactly as they appeared to the eye. This confirms the supposition that this unreserved realism was encouraged by the Roman custom of fabricating waxen images of their ancestors (*imagines majorum*), in which a precise copy of nature, or what passed for it, was obviously required. Still, the portrait statues, especially those made in the capital during the first century of the imperial time, adhere, as a whole, to the principle of ideality. In the second century the realistic principle prevailed, and preserved its vital force even longer. During the whole of the third century this school produced admirable works, as is proved, among others, by the busts of Caracalla, which represent in a masterly manner the brutal nature of this emperor. The same phenomenon appears in the province of *genre* representation. In the earlier portion of this period a realistic tendency appears only in the reliefs on the monument of the baker Eurysaces of the time of Sulla—a work of very plain, not to say coarse, execution, representing the various processes in the preparation of bread.

Unlimited, on the other hand, is the sway of the realistic tendency in the historical representations with which triumphal arches and other similar monuments were adorned in the imperial ages. Already, during the period of Alexander the Great and of the Diadochi, may be seen in the representations of contemporary events—battles, festal processions, hunts, etc.—an endeavor to portray characteristic scenes from real life. The historical reliefs of the imperial times appear as a further development of these works—a development in which the endeavor to be true to the real emancipates itself more and more from artistic fetters. The band of figures winding up the triumphal columns narrates, chronicle-wise, the principal events of the campaign according to the imperial bulletins. Then follows another peculiarly picturesque mode of treatment, explained by the fact that the historical relief of the imperial times stands in close relation to a preceding development of painting, and was, in fact, used for decorative purposes in much the same way as the sister art has since been employed. By the multiplication of the planes of relief an attempt was made to obtain an effect corresponding to perspective in painting. Bold foreshortenings, intimations of landscape detail, and other means of expression properly belonging to the pictorial art, became, with the advance of this development, more and more frequent. As late as under Trajan it continues to be characterized by a freshness and energy which reconcile us, in a certain degree, to the violation of the rules of plastic composition that frequently occurs in these monuments. After his time there is a rapid decline even in this form of art. The defects, which in the Trajan monuments appear in isolated cases and without exaggeration, are now multiplied. The reliefs of the Arch of Septimius Severus show a multitude of planes, piled one above another, each filled with a crowd of figures which confuse the eye.

Painting under the Later Empire.—The pictorial art shows, in every respect, a development analogous to that of the plastic. It is true that the writers preserved to us make very little mention of the painting of this period. In works of the first century of the empire there are passages which speak very disparagingly of the state of contemporaneous painting. Petronius, the best art connoisseur among the Roman authors whose works are preserved, and who probably lived under Nero, says in plain terms that painting was entirely a thing of the past, and Pliny characterizes it as a dying art. These individual statements are corrected by an examination of the wall-paintings found in Rome and in the Campanian cities that were buried under the eruptions of Vesuvius. These place us at once in a position to estimate rightly the severity of the contemporaneous criticisms. The execution of the frescoes, however hastily sketched they may have been, is on the whole excellent. Since the execution of decorative fresco maintained itself at so considerable an elevation, we have a right to suppose the same to be true in a greater degree of the contemporaneous pictorial panel-painting. Thus the condemnatory verdict of competent contemporaries does not refer

so much to the execution, of which there was no reason to complain, as to the conception; and this supposition is strikingly confirmed by an investigation of the originals reproduced by the mural painters. The compositions occurring in these frescoes, representing scenes from Grecian mythology and from ancient daily life ideally depicted, are by no means conceptions of the imperial period, but rather creations of true Greek art, reproduced here with more or less freedom. Some of these compositions have been traced back with certainty, or at least probability, to known Greek masters. We can easily understand that the selection of the compositions to be reproduced in fresco should fall especially upon those of the Alexandrian period; for this development lay nearest the Romans in respect to time, and exercised also in other directions a manifold influence upon their civilization. Very few wall-paintings can, with any probability, be traced to originals earlier than the time of Alexander. Among the examples found in Rome we may reckon as properly belonging to these only the Nozze Aldobrandini (Vatican Library), the composition and forms of which do not show the artistic principle which was brought to full development in the time of the Macedonian hero. On the other hand, the art of the Alexandrian and Diadochi age occupied itself less with grand subjects of a monumental character (megalographia) than with those suited for cabinet pictures intended for private enjoyment. As these cabinet pictures were not rich in figures, and were of proportionally small dimensions, and as they did not so much attempt powerfully to strike the spectator by the grandeur of the subject as to impress him agreeably by graceful representations of situations easily understood, they were well adapted for reproduction in Roman mural painting. In Roman dwellings these pictures, being placed in the centers of walls generally very limited as to space, satisfied all the demands which could reasonably be made upon such a style of decoration, and afforded an agreeable resting-point for the eye, without absorbing the attention. The subject of the scenes represented, and the sentiments associated with them, were as perfectly comprehensible to the Roman even if he did not understand the Greek language, as to the Greek of the Diadochi period; for the Latin poetry of the Augustan age had borrowed many of its themes from the Alexandrian poetry which had inspired these very pictorial compositions, and they treated the same subjects as their predecessors had done, and in the same spirit.

In Roman fresco-painting an important place is occupied by the landscape, a province of art which also came into independent development during the age of the successors of Alexander. The most beautiful extant paintings of this kind are the landscapes discovered on the Esquiline, with scenes from the *Odyssey* (Vatican Library). The essential merit of the artist who originated the Odyssean pictures lies in the plastic development of the landscape, in the clear arrangement of the planes, the harmony of the proportions, and the nobility of form in the figures introduced.

An exclusively realistic tendency manifests itself only in the mural painting of a very inferior kind. In Pompeii this class of pictures is almost entirely confined to houses of a very poor character. After the year 79 A. D., in which the Campanian towns were buried by the unexpected eruption of Vesuvius, we can no longer follow with any certainty the history of this art; however, the few frescoes of later date which are preserved to us show that then, as before, they repeated the traditional mythological motives transmitted from the earlier antiquity, but that at the same time the execution deteriorated from generation to generation. The paintings of a tomb on the Via Latina, belonging to the Hadrian period, show already a considerable decline, as far as the freshness and energy of the work are concerned, when we compare them with the average of the mythological pictures of Pompeii. The rise of Christianity did not tend to arrest this decline, but rather hastened its downward course. Unlike paganism, which in all times had permitted a high degree of independence in the treatment of the forms of the gods and of all mythological subjects, the Church kept art closely hampered by the bands of an orthodox discipline which could not but be detrimental to it. The programme of the Christian faith was especially announced by means of pictures in mosaic, a species of art which makes any individual rendering of the outlines difficult, but which answered admirably the purpose of the Church, to bring before the eye sacred forms and histories under orthodox types and clothed with great brilliancy.

W. HELBIG.

RESULTS OF RECENT EXCAVATIONS.

The works for the extension and embellishment of Rome executed since 1870 have been the occasion of a great number of archæological discoveries, which will be described briefly in order to show what immense progress knowledge of the history and topography of the ancient metropolis of the world has recently made. Properly, this description should classify the new monuments according as they belong to architecture, to painting, to sculpture, to epigraphy, but as most of the discoveries relating to the three latter classes must necessarily be mentioned in connection with the edifice to which they belong, it will be simpler to give a topographic description of the architectural monuments.

Fortifications.—Rome has been defended at three different periods by three different walls—that attributed to Romulus, which surrounds the Palatine; that of Servius Tullius, which encircles the Seven Hills; that of Aurelian, which forms the inclosure of the city at present. Four fragments of the wall of the Palatine have been discovered, as well as the sites of the gates Mugonia and Romanula.

A third ascent to the primitive city has lately been traced on the side facing the Circus Maximus. It is cut in steps and gradients, and well deserves its classic name of *Scalæ Caci*. The prehistoric walls of the Palatine are built with tufa quarried on the spot, the quarries being afterward turned into reservoirs for rain-water in case of siege. As to the walls of Servius Tullius, they can be traced to-day at fifty-six different points. They start from the left bank of the Tiber near the Porta Flumentana, skirt the northern cliffs of the Capitoline (discovered 1715, 1873, 1892) and Quirinal Hills (discovered in the Via di Marforio in 1865, in the Piazza di Magnanapoli 1875, in the Colonna gardens, in the Via delle Quattro Fontane 1873, in the Barberini gardens 1627, etc.). Near the Collina gate (Via 20 Settembre) the system of defense and fortification of the city suddenly changes. From a simple wall, built on a ledge of the craggy slopes, half way between the bottom of the valleys and the plateau above, it becomes an *agger* or bulwark composed of a ditch 100 feet wide, 30 deep, of a wall 40 feet high, and of an embankment inside the wall 100 feet wide, from 30 to 40 feet high. The agger runs southward to the Porta Esquilina (transformed in 262 A. D. into a triumphal arch of the Emperor Gallienus). It has been discovered since 1870 in its entire length. From the Porta Esquilina to the banks of the Tiber the Servian walls follow the slopes of the Esquiline (discovered in the Via Buonarroti 1887), of the Cælian (discovered in the Via della Navicella 1890, in the villa Mattei 1582), and of the Aventine (discovered at Santa Balbina 1884, at San Saba 1858, in the Villa Torlonia 1854 and 1867, at Santa Sabina 1857), and fall into the river near the modern Arco della Salara. The river front inside the city was likewise fortified with a powerful embankment, the remains of which were destroyed in the nineteenth century in widening the bed of the river itself. The Transtiberine region was not protected by walls, but by a detached fort on the top of the Janiculum (the present villa Savorelli-Heyland).

Of the nineteen gates of Servius, seven have been found, and three are left standing. The Ratumena was found in 1865 in the Via di Marforio; the Fontinalis in Nov., 1875, under the Palazzo Antonelli; the Sanqualis in 1866 under the Piazza del Quirinale; the Salutaris in Sept., 1892, under the Palazzo Crawshey, Via delle Quattro Fontane; the Collina in 1872 under the Treasury building, Via 20 Settembre; the Viminalis in 1877 near the railway station; the Capena in 1865 near the Church of St. Gregory on the Cælian.

In Dec., 1875, were discovered some vestiges of the citadel, or *arx*, which occupied the northeast summit of the Capitoline, and which seems to have been defended by a double inclosure, the one contemporary with the wall of Romulus, the other with that of Servius.

Temples.—The number of temples, either standing or uncovered, which in 1870 was twenty-one, was thirty in 1894. Among those recently unearthed are the temple of Cybele, discovered in 1870 on the Palatine, with the statue of the goddess; the temple of the Dea Dia (Ceres), discovered in 1868 outside the Porta Portese, at the station of the Magliana, with 1,750 lines of the *Acta Fratrum Arvalium* engraved on marble; the temple of the Fortuna Primigenia, discovered in 1873 between the baths of Diocletian and the Pretorian Camp, with many inscriptions and a statue representing the Roman lady Claudia Justa, with the attributes of

the goddess; the temple of Julius Cæsar, discovered in 1873 at the south extremity of the Forum; the temple of Jupiter Capitolinus (1865–76), on the west summit of the Capitoline; the temple of the Palmyrene Sun (1857), outside the Porta Portese; the temples of Bellona and of Honor and Virtue, discovered in 1873 in the foundations of the ministry of finance; that of Augustus under the Palatine (1881); of Dius Fidius on the Quirinal near the Church of San Silvestro (1884); of Isis and Serapis near the Church of Sant' Ignazio (1881); of Mars in the Campus Martius (1874); of Vesta with the adjoining *atrium* of her priestesses (1881). The temples of Castor and Pollux (1872), of Jupiter Stator (1867), and Victor (1868), of Neptune, of Venus, and Rome already known, have been entirely uncovered or explored. The latest find in this line is that the Pantheon, which has come down in its entirety, is not the work of Agrippa, as stated in the inscription of the pediment, but the work of Hadrian. Agrippa's temple was discovered under the foundations of Hadrian's rotunda at a depth of 12 feet (Dec., 1892).

Basilicas.—The whole of the surface covered by the Basilica Julia, which occupied the west side of the Forum, has been completely laid open. The pavement, enlivened by polychrome marbles, is tolerably well preserved, but the triple range of porticoes which surrounded it has almost completely disappeared. The basilica of Constantine has also been delivered from the mediæval buildings which concealed and disfigured its apse. Under the floor of the basilica the remains of the Horrea Piperataria (stores for Eastern spices) have been found, as well as a tunnel which connected the Sacra Via with the Carinæ.

Theaters.—In Jan., 1876, in the course of some restorations of the Palace Savelli-Orsini, which occupies the site of the theater of Marcellus, there was discovered a considerable portion of the lower portico, filled with architectural fragments of every kind. An imperfect imperial inscription, found in the same place, mentions a restoration of the stage of the theater by Antoninus Pius. The porticoes which surrounded Pompey's theater have been discovered in four places, with a number of granite columns still *in situ*. As regards the theater of Cornelius Balbus, the northeast corner of the scæna came to light during the construction of the new Via Arenula. A fourth theater was discovered in the gardens of Ælius Lamia on the Esquiline.

Amphitheaters.—During the whole of 1874 excavations were made in the interior of the Colosseum. It is now possible to study the system employed for raising and lowering the cages of the wild animals; the small cells in which they were kept before the commencement of the games have been found; in short, all the details of the service of the amphitheater have been revealed with the greatest minuteness. Almost all the architectural fragments found in these excavations belong to a portico or gallery which crowned the interior of the edifice. Some inscriptions have also been found indicating the place reserved at the games for personages of the court and for the higher order of magistrates.

Circuses and Stadia.—The palace of Augustus on the Palatine was separated from the palace and the Septizonium of Septimius Severus by a stadium built by Domitian and restored by Hadrian. This stadium was mostly uncovered in 1872; the portico which surrounds it is composed of pillars of brick cased with marble, but the imperial tribune was decorated with surprising richness, if we may judge by the shattered columns of Oriental marble, the fragments of sculptured frieze, and other ornamentation found in the excavations. In building a new quarter N. of the castle of St. Angelo remains of Hadrian's circus have been found. They had already been seen and ransacked at the time of Benedict XIV.

Thermæ.—Rome in the period of her splendor had eleven large thermæ and 926 baths of an inferior order for the use of the lower classes. These last have almost totally disappeared, but many of the thermæ still exist, and several of them have been explored since 1870. Scellier de Gisors, a French architect, made excavations in the baths of Titus, bringing to light certain details of the plan hitherto unknown. The baths of Antoninus Caracalla have been cleared under the direction of the Government. The superb mosaic pavements of the halls are nearly all preserved, as well as many fragments of architectural decoration and three mutilated statues—the Farnese Bull, the Hercules, and the Flora. In the piazza of S. Eustachio and in the neighborhood of the Pantheon several halls and chambers of the baths of Agrippa, filled with fragments of columns, entablatures, and basreliefs, have been discovered. The open space paved with travertine in front of the Pantheon has been uncovered to an extent of 120 sq. meters. In the Aldobrandini and Rospigliosi gardens, on the Quirinal, considerable remains of the baths of Constantine have also been brought to light—the theater, or *hexedra*, and the rooms which formed the southeast angle of the baths. All the foundations of these baths are constructed from the spoils of older monuments, such as columns, capitals, broken statues, friezes, marble roofings, etc. The thermæ of Diocletian, which covered an area of some 800,000 sq. feet, and which could accommodate at one time 3,600 bathers, have been cleared of modern superstructures and made more accessible to the public by the institution of a new museum of antiques in some of their spacious halls. The baths of Novatus in the Vicus Patricius, of Decius Albinus on the Aventine, of Helena near the Lateran, may also be included in the list of modern explorations. Taking 1,500 as the average number of places disposable in each of the great thermæ, and 50 as that of each of the private baths, it is evident that 62,800 citizens could bathe at the same time in ancient Rome.

Forums.—The exploration of the Roman Forum may be considered as complete. It has the form of a parallelogram, and is bounded on the E., W., and S. by streets, on the N. by the Rostra. The pavement is composed of blocks of travertine. Along the west side—that is, in front of the Basilica Julia—may be seen seven pedestals of honorary columns; the south side, facing the temple of Cæsar, was shut in by a line of shops. In the center of the Forum may still be seen the pedestal of the equestrian statue of Constantine the Great, called in the Middle Ages the Caballus Constantini, and farther to the N. the two *plutei*, or parapets, discovered in Jan., 1873, the sculptures of which are regarded as the most perfect that have been found in this locality. These *plutei* indicated the place where all the citizens on their way to the elections were to go and present their *tesseræ*, or tickets of admission. The whole area of the Forum is strewn with remains of historical monuments, such as pedestals raised in honor of victorious emperors, consuls, generals, triumphal arches and pillars, statues, bas-reliefs, etc. The most important topographical details ascertained by recent excavations are the pavement of streets radiating from the Forum itself, such as the *vici* Jugarius, Tuscus, Argentarius, ad Janum, the Nova and Sacra Via, the Argiletum, etc.: the foundations of the triumphal arches of Augustus (1888), and of Fabius Maximus (1881), the area of the Comitium (1887), the Rostra Iulia, the site of the Græcostasis, and many other such landmarks familiar to the student of Roman history. The pavement of the Forum Olitorium has been uncovered for an extent of 360 feet between the theater of Marcellus (Piazza Montanara) and the Temple of Piety (San Nicolà in Carcere).

The excavations consequent upon the building of the new quarters upon the Esquiline led to the discovery of the Forum Esquilinum, and of the public markets (Macellum Liviæ) which surrounded it. In the center of the square lay the pedestal of a statue, with an inscription relating to the embellishments of the Forum executed by order of Flavius Epitynkanus, prefect of the city, in the fifth century. The center of the market was occupied by a large fountain. The Forum Boarium, the Forum of Peace, the Forum Transitorium (Domitian's) and the Forum Palatinum have been partially explored, while the beautiful Forum of Augustus is (1895) in course of excavation. Its preservation is surprising—in its marbles are engraved the names of Appius Claudius, Cornelius Sulla, Fabius Maximus, Scipio Asiaticus, Augustus, Nigrinianus—and here also have been found beautiful architectural fragments of the golden age.

Honorary Monuments and Triumphal Arches.—In the sixteenth century a triumphal arch, erected in honor of Gordian the Pious at the entrance of the Pretorian Camp, was demolished by Bramante in order to use the material in constructing the Palace Della Cancellaria. Remains of this arch were discovered in 1872 in digging a drain in the Via Gaeta. These remains comprise portions of the entablature, as well as fragments of the inscriptions relating to restorations made by Diocletian. The small arch raised in honor of Septimius Severus by the cattle-dealers from the Forum Boarium has been isolated from the adjacent buildings, and so has the arch of Gallienus on the Esquiline. The seven pedestals of honorary columns found on the west side of the Roman Forum have already been mentioned. Three of these columns have also been discovered. They measure 26 feet in length, and, judging from the deep holes with which the shafts are pierced, they must have been covered with

plates of bronze ornamented with historical reliefs. Among the ruins of the temples of Isis and Serapis, which stood near the Church Della Minerva, had already been found the obelisks erected afterward in the open squares of the Pantheon, of the Minerva, and in the grounds of the Villa Mattei. Recent excavations in the same place have given a fourth obelisk, entirely covered with hieroglyphics, with the cartouches of Ramses the Great.

Military Establishments (*Castra*).—The military barracks were sumptuous edifices, built, or rather rebuilt, by Septimius Severus, except that of the pretorians, which dates from the reign of Tiberius, and which was restored under the Gordians. Of this latter it was already known that three sides were incorporated into the city walls by Aurelian. The fourth—that is, the west side—has been discovered in consequence of the works in the new quarter of the Viminal (*Castro Pretorio*). It contains seventy-eight small chambers, each capable of lodging six or eight soldiers. A little beyond was found a small apartment, reserved perhaps for the superior officers, the pavement of which was in mosaic, representing scenes of combat, the names of the warriors or the gladiators being marked by the side of each figure. The site of the Castra Equitum Singularium—that is, of the barracks of the imperial horse-guards—has been made known by the discovery of thirty-two magnificent monuments, dedicated to their gods by the men who had honorably finished their service (*missi honesta missione*). Hundreds of names are engraved upon them, with indications of paternity, place of birth, dates and duration of service, etc. The men are grouped by squadrons, which are indicated by the name of their commanders, such as the squadron of Marcellus, the squadron of Tranquillinus, etc. These monuments were found in the Lateran district crossed by the Via Tasso. The seven battalions of the vigiles, or policemen, were distributed through the city in such a way that each one occupied the boundary-line between two *regiones*. Recent discoveries established the fact that the barrack of the first cohort (or battalion) was situated below the Palace Savorelli, on the boundary between the VII. (Via Lata) and IX. (Circus Flaminius) *regiones*. That of the second has been found on the Esquiline, very near the Arch of Gallienus; that of the third at the southeast angle of the baths of Diocletian; that of the fifth in the Villa Mattei, by the Church of the Navicella; that of fourth near the Church of San Saba (Aventine). The sites of the sixth and seventh are unknown. Besides the main barracks there were fourteen outposts called *excubitoria*. One of these, belonging to the men of the seventh cohort, has been discovered in the Piazza di Monte de' Fiori, near the Church of San Crisogono. Its preservation is surprising.

Palaces and Houses.—The palace of the Cæsars on the Palatine has no unity of plan or of decoration, but is composed of a suite of palaces, differing one from another, built at different epochs, and separated sometimes by streets and squares accessible to the public. The most ancient portion is the house of Augustus, situated on the side of the Circus Maximus. Then follow the house of Tiberius, at the northwest angle of the hill, on the Velabrum; the house of Caligula, at the northeast angle upon the Forum; the house of Nero, at the southeast corner, toward the Colosseum; the house of Vespasian, which occupies the very center of the hill; and, finally, the house of Septimius Severus, at the southwest angle, toward the Porta Capena. Although the condition of these remains is in general very ruinous, yet many apartments preserve sufficient traces to render possible a decision as to their decoration and primitive destination; and the whole plan of the entire group has been reconstructed with as much precision as can be obtained in a house of Pompeii. Among the palaces and private houses of which the position or new details have been discovered should be mentioned the palace of the Laterans, considerable portions of which have been explored, especially in the garden of the hospital of St. John, where fragments of an imperial statue in porphyry and several mosaic pavements have been found; the house of Germanicus, on the Palatine, in perfect preservation, the pictures which decorate the walls being considered as the best among those thus far found at Rome; the house of Asinius Pollio, discovered in the Vigna Gnidi, at the southeast angle of the baths of Caracalla; the house of Q. Fabius Cilo, the site of which is occupied by the church and convent of Santa Balbina, and where have been found two superb busts of Caius and Lucius, nephews of Augustus; the house of the Cornelii, discovered in 1873 under the new ministry of finance. In the house of Avidius Quietus, governor of Galatia under Domitian, discovered Mar., 1876, near Sant' Antonio all' Esquilino, bronze tablets have been found on which are engraved the decrees in honor of Quietus awarded by the cities of the province which he had administered. On one of the walls of the vestibule of the house of Memmius Vitrasius Orfitus, a consul of the fourth century, inscriptions were found dedicated to their master by the officers of the household. Similar inscriptions preserved on the spot have determined the position of the palace of Neratius Cerialis, prefect of the city in the fourth century, on the piazza of Santa Maria Maggiore; of Numicius Pica Cæsianus, quæstor under Trajan, on the Via Strozzi; of the senator Q. Octavius Felix, near the Church of Santa Bibiana; of Nummius Albinus and of Martial, the poet, under the new War offices, Via 20 Settembre; of Vettius Agorius Prætextatus, in the Via Merulana, etc. The number of private mansions the ownership of which has been established by late excavations may be estimated as 175.

Villas and Gardens.—The gardens of Mæcenas, on the Esquiline, have been in a great measure excavated, from the Church of Sant' Eusebio as far as the Via Merulana. The most interesting monument as yet found is a magnificent conservatory in the form of a small oblong theater, the walls of which are decorated with beautiful landscapes. In the neighborhood of this conservatory have been found six Caryatides of Pentelic marble, as well as three *Hermes* of fauns, which were generally placed at the intersections of garden avenues; two fountains, one of which is in the form of a rhyton, or drinking-horn, marvelously sculptured by Pontios of Athens; three busts of philosophers; and several other fragments of sculpture worthy of the age of Augustus and of the artistic taste of Mæcenas. Still more important are the discoveries made on the site of the Horti Lamiani, which adjoined those of Mæcenas, occupying the whole of the rectangle comprised between Via Labicana, Via Merulana, Santa Croce, and San Matteo. In the very center of these gardens the remains of a palace have been found, the east and west sides of which were adorned by porticoes with columns of *giallo antico*. On the two other sides—that is, on the N. and S. of the rectangle—were found bath-rooms of extraordinary splendor. The floors were paved with slabs of precious marble, such as *occhio di pavone*, fleece-alabaster (*a pecorelle*), jasper, agate, etc. Some of the walls were covered with slate ornamented with arabesques in gold; others were incrusted with *opus sectile marmoreum*, or what is called "Florentine mosaic." It was in one of these rooms that on Dec. 24, 1874, there was discovered the group of sculptures which forms the principal ornament of the new museum of the Capitol. This group includes a statue of Venus, a Greek work anterior to the type of that goddess, created by Praxiteles; statues of the muses Terpsichore and Polymnia; a bust of Commodus, represented as the Roman Hercules, perhaps the most perfect work of the kind which antiquity has bequeathed; and a head of the young Commodus. In the same room was found an inscription relating to the improvement of the gardens and the reconstruction of the palace by the Emperor Alexander Severus—that is, by the same who restored the gardens of Sallust, as is proved by another inscription found Apr. 2, 1876, in the villa Spithöver on the Quirinal.

Recent researches also show that almost the whole surface of the Esquiline was occupied by gardens, which, laid out at first for private use, had fallen by degrees into the hands of the emperors, who opened them to the public; so that Rome became perhaps as rich in parks and delightful promenades as is London or Paris. Among the gardens recently discovered may be mentioned those of Vettius Agorius Prætextatus, the site of which is very near the Porta San Lorenzo. Nearly all the foundations of the buildings belonging to these gardens are composed of fragments of statues. A single one of these walls, scarcely 100 feet in length, has yielded 2,500 pieces of sculpture, which, united with infinite patience, have already furnished the museum of the Capitol with seventeen statues and two sculptured vases. It is enough to say that the single statue of a Hercules carrying off the mares of Diomed has been recomposed out of nearly 250 fragments. Foundation-walls built with fragments of statuary are the work of the semi-barbaric Romans of the sixth to the ninth century of our era. They are discovered by hundreds. One, found in 1890 on the banks of the Tiber by San Giovanni de' Fiorentini, contained the now famous account of the Ludi Sæculares celebrated by Augustus in 17 B. C. and by Septimius Severus in A. D. 204.

Another, found Dec., 1892, near the entrance to the Ponte Sant' Angelo, was built with pieces of statues from the mausoleum of Hadrian. Besides the gardens and parks already named, excavations have been made and discoveries obtained in the gardens of Sallust (1880–88), of Lollia Paulina (1886), of Domitia (the Prati di Castello), of Geta, in the grounds of the villa Corsini (1883), of Julius Cæsar on the Janiculum (1890), of Pompey and Agrippa in the Campus Martius, of Herodes Atticus on the Via Appia, of Varius Helagabalus on the Via Labicana.

Tombs.—The burial-place of the ancient inhabitants of Rome was not confined to the borders of the great consular highways, but outside the gates were found vast cemeteries called *campi*, which took their name from the gate nearest them. Thus we know already the Campi Viminalis, Esquilinus, Cælimontanus, Aventinensis, etc.; another is found between the Viæ Aurelia and Campana in the present inclosure of the villa Pamphili Doria; still another between the Viæ Appia and Latina, in which are the celebrated columbaria of Hylas and Vitaline, as well as the hypogæum of the Scipios. The tombs laid open in the Esquiline necropolis may be divided into two groups—the one contemporary with the first centuries of Rome, the other belonging to the age of the emperors. The first occupy the whole of the space included between the Churches of Sant' Antonio, Sant' Eusebio, and San Vito; the most ancient of the tombs are excavated in the rock according to Etruscan usage; the disposition of the bodies is also Etruscan, each being placed on the funeral couch with the feet toward the entrance of the sepulcher; the manufacture of the objects found in these tombs, such as household utensils, vases, personal ornaments, etc., is also Etruscan. All these details belong to the first three centuries of Rome. The second system of burial, which dates from the beginning of the fourth century, is that of sarcophagi and cinerary urns in volcanic stone; several hundreds of these have been found, with a large quantity of objects, the manufacture of which, departing from the Etruscan type, begins to show the progress of the native art of Latium. The third method is that of sepulchral chambers, either isolated or united in groups, built of square blocks of stone, without cement, but already possessing inscriptions and pictures. One of these inscriptions says that the tomb belonged to the college of flute-players (*tibicines*); another is described as the property of the family Ælutia. Among the frescoes discovered in this cemetery two are especially interesting: the first represents the scourging and execution of a criminal performed by six lictors under the orders of the pretor; the other relates to the history of the 300 Fabii and their glorious defeat in the war against Veii. On the opposite side of the Esquiline—that is, in the neighborhood of Porta Maggiore—fourteen columbaria of the first century of the empire have been discovered, containing 994 tombstones, 150 of which refer to the household of Messalina. In the triangle formed by the Via Appia, the Via Latina, and the walls of Aurelian 1,559 tombs have been discovered in modern times, not including the family vault of the Scipios; 855 between the Salaria and the Pinciana, and so on. The pagan epitaphs registered in vol. vi. of the *Corpus Inscriptorum Latinorum* number 30,000; and we may assume that Rome was surrounded by a belt of some 300,000 tombs.

The existence of a Rome anterior to the Rome of history has been revealed by objects, such as arrow-heads of silex, axes of bluish jadeite, knife-handles of deer-horn, necklaces of burnt clay, pottery made by hand, etc. All these palæoethnological objects belong to the age of polished stone and to the age of bronze. In comparing these discoveries with those which have been carried on at the same time on the Alban Hills, where a prehistoric town or village has been exhumed from beneath three volcanic layers produced by eruptions from the crater of Monte Cavo, and with those made at Gabii, Antemnæ, Faleria, Veii, and Fidenæ, knowledge of Rome's origin may be completely established.

Bibliography.—*The Remains of Ancient Rome*, by J. Henry Middleton (a later and enlarged edition of the work first published in 1885 as *Ancient Rome*); August Choisy, *L'Art de bâtir chez les Romains* (1873); Helbig, *The Collections of Classical Antiquities in Rome*; Furtwängler's *Meisterwerke der griechischen Plastik* (reproduced in English under the title *Masterpieces of Greek Sculpture*, edited by Eugénie Sellers); Rodolfo Lanciani, *Ancient Rome in the Light of Recent Discoveries* and *Pagan and Christian Rome*; and Prof. William Ramsay's *Manual of Roman Antiquities*, revised and partly rewritten by Lanciani (New York, 1895).

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Roman Catholic Church: that body of Christians which is united by the profession of the same faith and the participation of the same sacraments under the rule of their lawful pastors, and principally of the Roman pontiff. In the New Testament the Church is repeatedly called the "body of Christ." He is the head, his followers the members; and as in the natural body we distinguish structure and function, so in the Church we find an organization "compactly and fitly joined together," whereby "according to the operation in the measure of every part," certain spiritual functions are carried on.

Organization.—In the mystical body of Christ there are many members, "but all the members have not the same office." Broadly, the Church is composed of clerical members and lay members. Under the generic term "clergy" are included all those who exercise spiritual authority. Since this authority may be communicated in various degrees there are various ranks of the clergy, which, taken in their totality, constitute the *hierarchy*. The essential hierarchical grades are of divine institution. Christ not only appointed the apostles to continue his mission, but also gave to Peter certain special attributes, making him the rock on which the Church is built (Matt. xvi. 16–19), empowering him to confirm his brethren (Luke xxii. 32), and commanding him to feed both the sheep and the lambs of the flock (John xxi. 15–17). The office of the apostles is perpetuated in the bishops, the primacy of Peter in the Roman pontiff. (See Pope.) As the successor of Peter the pope enjoys not merely a pre-eminence of honor, but a real, immediate jurisdiction over the entire Church and over each of its members. Nevertheless, each bishop in his own diocese is possessed of a real authority in virtue of which he governs the faithful committed to his charge, ordains priests and ministers, and grants them the jurisdiction necessary for performing their sacred duties. These "ministers," finally, are of two classes: those who receive *major orders*—deacons and subdeacons, and those who receive *minor orders*—acolytes, exorcists, lectors, and ostiarii.

A number of dioceses are united into a province under an archbishop or metropolitan, of whom the bishops are said to be *suffragans*. In early times the powers of the metropolitan were extensive; but since the Council of Trent they are restricted to the convocation of provincial synods, the visitation of dioceses, the correction of negligent bishops, the hearing of appeals from the episcopal court, and the appointing, under certain circumstances, of an administrator in case of a suffragan's death. The title of primate is given to the bishop whose see was at one time an "apostolic vicariate" the vicar holding special powers from the Roman pontiff. Special jurisdiction over several provinces was granted by St. Peter to the patriarchs of Antioch and Alexandria. Later on Jerusalem and Constantinople were raised to the dignity of patriarchates, while in the Western Church the honorary rank of patriarch was conferred on a number of bishops.

In the exercise of his supreme jurisdiction the pope is aided by the College of Cardinals. These are seventy in number, are created by the pope, and grouped, for the administration of ecclesiastical affairs, in twenty-one congregations. These, with various subordinate officials, form the Roman *curia*, the ordinary organ of papal government. Furthermore, when circumstances require it, the pope sends his nuncios and legates to different portions of the Church, and empowers them to represent his person. For further details concerning the organization of the Church, see works on canon law, especially Gréa, *De l'Église et de sa divine Constitution* (Paris, 1885); Laemmer, *Institutionen des Katholischen Kirchenrechts* (2d ed. Freiburg, 1892); Smith, *Elements of Ecclesiastical Law* (New York, 1893).

Functions of the Church.—Christ is Teacher, Pontiff, and King; hence for the Church the threefold mission of imparting his doctrine (*magisterium*), of sanctifying his members (*ministerium*), and of governing his flock (*imperium*).

1. *Doctrine.*—The fundamental element in the Catholic Church is the permanent existence of a living teaching authority (Matt. xxviii. 19, 20). Through the abiding assistance of the Paraclete (John xiv. 16, 17), this authority is infallible in matters of faith and morals. Its subject is twofold: The teaching Church, i. e. the pastors in union with their head the pope, and the pope himself speaking *ex cathedra*. (See Infallibility of the Pope.) The immediate sources of doctrine are the ordinary teaching of the Church, the definitions of the pope, or those of an œcumenical council. Such definitions do not invent new dogmas, but give

explicit form to beliefs that are implicitly contained either in Scripture or in tradition. The sources of tradition are in general whatever makes known to us the belief held by the Church at any time on any subject. The documentary sources are the writings of the early apologists, the acts and epistles of the apostolic churches, the works of the Fathers, doctors, and theologians. Moreover, the articles of faith have at various times been summarized in creeds or symbols. Such are the Apostles' Creed; the Nicene, promulgated by the Council of Nice (325); the Athanasian, by St. Athanasius, Bishop of Alexandria (d. 373); and that published by the Council of Constantinople (381).

2. *The Means of Sanctification.*—These consist in the application to each soul of Christ's merits. The sacraments, the ordinary channels of grace, are seven in number: Baptism, confirmation, Holy Eucharist, penance, extreme unction, orders, and matrimony. These are administered with ceremonies peculiar to each prescribed by the ritual of the Church. The Eucharist is not only a sacrament, but also a sacrifice, and as such is offered in the Mass. This is the principal act of worship in the Church and the center of her liturgy. The Office, or public prayer of the Church, is a collection of psalms, extracts from both Testaments, commentaries of the Fathers, and short lives of the saints. It is divided to suit the different hours of the day, and is either chanted in common, as is the case in monastic orders and canonries, or is recited in private, its recitation being obligatory on all who have received the subdiaconate. Both in the Mass and Office there are certain portions which vary according to the liturgical season and the festival which is observed on a given day. Ecclesiastical *feasts* are days set apart for honoring in a special way some event in the life of Christ, of the Blessed Virgin Mary, or of the other saints. The greater of these feasts are preceded by seasons of a penitential character—such as Advent before Christmas, Lent before Easter, and the vigil of many other festivals. The chief practices enjoined for this preparation are fasting, abstinence, and prayer. Beside the administration of the sacraments, the Church attaches a sacred and symbolical character to various objects, the use of which is destined to inspire reverence and devotion. Hence the blessing of ashes, water, palms, candles, etc., in virtue of which these *sacramentals* profit those who employ them according to the intention of the Church and with proper dispositions. The language of the Liturgy in the Western Church is Latin, while in the churches of the East the vernacular, mostly in its archaic form, is employed. There exist also differences in the form of the Liturgy itself, and consequently a variety of *rites*, such as the Coptic, the Armenian, and the Greek. Along with these general means of sanctification for all the faithful, the Church has encouraged the founding of *religious orders*, i. e. of associations whose members are bound by special vows, live under particular rules, and labor for some peculiar purpose, such as caring for the poor and sick, spreading the Gospel, and carrying on the work of education.

3. *The Government of the Church.*—To fulfill her mission of teaching and sanctifying men the Church must enact laws to be obeyed both by clergy and laity. While her doctrines are unchangeable, her discipline varies according to circumstances of time and place. Ecclesiastical legislation is incorporated in the canon law. It is either general—decrees of the pope and of general councils, or particular—statutes of national, provincial, and diocesan synods. As regards its subject, it is either public (*jus ecclesiasticum publicum*) or private (*jus ecclesiasticum privatum*). The former is for the government of the clergy; the latter for that of the laity. The penalties inflicted for violation of ecclesiastical law are of two sorts: the *pœnæ communes*—excommunication and interdict—which may be incurred by clerical and lay offenders, and the *pœnæ particulares*—suspension and deposition—to which clerics only are liable. The penal law of the early Church was severe; but this rigor has been mitigated in the course of time. (See PENANCE.) Finally, as the members of the Church are at the same time subjects of the civil power, it has often been found necessary for Church and state to define their relations and settle upon a *modus vivendi*. These agreements regarding the external relations of the Church are termed concordats.

STATISTICS.—1. *General*: The number of Roman Catholics in the world is about 230,000,000. There are 64 cardinals and 12 patriarchs. In the Latin rite there are 820 archbishops and bishops, and in the Oriental rites 56; while the titulars, i. e. those who have no diocese, number 322. 2. *In the United States*: The Catholic population is about 10,000,000. The Church has 1 cardinal, 1 apostolic delegate, 14 archbishoprics, 79 bishoprics, and 11,636 priests.

See also the articles PAPAL STATES, JESUITS, GALLICAN CHURCH, TRENT, COUNCIL OF, and VATICAN COUNCIL.

STATISTICAL LITERATURE.—For the statistics of the mediæval Church, the works of Carolus a Sancto Paulo, Miræus, Holstein, Clericus, Schelstrate, and Weidenbach may be consulted with profit. In the nineteenth century Stäudlin, Wiggers, Neher, Silbernagl, Carolus a Sancto Aloysio, Wiltsch, Petri, and others have treated the subject with more or less accuracy. The episcopal catalogues of the Roman Catholic Church have been edited or compiled down to modern times by the Benedictine Gaius: *Series Episcoporum Ecclesiæ Catholicæ . . . a Beato Petro Apostolo* (Ratisbon, 1873). Diocesan, provincial, or national religious almanacs and directories are published in most places, to which may be added the reports of the various missionary bodies made known from time to time. The actual state of the Roman Catholic hierarchy is made known yearly in *La Gerarchia Cattolica*, a quasi-official Roman publication; *Les Missions Catholiques*, and the *Annales de la propagation de la foi* furnish details of great value. The Propaganda issues an official yearly bulletin entitled *Missiones Catholicæ*. The best and newest general summary of the public administration of the Roman Catholic Church is by O. Werner, S. J., *Orbis terrarum Catholicus*, etc. (Freiburg, 1890), and for the Catholic missions, the same, *Atlas des Missions Catholiques* (*ibid.*, 1886), and *Katholischer Kirchenatlas* (*ibid.*, 1888). Official reports of all dioceses, vicariates, prefectures, etc., are made to the proper Roman authorities at stated intervals, and are preserved in the special archives of the respective Roman congregations. For the actual working of the latter bodies, cf. Bangen (Catholic), *Die Römische Curie* (Münster, 1854), and O. Meyer (Protestant), *Die Propaganda* (Göttingen, 1852), and the sixth volume of Phillips's *Kirchenrecht* (Regensburg, 1864). The latest statistics of the Roman Catholic Church in the U. S. are found in Sadlier's *Catholic Directory* (New York) and Hoffman's *Catholic Directory and Clergy List* (Milwaukee). Special Catholic directories are annually published for Canada, England, Scotland, and Ireland. J. J. KEANE.

Romance Languages, or **Romanic Languages** [*Romanic* is from Lat. *Roma'nicus*, Roman, deriv. of *Roma'nus*, Roman, deriv. of *Ro'ma*, Rome]: those modern languages which, as the result of continuous oral transmission, are the current forms of spoken Latin. The languages grouped together under this name are French, Provençal and Catalan (the latter is hardly more than a dialect of Provençal), Spanish, Portuguese, Italian, Roumanian, and the Rhæto-Romance dialects. The territory is in general that of the Roman empire, excepting those parts which by later popular migrations or conquest were afterward removed from the sway of the Latin language, and those regions which were never completely Romanized.

The Latin spread in the conquered provinces was naturally the vulgar speech of the soldiers and colonists, not the Latin of the classic writers. Though in the beginning differing from the latter only as careless conversational speech always differs from the more elaborate usage of literary works, it was more subject to local variations, and changes were more rapid than in the literary language. The latter was also studied, however, in the provinces, and there were writers of a certain eminence in Spain and Gaul long after those countries had become Roman provinces. Borrowings from the Latin of literature became later very considerable; they are numerous in mediæval times after the modern languages began to be used in literature, and they have continued up to modern times. In general, the old popular words can be distinguished by their strict observance of the laws of phonetic change, while learned or semi-learned words have been less altered. Compare Fr. *peu*, from *paucum*, with *paucité*, *père* with *paternité*, *chose* with *cause* (both from *causa*).

The vulgar Latin of post-classic times was in the beginning very similar over the whole territory. In its vocabulary it differed somewhat from the literary Latin, more or less vulgar words or meanings being used, as for "horse," *caballus*, a nag, for "fire," *focus*, for "to strike," *batuere*, for "to turn," *tornare*, etc., and derivative words, especially diminutives, were used sometimes instead of the simple ones. Some words from foreign languages were added to the vocabulary. The oldest borrowings from Greek show Greek sounds to have been imitated as heard in Italy. Many of the

words from Greek are church words, as ἐκκλησία (Fr. *église*, Ital. *chiesa*, Span. *iglesia*), ἐπίσκοπος (Fr. *évêque*, Old Fr. *evesque*, Ital. *vescovo*, Span. *obispo*). The word *torŭare*, mentioned above, is from Greek. Of importance and interest are the borrowings from Germanic dialects after Germanic peoples came over the border and established themselves on Roman or Romanized territory. These newcomers became finally absorbed in the Romanized population, and after a time their descendants used only the Romance speech, but many Germanic words (not all retained to the present day) became familiar, and in France at least the Germanic influence extended somewhat beyond additions to the vocabulary. Only the Roumanian shows few or no traces of early Germanic influence. The influence of Arabic was later, and was felt especially in the Spanish Peninsula, where it began early in the eighth century, and in Sicily. The effect of the Iberian and of the Celtic languages seems to have been small. Even in the vocabulary Celtic influence was apparently considerably less than that of Germanic speech, and it is still doubtful whether Celtic habits of pronunciation had any traceable effects on Romance phonology. Slavic and other languages, as Greek, Turkish, Hungarian, Albanian, and perhaps others of which little or nothing is known, have affected Roumanian.

In the phonology of the native (far the most important) element of vulgar Latin and the modern Romance languages, the first thing to be noted is that the position of the accent remains in general the same as in classic Latin. It is of course not possible here to state the laws of sound-change for the different Romance languages completely, and it is to be remembered that the characteristic phenomena here mentioned did not all arise at the same time. In the vulgar speech many words were shortened by the change of *e* or *i* before a vowel to the consonant *y*, or by loss of an unaccented penult vowel. A short vowel, *i* or *e*, developed before *s* in words beginning with *s* followed by a consonant; compare Fr. *été*, Old Fr. *esté*, Ital. *stato* (under certain conditions *istato*), from *statum*. The classic distinctions of quantity soon produced distinctions of quality, the short vowels becoming open and the long becoming close, except that no such distinction between old long *a* and short *a* is clearly shown to have existed. The old short vowels were probably after a considerable time lengthened when accented and ending the syllable, and the old long vowels were sometimes shortened before following consonants. The diphthong *æ* early became a monophthong identical in quality with short or open *e*, and the diphthong *œ* became identical in quality with long or close *e*. In consequence of these changes short *i* came to be nearly like long *e* in sound, and ultimately, like old *œ*, became identical with it. Less universally short *u*, approaching long *o* in sound, became like that a close *o*, distinct both from open *o* and from old long *u*. The diphthongs *au* (except perhaps in some regions) and *ui* (as in *cui*, *huic*) remained long unchanged.

Among the modern literary languages (we shall not in general consider dialects) French has changed most the vulgar Latin accented vowels; for *a* compare Fr. *chaut*, *main*, *chanté* from *cantum*, *manum*, *cantatum*, with Ital. *cauto*, *mano*, *cantato*; and, for close *e*, compare Fr. *moi* with Ital. *me*. Latin *ĕ*, *æ*, vulgar open *e*, have become the diphthong *ie*, under certain conditions, over a large territory, as in Italian, Roumanian, French, Provençal (sometimes), Spanish, but the rules vary somewhat for different regions: compare, from *pĕtra*, Fr. *pierre*, Ital. *pietra*, Span. *piedra*, but Port. *pedra*. Similarly Latin short *o*, vulgar open *o*, was in some regions, as Portugal, retained as *o*, while in others a diphthong was often developed; in Italian *uo*, in Spanish and Old Fr. *ue* (from older *uo*). This Old French *ue* has since become the monophthong commonly written *eu*; compare vulgar Latin *potet* for classic *potest*, O. Fr. *puet*, Fr. *peut*, Prov. *pot* (Prov. has in some cases the diphthong *uo* or *ue*), Span. *puede*, Port. *pode*, Ital. *può*, Roum. *poate*. Latin long *u* all over France, in the west and center of the Rhæto-Romance territory, and in much of Northern Italy, became and to a great extent is still the sound now written *u* in French. The diphthong *au* has very generally, though not universally, become *o*. Of the unaccented vowels the most important to notice are those of Latin final syllables. The one best preserved is *a*, only French and Roumanian regularly changing it. The French form for it is its so-called mute *e*, and the Roumanian shows its vowel *ă*. In general these vowels have suffered most in French and least in Italian. In the case of unaccented vowels in the syllable immediately before the accent the treatment is very similar to that of vowels in final syllables. Following or preceding sounds often caused a modification of the vowel; this was especially the case with palatal sounds, as *y*, *c*, *g*, and the influence of a following nasal consonant has produced nasal vowels extensively, especially in Portuguese and French. In the latter the resulting changes in sound have been very considerable, but the older orthography is for the most part preserved.

The Latin consonants underwent also various changes. The sound of *h* was lost very early. In the group *us* the vulgar speech had no *n*, and the preceding vowel had the value of an old long vowel; the adjective ending *-ensis*, through *-ēsis* (with close *e*), gives Ital. *-ese*, Fr. *-ois*. When *t* was brought immediately before *l* through the loss of a formerly intervening vowel, *cl* was the result, as in *veclus* for *vetulus*; compare Ital. *vecchio*. The consonantal *u* (*v* in *vinum*) soon became a spirant, a bilabial (or perhaps locally even a labio-dental) *v*, and intervocalic *b* acquired, also at an early time, the same pronunciation. The modern value is generally labio-dental *v*, but the bilabial sound is common in Spain. Consonantal *i* (*y*. the Latin *j*), at least when initial, *g* before *e* and *i* sounds, and *di* (with consonantal *i*), all received the value of spirant *y*, and this very extensively became later the sound of English *j* in *jest*, as in Italian and Old French; but this latter sound has since often become that of English *z* in *azure*, especially in modern French, Portuguese, and locally in Rhæto-Romance dialects and Italian. In Spanish the older *y* is sometimes preserved, as in *ya* from *jam* (cf. Ital. *già*), *yerno* from *generum* (cf. Fr. *gendre*), and sometimes a written *h* (now silent) is found, as in *hermano* from *germanum*, but a very common result is the aspirate sound now written *j* or *g*, as in *joven* from *juvenem*; this is the descendant of an earlier sound like that of French and Portuguese (English *z* in *azure*).

The time when *c* before *e* or *i* began to assume a sibilant sound, instead of remaining *k*, was varied in different regions. The sound *k* is still preserved in one or two places, notably in a Sardinian dialect; but over almost all the Romance territory the assibilation took place. When *c* was before *e* or *i* not followed by another vowel the assibilation is not shown to have existed before the sixth century. (See G. Paris, *L'altération romane du c latin* in *Annuaire de l'école pratique des hautes études*, 1893.) The result was either *ts* or about the sound of English *ch* in *chin*, or later changes from one or the other of these sounds, though the letter *c* in general continued to be written as it is still. In modern French and modern Provençal the sound is *s*, from older *ts*, as also in Portuguese; in Spanish it is that of English *th* in *thin*, also from older *ts*; in Italian and Roumanian it is that of English *ch* in *chin*. Between vowels the *c* before simple *e* or *i* does not always give the same results: compare Fr. *plaisir* from *placere*, *croix* (in Old French better spelt *crois*) from *crucem*. Vulgar Latin *ty* (*ti* before a vowel) early became assibilated, producing *ts* and modern sounds resulting from *ts*. Before *a* the Latin *c* and *g* (and so were treated Germanic *k* and *g* also), if initial or preceded by a consonant, produced in a large part of France and of the Rhæto-Romance territory, by becoming palatalized or "fronted," sounds more or less like *ky* (*ty*), *gy* (*dy*), or (as in many Old French and Provençal dialects) those of English *ch* in *chin* (for old *c*) and English *j* in *jest* (for old *g*); hence in modern French appear in these cases the sounds of English *sh* in *shine* and *z* in *azure*; compare Fr. *champ* from *campum*, *vache* from *vacca*, *jambe* and Ital. *gamba*, *jardin* and Germ. *garten*. Initial consonant groups containing *l* as the second member show in Italian an *i* (= *y*) in place of the *l*, as in *piano* from *planum*, *fiamma* from *flamma*, *chiamare* from *clamare*, etc.; compare Span. *llano*, *llama*, *llamar*, Port. *chão*, *chamma*, *chamar*. from the same Latin words.

The changes thus far described are in great part obviously due to the influence of adjacent sounds, and many of them might be considered as instances of partial assimilation. The same influence is strikingly evident in the treatment of consonants which were not initial, some of which have already been noticed. Consonants standing alone between vowels were subject to alteration in vulgar Latin, the Italian and Roumanian preserving the older Latin sounds best. So intervocalic *p*, *t*, *c* were in the other Romance languages commonly voiced, as they sometimes were in Italian also, becoming *b*, *d*, *g* (or something like *dz* if assibilation of the *c* took place), and these voiced stops sometimes, like the old *b*, *d*, *g*, progressed further to become voiced spirants, or were even lost altogether. French shows the greatest amount of change for these sounds; it has now lost the original intervocalic *t* and *d* entirely, though in the oldest French they

were at the stage of voiced (except when unvoiced at the end of the word) spirants; compare *chantée* from *cantata(m)*, *nouer* from *nodare*. The doubled consonants of Latin were simplified except in Italian, which language has by assimilation produced a number of new doublings, as in *fatto* from *factum*, *freddo* from *frig(i)dum*. The Roumanian treatment of some consonant groups is remarkable; compare *opt* from *octo*, *demn* from *dignum*. The phenomena of palatalization can not be discussed here.

The most important final consonants in Latin are *m*, *s*, *t*. Of these, final *m* early disappeared entirely except in a few cases where it followed an accented vowel; compare Fr. *rien* from *rem*. Final *s* and *t* were lost in Italian and Roumanian, but elsewhere *s* was retained, and final *t*, which was for the most part lost, was in French, under certain conditions, retained. The retention of old final *s* and *t* in modern French is to a great extent only for the eye.

The Latin inflections of nouns and adjectives have suffered considerable change. The fourth and fifth declensions disappeared, the former being absorbed in the second declension, the latter in the first and third, so that only three of the old classes remain at all. The neuter gender is no longer distinguished in nouns, but neuter uses of adjective words (as in Spanish) and pronouns are not wholly lost. The old neuters became for the most part masculine, but there are many traces of Latin neuter forms. The Latin cases were reduced in number, partly by the results of phonetic change, partly by the substitution of prepositions with the accusative. The Roumanian still has, in the singular of feminine nouns, a case corresponding in use to the Latin genitive and dative, and the same language has a vocative which may be in part descended from the Latin vocative, but it has no distinction in form between nominative and accusative in nouns. In the other languages of the family the dative in nouns was soon lost, as were also the genitive and the ablative, except in a few instances. In Old French and Provençal a declension with two cases, representing the Latin nominative and accusative, existed; thus in Old Fr. nom. sing. *murs* (from *murus*), obj. sing. *mur*, nom. plur. *mur*, obj. pl. *murs*. Feminine nouns, however, from the Latin first declension were generally alike in both cases, as in modern French. Traces of a similar declension exist in Rhæto-Romance dialects still; but the modern forms of the languages which had this declension have, with some exceptions, lost the old nominatives, and it can be said that, with the exception of Roumanian, nouns in the Romance languages no longer have any cases, the inflection being reduced to a distinction of plural and singular forms, and even this distinction is largely lost in spoken French. The modern forms as a rule represent the Latin accusative, but in Italian and Roumanian the single form of the plural is from the Latin nominative in nouns coming from the Latin first and second declensions: Ital. *rose*, Roum. *roase* from *rosae*, Ital. *anni*, Roum. *anĭ* from *anni*; but Fr. *roses*, *ans*, Span. *rosas*, *años*, from *rosas*, *annos*. The declension of adjectives is very similar to that of nouns. Some comparative forms of Latin are widely retained; compare Fr. *meilleur*, Ital. *migliore*, Span. *mejor* with Lat. *meliorem*; but commonly the comparative is expressed by the aid of an adverb meaning "more" (modern forms of *plus* or *magis*), and for a superlative the comparative with the definite article is regularly used, there being no true superlative.

Among pronouns occur some forms which go back to Latin nominatives, accusatives, genitives, and datives, and these four cases are still more or less living, partly through the aid of new formations, as Fr. *en*, Ital. *ne*, from the adverb *inde*. Ital. *loro*, Fr. *leur* are from *illorum*, though they are now used as datives (Ital. *loro* can also be used as an accusative or even as a nominative) or as possessives. Ital. *lui*, *colui*, etc., Fr. *lui*, *celui* go back to vulgar Latin datives (as *illui*; compare Latin *cui*, *huic*). It is true that these forms are no longer confined to use as object cases. Nominative forms from *ego*, *tu*, and vulgar Latin *illi* or *ille* are also preserved; as from *ego*, Ital. *io*, Roum. *eŭ*, Fr. *je* (Old Fr. also *jo*, *jou*), Prov. *eu*, *ieu*, Span. *yo*, Port. *eu*, while the accusative is shown, for example, in Ital. *me*, Fr. *moi*, etc. Among the descendants of Latin pronouns is to be especially noted the definite article which comes from *ille* (in some dialects from *ipse*) in an unstressed form. Fr. *le*, *la*, Ital. *lo*, *la* represent respectively *illum*, *illa(m)*, just as the same forms are also used as unstressed personal pronouns in the accusative, while the stressed form *illa* gave Fr. *elle*, Ital. *ella*. The indefinite article goes back to Lat. *unus*.

In verb inflexion the passive voice is entirely lost, except the past participle, which is used to form the passive (over most of the territory) and tenses for completed action in the active voice; further are lost the future indicative, the future or emphatic imperative, the perfect infinitive, the future participle, the supines (in Roumanian the form of the past participle is used also with prepositions in a sense like that of the Latin supines), the imperfect subjunctive (retained in Sardinia), and perhaps also the perfect subjunctive (see below). But of the remaining forms not all are found in every one of the Romance languages. The pluperfect indicative was retained in Spanish, Portuguese, Provençal, and the oldest French among the recognized literary languages, and in these its sense has generally been changed to that of a conditional or (as in Old French) to that of a simple preterite. The future perfect remains in Spanish, Portuguese, and the older Roumanian (but the perfect subjunctive may be in part the source of these forms). The present participle (lost in Roumanian) is mostly found only as a verbal adjective, its place being largely taken by the gerund. The old pluperfect subjunctive is now mostly an imperfect subjunctive; in Roumanian it has become a pluperfect indicative. The perfect indicative where retained has become simply a preterite. By the aid of auxiliaries, however, and of new formations all deficiencies are well supplied. New formations are those for the future indicative and the so-called conditional mood. The former is the result of an old combination of the infinitive with the present indicative of *habere*, the latter of a similar combination of the infinitive with the imperfect or perfect indicative of the same auxiliary. "I shall sing" was expressed by "I have to sing," *cantare habeo*, and "I should sing" by "I had to sing," *cantare habebam* or *cantare habui* (the latter is the basis for the usual Italian form). As such phrases coalesced into single words contraction somewhat disguised the original forms, but the terminations still show the connection with the verb "to have." This method of formation is not the only one in use. Roumanian uses an auxiliary corresponding to Latin *volo* to form the future, and in the western part of the Rhæto-Romance territory is found a formation for the future corresponding to *venio ad cantare*. To the Romance formations are to be added, besides the future and the conditional, many new past participles, needed to form compound tenses for intransitive verbs, and some others of less importance.

The four Latin conjugations are still more or less well preserved in much of the Romance territory, but the second and third are to a great extent confused, and the greatest vitality is shown by the first and fourth conjugations. In personal endings and in tense formation the influence of analogy has been strong, no conjugational type having escaped it. Remarkable are the variations in the form of the stem, due to different positions of the accent; compare Fr. *tient* and *tenir*, Ital. *tiene* and *tenere*, Fr. *meurt* and *mourir*, Ital. *muore* and *morire*, Old Fr. *aime* and *amer* (now *aimer*), etc. In most verbs of the fourth conjugation an inchoative ending, originally *-isc-*, was added to the stem, appearing in only some forms of the present tenses, in Italian and Roumanian, spreading in French somewhat more, and in Spanish and Portuguese appearing in all the forms of the verb, so that the infinitive in these last ends in *-ecer* instead of *ir*, and these verbs cease to belong to the fourth conjugation. Compare Fr. *finis* (pres. indic.), *finissais*, *finissant*, with the infinitive *finir*, Ital. *finisco* with *finire*. The formation of the preterite indicative and the past participle is somewhat complicated, especially in the so-called irregular verbs. The occasional Latin reduplication, as in *cucurri*, is lost and other formations substituted, especially with *s* and *u* (cf. Ital. *corsi*, Fr. *courus*); but the perfects *dedi* and *steti* (or vulgar *stetui*) extended their endings to other verbs considerably in vulgar Latin. The past participle also shows influences of analogy, notably for the many forms going back to the ending *-utum*, as in Fr. *eu* (formerly *eü*, *oü*), Ital. *avuto*.

The Romance languages are well supplied with derivative endings or suffixes forming nouns, adjectives, and verbs. One of the most interesting suffixes is the descendant of Latin *mens*, *mentis*, mind, now widely used as an adverbial suffix: Fr. *-ment*, Ital., Span., and Port. *-mente*. These suffixes are mostly of Latin origin, but some are from Greek, as Fr. *-esse*, Ital. *-essa*, forming feminines, from Greek *-ισσα*, Fr. *-oyer*, Ital. *-eggiare*, Span. *-ear*, and, in less popular form, Fr. *-iser*, Ital. *-izzare*, Span. *-izar*, from *-ίζειν*; others are from the Germanic, as Fr. *-ard*, Ital. *-ardo*; and the origin of yet others is not quite certain, as of the diminutive *-et* in Fr., *-etto* in Ital. Slavic and other languages have supplied some suffixes to Roumanian.

Questions of syntax are largely involved in the inflectional changes outlined above, and a fuller treatment of the development of Romance syntax is not here possible. Reference may be made to Diez's grammar, vol. iii. (see below); K. Foth, *Die Verschiebung lateinischer Tempora in den romanischen Sprachen* in *Romanische Studien*, ii., 243 ff.; Vising, *Die Tempora der Vergangenheit*, etc., in *Französische Studien*, vi. and vii.; E. Wölfflin, *Lateinische und romanische Comparation* (1879); Tobler, *Vermischte Beiträge zur französischen Grammatik*, i. (1886), ii. (1894).

Further references: Diez, *Grammatik der romanischen Sprachen* (3d ed. 3 vols., 1870–72, and since without change), and *Etymologisches Wörterbuch der romanischen Sprachen* (5th ed. 1887); Thurneysen, *Keltoromanisches* (1884); Gröber's *Grundriss der romanischen Philologie* (i., 1888); W. Meyer-Lübke, *Grammatik der romanischen Sprachen* (i., 1890; ii., 1893–94; vol. iii. is to treat the subject of syntax); G. Körting, *Encyklopädie und Methodologie der romanischen Philologie* (3 vols., with index, etc., 1884–88), and *Lateinisch-romanisches Wörterbuch* (1891). For vulgar Latin may be specially mentioned Schuchardt, *Vokalismus des Vulgärlateins* (3 vols., 1866–68); Wölfflin's *Archiv für lateinische Lexikographie und Grammatik* (1884 and since; contains among other things Gröber's articles on *Vulgärlateinische Substrate romanischer Wörter*); Bonnet, *Le latin de Grégoire de Tours* (1890); G. Cohn, *Suffixwandlungen im Vulgärlatein*, etc. (1891); P. Meyer, *Recueil d'anciens textes bas-latins, provençaux et français* (i.–ii., 1874–77); W. Foerster (for the *Appendix Probi*) in *Wiener Studien* (xiv., 278 ff.), etc. Many periodicals are devoted wholly or in great part to Romance philology; among the most important are: (in France) *Romania*, *Revue des langues romanes*, *Revue de philologie française et provençale*, etc.; (in Germany) *Zeitschrift für romanische Philologie*, which succeeded the *Jahrbuch für romanische und englische Sprache und Literatur*, *Romanische Studien*, *Romanische Forschungen*, *Französische Studien*, *Zeitschrift für französische Sprache und Litteratur*, *Archiv für das Studium der neueren Sprachen und Litteraturen*, *Literaturblatt für germanische und romanische Philologie*, *Kritischer Jahresbericht über die Fortschritte der romanischen Philologie*, etc.; (in Italy) *Archivio glottologico italiano*, *Giornale storico della letteratura italiana*, *Rivista di filologia romanza*, succeeded by the *Giornale di filologia romanza*, and this by the *Studj di filologia romanza*, *Il Propugnatore*; (in America) *Modern Language Notes*, *Publications of the Modern Language Association*, *Harvard Studies and Notes in Philology and Literature*, etc. Further may be noted collections like Stengel's *Ausgaben und Abhandlungen*, the publications of the academies of Berlin, Vienna, etc. E. S. Sheldon.

Romance of the Rose: a famous French poem. Guillaume de Lorris (see Lorris) composed the first portion (4,680 verses) about 1237, and about 1277 Jean Clopinel, commonly called Jean de Meun (see Meun), completed it in a total of 22,817 verses. The former wished to write an allegorical art of love, and so represented the whole as a dream, designating the object of the lover's pursuit as a rose which must be plucked, an idea taken from the earlier *Dit de la rose*. His originality was shown in allegorizing as actors in the drama the inclinations and motives of the lover and the lady, as well as the kindly and malevolent judgments of society. Essentially, therefore, the poem was a study of the psychology of passion and its social environment. Jean de Meun preserved the form and the allegorical characters of the story, but used them only as a pretext for bringing out his own erudition, speculations, and observations. The former part is delicate and filled with the peculiar sentiment of the period, while the second part is copious and varied, but also cynical and at times unspeakably coarse, women in particular being treated with a most brutal insolence.

The *Romance of the Rose* became at once the most popular poem in the French tongue. It was reproduced in Flemish and Italian in the thirteenth century, and in English by Chaucer—a version which has probably not come down to us, though the *Romaunt of the Rose* of about this time, printed in the editions of Chaucer's works, has found able defenders (e. g. Lounsbury). Editions of the *Roman de la Rose* are by Fr. Michel (2 vols., Paris, 1864); P. Marteau, with introduction, notes, and modern French translation (5 vols., Orleans, 1878–79); J. Croissandeau, with notes and glossary (5 vols., Orleans, 1881). Very important for an understanding of the poem is E. Langlois, *Origines et sources du Roman de la Rose* (Paris, 1891). A. R. Marsh.

Romances [so called from the *lingua Romana*, or vernacular, in which they were mainly composed]: the expression of that desire for the adventurous, the new, foreign or marvelous, and the ideal which characterized the early vigor of European literature in the interval between the Dark Ages and the revival of learning. This definition leaves out of account the late Greek romances, such as *Daphnis and Chloe* and *Apollonius of Tyre*, the latter a great favorite in Western Europe; it reached England probably in a Latin version, was soon translated as one of the earliest prose romances in our tongue, and furnished the plot of Shakspeare's *Pericles*. It also excludes consideration of romances in Latin, like the *Ruodlieb*, written by a Bavarian about 1050 and called (Scherer, *Gesch. d. deutsch. Lit.*, p. 68) the earliest romance of Europe.

The romance was meant mainly for aristocratic hearers or readers, and along with its exaggerated adventures of chivalry it struck the new note of sentimental love. Incident is the main consideration, but ideals of character, types rather than individuals, are developed in such figures as Launcelot and the courteous Gawain. Romances differ from the older *chanson de geste* (see Geste) in this echo of chivalry, in a greater range of invention and in a disposition to avoid the local and the popular.

The Arthurian romances, foundation of the whole edifice, have for their corner-stone the *Historia Britonum* of Geoffrey of Monmouth, who died in 1154. The work is based partly on Nennius, partly on Breton traditions; also perhaps on Geoffrey's invention. Among other astounding feats it matches the facts of Celtic loss with a fable of Celtic triumphs mainly due to King Arthur. Nennius had mentioned Arthur merely as a chieftain, a *dux bellorum*; with Geoffrey he is of supernatural origin and a monarch of boundless power. The daring imagination of this book met most happily a new spirit in European literature. The contact, moreover, was on Norman or French soil, and in these chivalrous surroundings the romances of Arthur and his Round Table—the latter was first noticed by Wace in his *Geste des Bretons*—rapidly became an international possession. Conspicuous for novelty and merit were the romances of Chrestien de Troyes, who brought the adventurous material into unison with the new ideals of chivalry. Translations and paraphrases followed; among the best, as well as more independent, versions is the English romance of *Sir Gawain and the Grene Knight*, mainly based on an episode in Chrestien's *Conte de Graal*. A successful German version, with strong ethical leanings, is the *Parzival* of Wolfram von Eschenbach. Meanwhile important facts and characters had been added to the Arthurian legend—Launcelot, with his love for the queen, the Cornish Tristan, and, above all, the story of the Grail, in the later romances merely a miraculous jewel, but commonly regarded as the cup or dish used by Christ at the Last Supper. Here one sees the interpenetration of the two great elements of late mediæval literature—the sacred legend and the chivalrous romance. The story of the Grail was evidently influenced by a legend of Joseph of Arimathea. (See Birch-Hirschfeld, *Die Sage vom Gral*, 1877.) Finally, all these characters and incidents were combined in a single narrative by Sir Thomas Malory (see Malory), whose *Morte d'Arthur* has been the source of subsequent Arthurian literature.

Out of the materials of the popular epic, which had reached its height in the *Chanson de Roland*, the age of chivalry built up for aristocratic patrons, and according to more refined ideals, a cycle of romances which centered in the person of Charlemagne. This cycle touches that of Arthur in many points, the Saracens of course taking the place of the Saxons. It was long supposed that what Geoffrey did for Arthur was done for Charlemagne by the Latin chronicle falsely attributed to Turpin, but really the work of several hands, and finished about 1150. This chronicle, however, is based on the *Chanson de Roland* and other popular poems. Later there sprang up in France a number of prose romances on the same subjects, such as *Fierabras* and the interesting *Huon de Bordeaux*; the latter was sung in the twelfth century as a *chanson de geste*, and appeared as prose romance about 1450. It was translated into English by Lord Berners, but is best known in the charming *Oberon* of the German poet Wieland.

Another cycle goes back to pseudo-classic sources, as in the romances about Alexander and those which belong to the "tale of Troy divine," for example, Benoît de Sainte-More's *Roman de Troie* (1185). The Spanish *Amadis de Gaula* owed much to the Arthurian cycle, and is chief of the

numerous family to which Cervantes paid his respects. It is impossible, however, to follow all the later and divergent paths of the romance, which lead not to distinct persons so much as to special subjects. Such are romances of the innocent wife, like Griseldis; romance interwoven with allegory, like the *Roman de la Rose*; romance with satiric leaning, as in *Reynard the Fox*, which lays the beast-epic under contribution; pastoral romances, like Sidney's beautiful *Arcadia*; and long romances of later date, such as those of Mlle. de Scudéry.

The literature of the romances is enormous, but two works contain ample bibliographical as well as direct information: Ward, *Catalogue of Romances in . . . the British Museum* (i., 1883), and Dunlop, *History of Prose Fiction* (revised ed. London, 1888). For English romances, see G. Ellis, *Specimens of Early English Metrical Romances* (1848), and the various editions in the publications of the Early English Text Society. For the French, see Nyrop, *Den oldfranske Heltedigtning*, and G. Paris, *Histoire Poétique de Charlemagne*. FRANCIS B. GUMMERE.

Romanes, rō-mānz', GEORGE JOHN, F. R. S., LL. D.: biologist; b. at Kingston, Canada, May 20, 1848; graduated with honors at Cambridge, England, 1870; fellow of Royal Society 1879; became an intimate friend of Charles Darwin while in Cambridge; was Fullerian Professor of Physiology in the Royal Institution of London, and Rosebery Lecturer on Natural History in the University of Edinburgh. He devoted himself principally to extending evolutionary doctrines in the field of psychology; published *Animal Intelligence* (1881); *Mental Evolution in Animals* (1883); *Mental Evolution in Man* (1888); *Origin of Human Faculty* and *Philosophy of Natural History before and after Darwin*, and numerous scientific essays. D. at Oxford, May 23, 1894. C. H. THURBER.

Romanesque: See ARCHITECTURE.

Romanic Languages: See ROMANCE LANGUAGES.

Roman Law: primarily, the body of rules which governed the city of Rome and its citizens. As the power of Rome grew, this system of law was extended over a large part of Italy, but it was not generally introduced into other territories nor made applicable to Rome's subjects as distinguished from her citizens. For the conquered provinces and their inhabitants a different body of rules was worked out. This new law was only in small part a further development of the law of the city; in the main it was a distinct and superior system. It was based on the customs of the various Mediterranean peoples, and representatives of nearly all those peoples ultimately played some part in its development. During the imperial period these two systems were gradually fused into one, and in the codification of Justinian they are presented as a single and substantially homogeneous body of law.

Much of the Roman law has only an historical interest. This is the case with the older law of the city as a whole; this is the case also with the public law of the empire. On the other hand, the principles governing private relations, which were worked out in the later republic and the early empire and which were incorporated with little change in the law-books of Justinian, have more than an historical significance—they are to-day a living force. It was in large part on the basis of the Roman law that the mediæval Church worked out for all Christendom its law of family and of testament. Toward the close of the Middle Ages the law-books of Justinian, as modified by the Roman canon law, became the chief basis of adjudication in the secular courts of continental Europe, and in the so-called "modern Roman law" Europe obtained a body of substantially uniform rules for property and obligations. The principles of the Roman law have not exercised a controlling influence upon the English common law; but in all modern states, except those founded by Englishmen, the existing law is based on Roman conceptions of private right, reveals in its form the influence of Roman legal science, and expresses itself in Roman terms. The modern civil codes of Europe and of Central and South America are Roman in much the same sense in which the existing law of the self-governing British colonies and of the U. S. is English; and in this sense the Roman law and the English law are the two great systems that rule the modern civilized world.

1. THE LAW OF THE CITY (*Jus Civile*).—According to one tradition the city was governed during the first three centuries of its existence (i. e. during the royal period and the first half-century of the republic) by unwritten custom. According to another tradition the earliest laws were royal enactments. A considerable body of ancient rules, described as royal laws (*leges regiæ*), existed and were collected in the republican period. Many of these have come down to us, and it is evident that they are simply rules of early custom, similar to those which prevailed among other Aryan peoples. Precepts of a religious or moral nature are blended with rules of a legal character. Their formulation suggests a strong sacerdotal influence—an assumption which is corroborated by other Roman traditions.

The Twelve Tables.—Early in the republican period the plebeians complained that the ancient customs of the city were misinterpreted by the patrician priests and misapplied by the patrician magistrates. They therefore demanded that the law be reduced to writing and enacted in statutory form. In compliance with this demand the *law of the Twelve Tables* was drafted by a commission of ten elected for the purpose, and was approved by the popular assembly (451 and 450 B. C.). Much of this early code has come down to us. It is clearly nothing but a compilation of the older customary law. It differs from the so-called royal laws in that it contains fewer religious precepts and gives a clearer formulation of personal and property rights. It was regarded by the Romans as the great charter of their liberties. As late as Cicero's time Roman schoolboys learned its text by heart; and during the greater part of the republican period it was practically impossible to secure the adoption of any law which directly and overtly abrogated or changed the provisions of the Tables.

The Republican Jurists.—Under these circumstances the development of the law was accomplished mainly by interpretation. The scanty and rude provisions of the Twelve Tables were supplemented and modified by a free use of analogy and of fiction. For nearly two centuries after the enactment of the Twelve Tables the priests of the pontifical college controlled the forms of pleading and retained a practically exclusive power of interpreting the law; and it was not until the plebeians had forced their way into this last stronghold of the conservative party (300–254 B. C.) that Roman jurisprudence was secularized. Thenceforward the Roman who wished to study the great body of rules that had grown up around the Twelve Tables was no longer forced to seek an election as pontifex; he placed himself under the instruction of some older jurist. The knowledge of the law was not treated as a means of gaining a livelihood; legal advice was given gratuitously. Next to conspicuous service in war the knowledge of the law furnished the ambitious Roman with the best opportunity of recommending himself to the favor and the suffrages of his fellow citizens. The jurists did not plead cases; this was the business of the orators. They did not directly decide cases unless they happened to be elected judges or appointed referees (*judices*); but in a doubtful case the opinion of some eminent jurist was brought to the referee or was solicited by him, and such an opinion was regularly conclusive.

Character of the Jus Civile.—The civil law of the republic presents many interesting analogies to the older common law of England. It was essentially a body of case law, shaped by decisions. It was very strict and very formal, certainty of law being held in higher regard than equity. It was very technical, but nearly all its technical distinctions were based upon sound principles. The great advance which the Roman civil law represents in universal history is found (1) in the unprecedented clearness with which private rights were marked out and the extent to which the individual was permitted to shape his own legal relations; and (2) in the separation of law and religion. This last step was one which no Asiatic or European people had previously taken.

2. THE LAW OF THE ANCIENT WORLD (*Jus Gentium*).—With the extension of Roman rule over the Mediterranean basin, legal problems were presented which could not be solved by the law of the city. The protection of the civil law could be accorded to aliens only through interstate treaties, and the conquered provincials (as distinguished from the favored allies of Rome) were not merely aliens—they were stateless aliens. The states of which they had been citizens had been destroyed by war. They themselves were simply subjects of Rome. In theory they were the slaves of the Roman people, and their property belonged to the republic. In fact, they were treated as freemen, and it was necessary to administer justice to them.

A more serious difficulty lay in the inadequacy of the city law to meet the needs of the new empire. The Roman civil law had been worked out by and for a people whose chief

occupation was agriculture. Among the subjects of Rome were the great trading nations of the ancient world, the Greeks and the Phœnicians. Rome itself became more and more the center of Mediterranean commerce, and when piracy had been crushed out by her fleets, this commerce rose to unexampled importance. A new and very different body of rules was required to govern the relations between the provincials themselves and between them and the Romans.

These problems were solved in a thoroughly Roman way —tentatively and gradually. A second prætor had been elected at Rome since 247 B. C., and to this magistrate was assigned the duty of administering justice to foreigners in the city. The governors of the several provinces were charged from the outset with similar duties. No rules were laid down for their guidance; they were left to make their own law. In accordance with the old Roman rule that cases should not be actually decided by the magistrate, these officers, after hearing the allegations of the parties, sent each case to a referee (*judex*), with a brief note of instruction (*formula*) which ran somewhat as follows: "If it appear that such and such allegations are true, condemn the defendant; if not, absolve him." Each formula contained, by implication, a rule of law; and a collection of the formulas regularly issued would, in course of time, have amounted to a digest of the new law. From the very outset, however, the prætor of the foreigners and each provincial governor published at the beginning of his term an edict (*edictum*), in which he stated the grounds upon which he would give actions and "exceptions" or defenses. Each successive magistrate adopted the edict of his predecessor, with such additions and improvements as the latter's experience or his own might suggest; so that the codification of the new law kept pace with its development. The foreign edict at Rome served as a general model for the provincial edicts, and was itself steadily enriched by provisions which first made their appearance in this or that provincial edict. In this whole development the Roman jurists exercised a controlling influence, partly through actual possession of the magistracies, but far more through their activity as councilors. Every Roman magistrate, before entering upon his duties, selected a body of advisers (*consilium*); and those magistrates who were charged with the administration of justice naturally sought the assistance of jurists of established reputation.

Character of the New Law.—In matters which bore no relation to commerce no effort seems to have been made to create uniform law for all the provinces. Family relations and questions of inheritance seem to have been differently regulated in the various provincial edicts, in accordance with national or local customs. As regarded property and obligations, however, the foreign edict at Rome and the various provincial edicts were kept in substantial harmony, so that a uniform system of commercial law was established for the entire civilized world. This law, as the Romans themselves declared, was based upon the rules which prevailed among all the nations (or rather upon the common elements found in all their various rules), and upon natural reason.

As compared with the law of the city, the new law was far less formal, far broader, freer, and more equitable. It gave remedies against mistake and fraud which the civil law did not give. It went back of the form of transactions, and regarded their substance. It laid the greatest stress, in contractual relations, upon the demands of "good faith."

3. Fusion of the Two Systems.—*The City Edict.*—As soon as the *jus gentium* was fairly developed, the impulse to reform the law of the city became irresistible. The method by which the new system had been developed naturally suggested itself as a method by which the old system might be reformed. The *jus gentium* had been created by magistrates whose activity was unfettered by forms and whose authority was unrestrained by law. The basis of its development was the power of the magistrate to instruct the referee. The city prætor, who administered justice to Roman citizens, had not this power. Under the technical forms of civil pleading (*legis actiones*), the litigants themselves formulated the issue and the judges or referees were bound to decide according to established law. By a *lex Æbutia*, passed about 150 B. C., informal pleadings were permitted and the city prætor was empowered to instruct the referee. The edict of this magistrate at once became the central factor of legal development. The law of the city was not only supplemented, but "corrected." The principles of the *jus gentium* were applied to Roman property and Roman contracts, and received further improvements. As far as these matters were concerned, the city edict now set the pace of development for the provincial edicts. The city prætors also reformed and modernized the law of the family and of inheritance. The reform of the civil law by the prætors is a movement which presents striking analogies to the reform of the English common law by the English chancellors.

The growth of the prætorian law practically ceased with the overthrow of the republic. In the reign of Hadrian a noted jurist, Salvius Julianus, was charged with a final revision of the edict. From this time the development of the law was accomplished by interpretation and by legislation. Legislative power had been transferred from the people to the emperor and the senate. The controlling influence was exercised by the emperors. At first they legislated with the advice and consent of the senate; but the *oratio principis*, or proposal of the emperor, was invariably accepted, and in the second and following centuries the emperors habitually employed the form of direct decree or "constitution." In the field of private law, however, the dominant influence was that of the jurists, and the development of the law was carried on by juristic interpretation far more than by legislation.

The Jurists of the Empire.—The recognition and influence which were accorded to the jurists, under the republic, by opinion and custom, now received legal sanction. To the most noted jurists the emperor gave a formal right of response (*jus respondendi*), and the judges or referees were bound to follow the responses of these "patented jurists" unless conflicting responses were submitted. In the second and third centuries, when jurisdiction at Rome had been transferred from the prætors to imperial prefects, when all the provincial governors were imperial appointees, and when, in consequence of the disappearance of the reference (*judicium*), these officials were judges of both law and facts, the leading jurists were regularly charged with the direct administration of justice. The office of prætorian prefect, to whose court appeals were carried from all parts of the empire, was successively occupied, in the first half of the third century, by Papinian, Ulpian, and Paul, the three writers whose names stand highest in the roll of Roman jurists; and Ulpian and Paul, before their promotion to the chief-justiceship, had served as "assessors" or associate justices in the court of Papinian. The great body of new law which was worked out by the jurists of the early empire was therefore judge-made law. The decisions by which it was gradually elaborated were reported and digested by the jurist-judges themselves.

Juristic Literature.—Toward the close of the republican period the leading jurists began to write legal treatises. Early in the imperial period law schools were established, and the development of systematic instruction gave an important impulse to the systematic presentation of the law. The famous *Institutes* of Gaius, written in the second century, is apparently a course of lectures. Most of the great jurists, including Ulpian and Paul, published detailed commentaries upon the civil and the prætorian law, as well as monographs upon special subjects. All of them, including Papinian, published books of "questions," "opinions," or "responses." These latter works, as their names imply, were collections of cases, and the systematic treatises were full of illustrative decisions.

In the fourth and following centuries a peculiar degree of authority was attached to this body of literature. The laws of the republic, the prætorian edict, the decrees of the senate, the constitutions of the earlier emperors were no longer cited in the courts; the great jurists alone were cited. Their writings were identified with the law existing in their time; *jus* came to mean the juristic literature of the first three centuries. A "law of citations," issued by the West Roman emperor Valentinian III. (426), recognized and regulated the use of this body of jurisprudence. In case of divergent dicta that opinion was to be followed which was supported "by the greater number of authorities." "If the number on each side be the same, that opinion shall prevail which has the support of Papinian." Only when these tests failed was the judge to employ his discretion. Citations were limited to the writings of Gaius, Papinian, Ulpian, Paul, and Modestine, and of the earlier jurists cited and approved by these five.

A considerable portion of this literature has come down to us in the *Digest* of Justinian. Outside of the *Digest* little remains except the *Institutes* of Gaius (a palimpsest of this work was found in Verona in 1816), and parts of treatises by Ulpian and Paul.

The Edict of Caracalla.—During the first two centuries of the Christian era Roman citizenship had been conferred upon great numbers of provincials. Early in the third century Caracalla declared all free inhabitants of the empire to be Roman citizens. This edict swept away the last remaining differences between civil and provincial law. Technically speaking, the empire was henceforth governed by the law of the city; but as the civil law had been completely remodeled in accordance with the principles of the *jus gentium*, the substantial triumph rested with the latter system.

The Later Empire and the Codification of Justinian.—The list of the great jurists is abruptly closed about the middle of the third century. After Paul but one name of note occurs, that of Modestine. The development of the law was henceforth carried on by imperial decrees or "constitutions." The breach with the old order, however, was less complete than it appears to be. Most of the constitutions issued during the last half of the third century were "rescripts." These were responses rendered in the name of the emperor to petitions requesting imperial decision of concrete cases. Such applications had been made throughout the early empire. In some cases the emperor decided these cases in council; more frequently he assigned their decision to the ordinary judges, with instructions, however, touching the principles which should be applied. In substance, therefore, these rescripts were decisions rather than statutes. The rescripts issued in the reigns of Gordian and of Diocletian are similar in form, and not inferior in the quality of their legal reasoning, to the average responses of Ulpian and Paul. Jurisprudence had not yet sensibly waned, as it did in the fourth and following centuries, but the jurists had disappeared behind the throne, and spoke only with the voice of the emperor.

Technically, however, the rescripts, as well as the general decrees of the later emperors, were imperial "laws" (*leges*), and were distinguished from the older law (*jus*) very much as we distinguish statutes from common law.

The first attempts at *codification* were confined to the imperial constitutions. A private collection of rescripts was made at the end of the third century (*codex Gregorianus*), and a supplement was issued late in the fourth century (*codex Hermogenianus*). In the year 429 the East Roman emperor Theodosius appointed a committee of codification. It was clearly his intention to have the entire law, both the *jus* and the *leges*, brought into manageable compass; but nothing came of his initiative except an official revision of the imperial constitutions (*codex Theodosianus*). This code was transmitted to the Emperor Valentinian III., and was published in both the Eastern and the Western empire in the years 438 and 439.

The Emperor Justinian (527–565) and his minister Tribonian took up the wider plan of Theodosius. A new collection of imperial constitutions was published in the year 529. A committee was then appointed to digest the juristic literature, omitting all that was antiquated and avoiding contradictions. The result of their labors was the *Digest* or *Pandects*, which consisted of more than 9,000 excerpts from the writings of thirty-nine jurists, arranged under 429 titles and grouped into fifty books. Each excerpt or fragment is preceded by the name of the writer and the title of his work. As a rule, the excerpts were literally reproduced, without condensation or other change. During the progress of this work an official text-book was drafted, intended primarily for use in the imperial law schools. It was based on the *Institutes* of Gaius, and bore the same title. The *Institutes* and the *Digest* of Justinian were published Nov. 21 and Dec. 16, 533. In the meantime the codex of 529 had become antiquated. A number of controversies had been discovered in the juristic literature, and no less than fifty new constitutions had been issued for their decision. A *Codex* "of the second reading" (*repetitæ prælectionis*) was therefore published Dec. 29, 534. It contains more than 4,600 constitutions (more than half of them "rescripts"), arranged in twelve books. The *Institutes*, *Digest*, and *Codex* were declared to be henceforth the sole sources of the law, and to forestall further controversy it was made a penal offense to write commentaries upon these books. During the remaining years of his reign Justinian issued many new constitutions. Of these *Novels* (*novellæ leges*) only private compilations were made.

The value of Justinian's work lies mainly in the fact that the Roman law was not codified in the modern sense of the word; i. e. no attempt was made to set forth the entire law as a body of positive rules. In the excerpts from the juristic literature which make up the *Digest* and in the rescripts contained in the *Codex* we have a great body of rules stated only by implication, and therefore capable of reformulation. This gives the Roman law that elasticity which is inherent in all case law. This made it possible to apply the underlying principles of the Roman law to the new and different social conditions of the Middle Ages, and this makes the law-books of Justinian of value to-day to the student of legal science.

4. Roman Law in Mediæval and Modern Europe.—*In the East.*—The collections made by Justinian continued to be employed in the East Roman or Byzantine empire until the close of the ninth century, when they were displaced by a less bulky compilation, known as the *Basilica* (sc. *nomima*), royal laws. This book remained nominally in force until the fall of Constantinople (1453), but it was superseded in practice by a series of private digests and compendiums, each briefer than its predecessor. One of these, the *Hexabiblos*, compiled in the fourteenth century, was extensively used among the Christian subjects of the Ottoman empire, and was in force in the kingdom of Greece as late as the middle of the nineteenth century. It is said that the Roman law in its later Byzantine form exercised a considerable influence upon the development of the Turkish law.

In the Teutonic Kingdoms.—Half a century before Justinian ascended the throne at Constantinople the West Roman empire had fallen. In most of the Teutonic kingdoms established in Western and Southern Europe the conquered provincials were permitted to live by the Roman law (the so-called system of the "personal statute"), and several of the kings had handbooks of Roman law compiled for the use of their Roman subjects. The most important of these was the so-called *Breviary* of Alaric II., King of the Visigoths (A. D. 506). It included a condensation of the *Institutes* of Gaius, a portion of the *Opinions* of Paul, and a considerable number of constitutions from the older codices, particularly the Theodosian.

Local Law.—As the Romanic and Teutonic elements in Western and Southern Europe were gradually fused into new nations, the system of the "personal statute" was necessarily abandoned, and the Roman law became the local law of those districts in which the Romanic element was preponderant. In France, for example, the southern provinces, where it was regularly applied, were known as the "lands of written law" (*pays de droit écrit*), in distinction from the "lands of custom" (*pays coutumiers*), where Frankish usages prevailed. Until the latter part of the Middle Ages, however, the economic conditions prevailing throughout Europe were so simple that the Roman law which was required and applied was but a slight part of the jurisprudence which had grown up in the second and third centuries. Until the twelfth century the *Breviary* was almost the only source of Roman law employed in Western Europe.

The Canon Law.—Of greater importance was the survival and development of Roman law in the mediæval Church. It was an unquestioned maxim that the Church lived by the Roman law. Its entire sacerdotal personnel stood outside of the tribal and local laws which governed the laity, and in many matters which are to-day regarded as secular (marriage and the family relations, testamentary succession, etc.) it claimed and obtained a practically exclusive jurisdiction over all Christians. From the court of the bishop (see Ordinary) appeals ran to Rome and by the decisions of the popes a great body of new law was gradually built up—the *jus canonicum*. See Canon Law and Marriage.

Study and Reception of the Law-books of Justinian (1100–1600).—Toward the close of the eleventh century the lawyers of Lombardy began to have recourse to the *Digest* of Justinian for the solution of questions upon which their local law was silent. In the twelfth century flourishing law schools existed at Bologna and other Italian university centers in which the Roman law, both civil and canon, was systematically taught, and to which students from Western and Central Europe (*ultramontani*) thronged by thousands. In the course of the same century Roman law was read at Montpellier, at Paris, and at Oxford. In the following centuries it became a regular branch of instruction in the new universities established in the Netherlands and in Germany. In those countries where Roman law was already in force the law-books of Justinian began to be cited in the courts, and in countries where the Roman law had previously

gained no foothold (except indirectly, through the ecclesiastical courts) these books were gradually received as positive law. Such a "reception" of the Roman law took place in Germany and in the Netherlands in the course of the fifteenth and sixteenth centuries.

The prime cause of this phenomenon was the need of a more highly developed system of law. With the revival of commerce which followed the crusades economic conditions became more complex, and the simple customs by which the greater part of the continent was governed became inadequate. One of the first results of the commercial revival was the extension of the mercantile law of the Mediterranean, which was largely Roman in character, along the coasts of Western and Northern Europe (see MERCANTILE LAW); but this body of law was applied only to merchants and to transactions of a distinctly commercial character. The new needs of the rest of the community were amply met by the law-books of Justinian. In those parts of Europe which were not at first touched by the revival of commerce, and in which simple economic conditions continued to prevail (e. g. Switzerland and the Scandinavian countries), the Roman law was not received.

A further and negative cause of the reception was the inability of the mediæval state to furnish the kind of law that was needed. Feudalism had so disintegrated political authority that in most parts of Europe there was no real legislative power nor any supreme judicial control. The principal exception was England, where the Norman conquest had so solidified the state that the king in Parliament could enact statutes for the realm, and the king's courts were able to develop the national law by their decisions. A second exception was Northern France, where, at the close of the thirteenth century, the crown had obtained power enough to reform procedure in the provincial courts and to draw cases to the king's courts on appeal. In England therefore the Roman law was not received at all; and in Northern France the reception was "partial" only—i. e. single rules were received, but the Roman law was not adopted as a whole. A third factor of importance was the conviction which prevailed throughout Europe, and which was especially strong in Germany and Italy, that all political authority was derived from the Roman empire, and that all the Roman emperors from Augustus to Justinian were the legal predecessors of the mediæval rulers. This fiction of "continuous empire" did much to facilitate and legitimize the reception.

Closely connected with the reception of the Roman law was the disappearance of popular courts and lay judges and the development of the "learned judiciary." Each of these movements was in part a result and in part a cause of the other.

From the broadest point of view the reception of the Roman law may be regarded as a first step in that reception of the ancient culture which culminated in the humanistic movement of the fifteenth and sixteenth centuries.

Character of the Reception.—(1) The Roman law was adopted in the form and with the modifications which it had received in the Italian practice of the twelfth and thirteenth centuries. The Italian jurists had combined with the *Institutes*, *Digest*, and *Codex* of Justinian the greater portion of his *Novels*, and to distinguish this mass of law from the canon law they termed it "the body of the civil law" (*corpus juris civilis*). They had also "glossed" or annotated its provisions, and their notes, as digested in the "ordinary gloss" of Accursius (about 1250), enjoyed an authority almost greater than that of the text. (2) The "civil law" was received subject to the changes introduced by the canon law. (3) It was received nominally as subsidiary law—i. e. it was to be applied only in the absence of local rules. In Germany, however, the learned judges were generally hostile to local custom, and by throwing upon the party who alleged a local rule the burden of proving its existence and its nature they did much to destroy local custom and substitute Roman rules.

Modern Codes.—A reaction against the Roman law began almost simultaneously with its complete reception. Codification of local customs was first demanded; later, under the influence of the "natural law" school (see JURISPRUDENCE), there arose a general demand for modern codes better adapted to modern conditions. The decisive factor in modern European codification, however, has been the desire to substitute uniform national law for divergent local and provincial laws. In many branches of the law (notably in the field of contract) the existing codes of Europe are substantially Roman, and the non-Roman rules which have found acceptance are usually formulated in a manner which shows the influence of Roman ideas to be still dominant. In several countries in which the law-books of Justinian were never received a "scientific reception" of the Roman jurisprudence has taken place; so in Switzerland and in the Scandinavian countries.

SOURCES AND LITERATURE.—For the older Roman legislation and jurisprudence, see Bruns and Mommsen, *Fontes Juris Romani*, and Huschke, *Jurisprudentia antejustinianea*. The *Institutes* of Gaius have been translated into English by Poste and by Muirhead; the *Rules* of Ulpian by Muirhead; the *Institutes* of Justinian by Moyle. The best edition of the *Corpus Juris Civilis* is that of Mommsen and Krüger; the latest edition of the *Corpus Juris Canonici* is that of Friedberg. Histories of the Roman law (to Justinian) are numerous; the best in English is that of Muirhead. The best brief exposition of the Roman law in English is the translation of Sohm's *Institutes*. For the mediæval history of Roman law the best book is still that by Savigny. For the reception, see the works of Schmidt and Modderman. MUNROE SMITH.

Romano, GIULIO: See GIULIO ROMANO.

Roma'noff: the name of the family from which the present dynasty of Russia derives its origin. Michael Feodorovich Romanoff, the descendant through his grandmother of the royal house of Ruric, was the first of the name to ascend the imperial throne, being chosen by the higher nobility and the clergy in 1613. His successors in the male line ruled till the death of Peter II. in 1730, when the succession reverted to the female line. Another change took place on the death of Elizabeth in 1762, when her nephew, the son of the Duke of Holstein-Gottorp, ascended the throne under the title of Peter III., founding the dynasty of Romanoff-Oldenburg, to which the present sovereign of Russia belongs. See RUSSIA and the articles on the Russian rulers.

Romansch, or **Romansh**: See RHÆTO-ROMANCE DIALECTS.

Romans, Epistle of St. Paul to the: one of the most important of the Pauline books; probably written from Corinth. It affords so many fine examples of the noble and altogether peculiar style and reasoning of the great apostle that its authenticity has never been seriously called in question. Its contents are largely doctrinal, but it contains fine hortatory passages and directions for practical conduct. Its exegetical literature is extensive. The Epistle contains a thorough and comprehensive statement of the theology of Paul. He wrote the epistle to the Church at Rome, which had been already established, probably by some of his own disciples, in order to prepare the way for a visit which he was anxious to make to them (xv. 23). At the time of writing he was under the necessity of going to Jerusalem (xv. 25–27). He therefore stood at the point described in Acts xx. 3; that is, about the year 58. For literature see PAULINE EPISTLES, to which add the English translation of the work of Godet on the Pauline Epistles (Edinburgh and New York, 1894). Revised by S. M. JACKSON.

Romanticism [deriv. of *romantic*, from O. Fr. *romantique*, romantic, deriv. of *romant*, romance]: a term applied to a literary school or movement which is opposed to the methods and ideals of classicism.

Definitions.—The following are some of the definitions given by well-known writers. Heine: "The romantic school in Germany was simply the reawakening of the poetry of the Middle Ages." Mme. de Staël: "The name romantic was introduced in Germany to designate the poetry which was born of chivalry and Christianity." Walter Pater: "It is the addition of strangeness to beauty that constitutes the romantic character in art." Dr. F. H. Hedge: "The romantic feeling has its origin in wonder and mystery. It is the sense of something hidden, of imperfect revelation. . . . The peculiarity of the classic style is reserve, self-suppression of the writer. . . . The romantic is self-reflecting." Prof. Boyesen: "Romanticism is really on one side retrogressive, as it seeks to bring back the past, and on the other hand progressive, as it seeks to break up the traditional order of things." George Saintsbury: "The terms classic and romantic apply to treatment, not to subject, and the difference is that the treatment is classic when the idea is represented as directly and with as exact an adaptation of form as possible, while it is romantic when the idea is left to the reader's faculty of divination assisted only by suggestion and symbol." Victor Hugo: "Roman-

ticism, so many times badly defined, is simply liberalism in literature."

Essential Qualities.—All these definitions have something in common. There are evidently three essential qualities in romanticism: Subjectivity, love of the picturesque, and a reactionary spirit. By the first is meant that the aspiration and vague longing of the writer will be manifest in his literary production; by the second, that element of strangeness added to beauty, which Pater declares is fundamental; this may appear mildly, as where the writer is fond of ivy-mantled towers and moonlit water, or may turn into a passion for the unnatural and the horrible, as in tales of ghosts and of deeds of blood. By the third is meant that the romantic movement in any country will always be reactionary to what has immediately preceded; it may be gently and unconsciously reactionary, as in England, or proudly and fiercely rebellious, as in France.

Mediævalism.—Taking these three elements, subjectivity, picturesqueness, and reaction, it is easy to see why the romantic movement in Great Britain, in Germany, and in France, went for its inspiration back to the Middle Ages. In the Middle Ages lay just the material for which the romantic spirit yearned. Its religious, military, and social life can hardly be better characterized than by the word *picturesque*; and souls weary of form and finish, and of the monotony of rules, naturally sought the opposite of all this in the literature and thought of the Middle Ages. And as the classicists had neglected this period above all others, and treated it with contempt, the reactionists began with an attempt to revivify and brighten this mediæval life.

English Romanticism.—The most striking difference between the romantic movement in France and in Great Britain is that in the former the movement was conscious, while in the latter it was only instinctive. French romanticism had a definite programme, backed almost from the start by a critical school, and headed by one supreme creative genius. English romanticism was a totally different thing. Its beginnings are so faint and so far below the surface that many writers seem to believe that English romanticism began with the nineteenth century, and that in the "age of prose and reason" there was no such thing as a romantic movement at all. It is certainly impossible to name any author as the chief pioneer; for even at the height of Augustan taste there were feeble signs of reaction shown by such writers as Parnell, Croxall, Lady Winchelsea, William Hamilton of Bangour, and Allan Ramsay. The reaction in form, which resulted in the overthrow of the heroic couplet, was brought about by Thomson, Blair, Dyer, Young, Akenside, and others, who cultivated blank verse. The sonnet was revived by Thomas Edwards, Thomas Warton, Stillingfleet, and Mason. Perhaps the most marked change, both in thought and style, is indicated by the Spenserian revival—the renewed study of his poetry and the metrical imitations of his stanza. The latter began as early as 1706, with an ode by Prior, and the fad reached its highest popularity in the years 1735–55, when about forty poems by various writers appeared in Spenserian form. The influence of Milton's poems—especially his *Il Penseroso*—was very effective after 1750, giving to literature a dreamy, melancholy cast, which aided in developing the churchyard school. The Warton brothers, happily re-enforced by the lyrical genius of Collins, were the leaders of the Miltonic group, and became prominently identified with the romantic movement. Joseph Warton wrote blank verse and odes, but his most important contribution was his *Essay on Pope* (1756), in which he maintained that Pope, being deficient in the higher qualities of poetry, imagination, and passion, could not be classed in the first rank of British poets. Thomas Warton wrote sonnets and poems on romantic themes, and aided the Spenserian school by his *Observations on the Faery Queen* (1754). Following the influences just mentioned came the rage for mediævalism, shown in the revival of Gothic architecture, begun by the dilettante Horace Walpole. He did pioneer work by building a fantastic structure at Strawberry Hill (1750), and by writing the extravagant Gothic romance, *The Castle of Otranto* (1764). The love and study of chivalry, for which Thomas Warton made a strong plea in his *Observations*, was greatly aided by Hurd's *Letters on Chivalry and Romance* (1762). Meanwhile a taste for old ballads, which was created in 1723 by a very popular collection of old ballads (anonymous) and in 1724 by Ramsay's *Evergreen*, received a tremendous impetus by the publication of Percy's *Reliques* (1765). The love of mediævalism showed itself also in the opening of a new romantic storehouse—the Northern mythology. In 1755 Paul H. Mallet published the first part of his *Histoire de Dannemarck*, which treated of the religion, laws, and customs of the ancient Danes, and which gave a translation of a large portion of the Eddaic mythology. Percy and Gray became enthusiastic students of this, and made Odin nearly as familiar to readers as Jupiter. Old Welsh poetry was also cultivated; and everything old or wild or sentimental leaped into popularity by the publication of Macpherson's Ossianic poetry (1760–63), which ultimately was taken more seriously on the Continent than in Great Britain. It was fortunate for the movement that the greatest poet of the time, Gray, finally threw his whole influence in its favor. Beginning as a classicist and disciple of Dryden, Gray came strongly under the influence of the *Il Penseroso* group, and finally ended in downright romanticism. Gray was also the first man of note in the eighteenth century to appreciate natural scenery, and his *Journal in the Lakes*, written 1769, published 1775, is full of the Wordsworthian spirit. By 1770 the romantic movement was in full swing; Chatterton's poems were an important contribution, and two great sides of the movement—the taste for ballads and for chivalry—culminated in the poetry and prose of Walter Scott. Byron belongs to sentimentalism more strictly than to romanticism, but his influence on the romantic schools in France and Germany was enormous. Coleridge and Keats are identified with romanticism, and Wordsworth's methods and theories would certainly give him a place in the history of the movement. After 1830 romanticism in Great Britain became less pronounced, because everything in a sense was romantic; there was nothing to fight.

French.—Speaking generally of the literary history of the two countries, Great Britain has almost consistently stood for romanticism; France for classicism. The romantic movement in Great Britain in the eighteenth century was really the heart of the people asserting itself, timidly and instinctively at first, against the domination of a critical school; while the romantic movement of 1830 in France was a bitter, desperate fight between a band of young reformers and the national literary instinct. The beginnings of French romanticism may be seen in the writings of Chateaubriand and Madame de Staël, but it was with Victor Hugo that the school definitely began (and ended) its work. In the preface to *Cromwell* (1828) he laid down plainly and defiantly the romantic programme, which was fought for by the presentation of his *Hernani* in 1830, and the publication of his great romance *Notre Dame de Paris* (1831). A group of young writers followed enthusiastically in Hugo's wake; they and the movement are well set forth in Gautier's *Histoire du Romantisme*. The school directed its sharpest attacks against the classic French drama, and this reform was the most important literary result they accomplished. The emancipation proclaimed, and at last established, the movement naturally spent its force.

German.—The German romantic movement is not so easy to follow. Between the years 1770 and 1832 it flourished, drooped, and flourished again, Herder's enthusiastic interest in the past kindled a flame of mediævalism, which was re-enforced by Ossianic sentimentalism from Great Britain. Ossian's influence on Goethe's *Werther* is well known, and *Götz von Berlichingen* (1773) came from the heart of Goethe's youthful romanticism. Twenty years later, however, the interest in Greek antiquity put mediævalism in the shade, and classicism became supreme. Then in the early years of the nineteenth century the romantic school asserted itself with renewed force, and a younger generation of poets took up eagerly the cultivation of old patriotic German literature. The Schlegel brothers, Tieck and Novalis, were the leaders of the romantic school proper; the younger, or new romantics, were represented by Uhland, Brentano, the Grimm brothers, Arnim, and others.

WM. LYON PHELPS.

Romany Language: the language of the GYPSIES (*q. v.*).

Rome [from Lat. *Ro'ma* (whence Gr. Ῥώμη) > Ital. *Roma*: Fr. *Rome*: Span. *Roma*]: the chief city of ancient Italy, giving its name also to a great republic and empire; the capital of the modern kingdom of Italy.

I. ROME FROM 753 B. C. TO 476 A. D.

THE EPOCH OF THE KINGS (*Legendary Dates, 753–509 B. C.*).—According to the legends current during the later republic, the city was founded in 753 B. C. by a settlement from Alba Longa led by ROMULUS (*q. v.*). The earliest set-

tlement on the Palatine Hill grew by the addition of numerous fugitives, who were welcomed to an asylum on the Capitoline, and by union with the neighboring Sabines, whose king, Titus Tatius, was associated with Romulus in the government. Romulus was the founder of the political and military institutions of the Romans, as his successor, Numa Pompilius, was the organizer of their religious institutions. After the reigns of Tullus Hostilius, the conqueror and destroyer of Alba Longa, and the peace-loving Ancus Marcius, an Etruscan dynasty gained possession of Rome. Under the three kings of this house—Lucius Tarquinius, Servius Tullius, and Tarquinius Superbus—Rome grew rapidly in power, but the rule of the last Tarquin became so oppressive and hateful that the people drove him out and established a republic in 509.

First subjected to systematic criticism early in the nineteenth century by Niebuhr, the legends of the regal period are no longer accepted by competent scholars as a true account of the early history of Rome. They rest upon no contemporary authority. The earliest historians of Rome wrote in the time of the Punic wars, and had to depend almost entirely on oral tradition, since the greater part of the records of the city had been burned when Rome was taken by the Gauls in 390 B. C. Moreover, the legendary narrative contains many inconsistencies and chronological impossibilities, much that would appear improbable even if supported by the best of evidence, and much that is obviously the result of invention. No confidence can be placed in the detailed history of the regal period, but it is still possible to reconstruct the broad features of the development of the early Roman state when studied in the light of the later history of the city, its archæology and topography, and the comparative history of institutions. The tradition gains in value as we approach the end of the regal period, and becomes fairly trustworthy soon after the establishment of the republic.

However and whenever founded—and it may well be believed that the foundation of Rome was due to the influence of some dominant leader—the earliest Rome was a small Latin town on the Palatine and the small adjacent hills, an easily defended site whose position on the Tiber gave it important commercial advantages. The history of the Roman state begins with a community of three tribes—the Ramnes of the Palatine and their neighbors whom they had absorbed, the Sabine Tities on the Quirinal, and the Luceres on the Cælian. Each tribe was divided into ten *curiæ*, and these again into several clans or *gentes*. The members of the gentes—the patricians—alone had political rights. The government consisted of a king, who was chief priest, judge, and commander in war; of a senate of 300 heads of families, who gave counsel to the king and took charge of the government in case of an interregnum; and of a popular assembly (*comitia curiata*), composed of all patricians capable of bearing arms. Besides the fully qualified citizens there were three other social classes which in time united to form the class of plebeians—the clients or serfs of the clans, a number of resident foreigners engaged in trade, and the rural plebeians or inhabitants of conquered Latin cities who had not been admitted to citizenship. That the last kings of Rome belonged to an Etruscan dynasty there is no good reason to doubt, although it is not likely that their number has been correctly handed down. Under their rule the walls were built and important public works erected, and the Roman territory, which had previously extended along the Tiber and in the direction of Alba Longa, came to include the greater part of Latium. Closer relations with outside nations were established, resulting in the introduction of new elements of culture. To this period probably belong the important constitutional changes which ancient writers ascribe to Servius Tullius. As a means of strengthening the army, hitherto composed only of patricians, the people were grouped into five classes on the basis of landed property, so that every possessor of land bore a share of the public burdens proportionate to his ability. This organization soon acquired political importance, and the 193 military divisions or centuries into which the classes were divided became the basis of the *comitia centuriata*, a popular assembly which soon rivaled and finally superseded the older *comitia curiata* in its most important political functions.

The Struggle of Patricians and Plebeians (*B. C. 509–286*). —After the expulsion of the last Tarquin from Rome, a republic was established under the presidency of two consuls chosen only from the patricians and invested, except in religious matters, with the full authority of the kings. From their decision an appeal lay to the popular assembly; in time of great public danger a dictator was given sovereign power for a term not to exceed six months. Although the plebeians had joined with the nobles in the movement which put an end to the rule of the kings, dissensions between the orders broke out almost immediately. The plebeians were excluded from the magistracies, and, while all who possessed land had a vote in the *comitia centuriata*, the assembly was so organized that the wealthy members of the first class were able to control it. The condition of the poor was rendered particularly hard by the oppressive burden of military service and the harsh law of debt, which gave the creditor absolute power over the person of the debtor. Matters came to a head in the year 494, when the plebeians marched in a body to the Sacred Mount, and were only induced to return by measures of relief from debt and by the institution of tribunes of the people, elected by the plebeians and empowered to annul the acts of any magistrate. Shortly afterward (486) Spurius Cassius made an unsuccessful attempt to break the patrician monopoly of the public land by proposing a division of newly acquired territory among the plebeians. Centering at first about the agrarian law, the struggle between the orders continued with great bitterness. The plebeians organized a tribal assembly of their own, the *concilium tributum plebis*, which sought to make its decrees binding upon the whole body of citizens, and the tribunes usurped the power of banishing or even condemning to death those who opposed their policy. The plebeians protested especially against the exclusive knowledge and administration of the law by the patricians, and after repeated demands for a code which should introduce equality and certainty into the legal system, it was agreed in 451 to elect a board of ten commissioners (decemvirs) with power to revise and codify the laws. Their work was continued by a second commission appointed in the following year, and the results of the decemviral legislation, called from the twelve tablets on which they were engraved the Laws of the Twelve Tables, became the foundation of the whole legal system of Rome. The civil equality of the patricians and plebeians was completed in 445 by the Canuleian law, which legalized intermarriage between the two orders. The same year marks an important landmark in the struggle of the plebeians for political rights. Instead of throwing open to them the consulship, which conferred membership in the senate and important social privileges on those who had held it, the patricians agreed that each year the people might determine to elect, in place of the consuls, military tribunes with consular power, chosen indifferently from the two orders. Two years later, with the purpose of reducing this concession as much as possible, the office of censor was created and invested with the powers which the consuls had exercised in taking the census and making up the list of citizens. Unimportant as the institution of military tribunes proved to the plebeians—no plebeian was chosen to the office until 400—it seemed to quiet their demands, and it was not until 367 that the patricians were finally forced to admit them to the consulship. In that year the Licinian laws abolished the military tribunate and provided that at least one of the consuls should be a plebeian, while they also made the plebeians eligible to the body of priests who had charge of the Sibylline books. These laws also made an ineffectual attempt to remedy economic evils by reducing debts and limiting to 500 *jugera* the amount of public land that could be held by one individual. In political matters, however, the laws mark the end of the long struggle between the orders. It is true that in the same year all judicial functions were taken from the consuls and conferred upon the newly created patrician office of prætor, and that the "sulking patricianism" yielded slowly and sought to destroy the effect of its concessions as far as possible; but with the consulship once granted to the plebeians, eligibility to the other magistracies was sure to follow. A plebeian held the office of dictator in 356, of censor in 351, and of prætor in 337. The quæstors, who had charge of the public treasury, had been elected from both orders since 421, and the priesthoods were divided between the orders in 300. With all the magistracies in the state thus open to them, the plebeians also gained influence in the popular assemblies. The decrees of their own assembly, the *concilium tributum plebis*, first organized in 471, were by the Publilian law of Philo in 339 and the Hortensian law of 286 given legal force and made binding on the whole people. The *comitia curiata* lost all importance in the state; its earlier

functions passed to the *comitia centuriata*, reorganized on a democratic basis at some time in the third century, and to the *comitia tributa*, in which the whole people met in their tribal divisions. "As a righteous retribution for their perverse and stubborn resistance," the patricians saw "their former privileges converted into so many disabilities," since they were forced to share these privileges with the plebeians, and were excluded from election to the tribunate and from membership in the special plebeian assembly.

While the popular assemblies thus "acquired the semblance, the senate acquired the substance of power." The assemblies were unwieldy, the power of the magistrates was weakened by division and by the shortness of their terms; the senate alone had a continuous policy, and it drew to itself the control of elections and legislation and the general direction of the policy of the state. On the ruins of the old nobility of birth arose a new patricianism based upon wealth and possession of office.

The Conquest of Italy (*509–275 B. C.*).—The same generation that saw the formal completion of plebeian rights by the Hortensian law witnessed the establishment of Roman supremacy in Italy. The wars that followed the expulsion of Tarquinius Superbus deprived Rome of her hegemony over Latium and reduced her almost to her original limits, so that for a time the very existence of the state was threatened. The chief enemies of Rome in this period were the Volscians, situated to the southeast, the Sabine and Æquian mountaineers to the east and northeast, and the powerful Etruscan confederacy across the Tiber. Against these, in 493, an alliance was formed between Rome and the towns of the Latin confederacy, and in 486 this league was joined by the neighboring Hernicans. The long and doubtful wars which followed, embellished by Roman annalists with poetic details and the half-fabulous stories of Coriolanus and Cincinnatus, brought little advantage to Rome. The state was weakened by civil dissensions, and only after these were temporarily healed by the decemviral legislation and the reforms which immediately followed it, did the Romans begin the steady advance which brought them in 406 before the gates of the important Etruscan city of Veii. The capture of Veii, after a ten years' siege, was an event of great importance in the territorial growth of Rome, since it removed the most serious obstacle to the advance of Roman power. In the year 390 Rome was taken and burned by the Gauls, a Celtic people from the north of Italy. In spite of the immediate loss, the Gallic invasion seems in the end to have favored the growth of the Roman power by weakening Rome's great rival, the Etruscans, and putting Rome into the position of a defender of the rest of Italy against the foreigner. A war with the Latins ended in 338 in the dissolution of the Latin league and the incorporation of most of its members into the Roman state. In 306 the Hernican confederacy met a similar fate. The overthrow of the powerful tribe of the Samnites in 290, after a struggle which had lasted with little intermission for more than fifty years, led to the subjection of their Etruscan and Umbrian allies, and the defeat of Pyrrhus at Beneventum in 275 put an end to the independence of the Greek cities in the south, and left Rome mistress of Italy. The Roman territory (*ager Romanus*) received considerable additions, but Roman supremacy was most effectively secured by the founding of colonies, by the building of military roads, and by the grant of municipal rights and the establishment of treaties of alliance with the conquered cities.

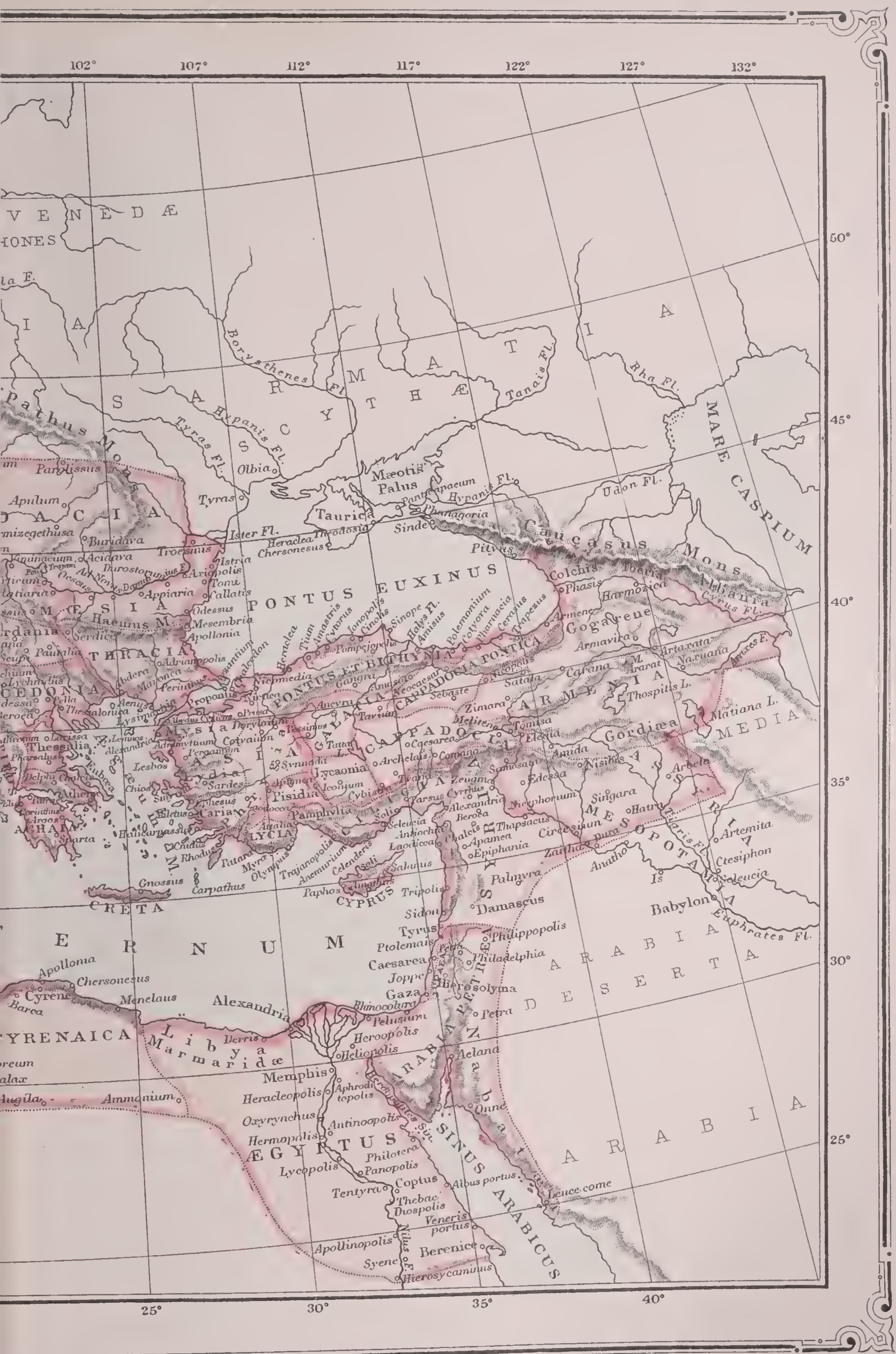
The Establishment of Roman Supremacy in the Mediterranean (*264–133 B. C.*).—Rome's attempt to extend her dominion beyond Italy brought her at once into conflict with Carthage, the leading power in the western Mediterranean. The immediate occasion of the first Punic war was the interference of Rome in the affairs of Sicily, which was then in dispute between the Carthaginians and the city of Syracuse. The war lasted from 264 to 241, and resulted in the victory of Rome only after she had created a navy and learned to compete with the Carthaginians on the sea. Shortly after the conclusion of peace, Rome took advantage of the mutiny of the Carthaginian mercenaries to annex the possessions of Carthage in Sardinia and Corsica. While Rome was engaged in subduing the Gallic tribes in the valley of the Po, Hamilcar Barca conquered Spain for Carthage. His son Hannibal began the second Punic war in 218 by leading his army over the Alps into Italy. Important victories on the Trebia, at Lake Trasimenus, and at Cannæ, gave him control of the Po valley and the southern part of the peninsula, but he was unable to attack successfully the city of Rome or to shake the loyalty of the peoples of Central Italy. The defeat of his brother Hasdrubal on the Metaurus destroyed Hannibal's hope of re-enforcements, and he was compelled to return to Africa, where the victory of the Roman general Scipio at the battle of Zama put an end to the war. Spain was ceded to Rome, and the political and commercial supremacy of Carthage was at an end.

The alliance of Philip of Macedon with Hannibal gave Rome a pretext for interference in the East, and the second Macedonian war resulted (197) in the destruction of the Macedonian supremacy in Greece and the independence of the Greek states. In 190 Antiochus of Syria was defeated at Magnesia and compelled to surrender Asia Minor, which went to increase the territories of Rome's allies. Illyricum became a Roman province in 167. The third Macedonian war ended in 168 in the division of the Macedonian kingdom into four republics under Roman supremacy. In 146 these republics became the Roman province of Achaia, and in the same year a desperate revolt led to the destruction of Carthage and the formation of the Roman province of Africa. In 133 Attalus, King of Pergamus, bequeathed his dominions in Asia Minor to Rome.

This rapid extension of territory was accompanied by far-reaching changes in Roman society. The increase of slavery and the growth of large estates in Italy hastened the decline of the class of small proprietors, who formed the backbone of the old Roman state. Foreigners and dispossessed farmers flocked to the capital, where they formed an idle and dangerous proletariat. In spite of the efforts of such men as Cato, the simple and austere life of earlier times gave way before the spread of a cosmopolitan Hellenism. Political institutions had not adjusted themselves to the changed conditions; Rome was trying to govern an empire with the constitution of a city. The provinces had no share in the government, and were considered a legitimate source of plunder by the governors and tax-gatherers. The senate sank "from its original high position, as the aggregate of those in the community who were most experienced in counsel and action, into an order of lords filling up its ranks by hereditary succession, and exercising collegiate misrule." Reform was imperatively needed.

The Decline of the Republic (*B. C. 133–27*).—The last century of the republic is a period of civil struggles, under the strain of which the republican constitution broke down and gave way to the empire. "It is a sign of the decay of genuine republicanism at Rome, and the approach of autocratic government, that from this time on its history centers about the names of individuals." Controversy first arose over the efforts of Tiberius Gracchus to remedy the evils growing out of the Roman land system. Elected tribune of the people in 133, Gracchus at once proposed an agrarian law which provided for the enforcement of the act of Licinius, limiting the amount of public land which any citizen could possess. Land thus held in excess of the legal amount was to be parceled out among the citizens and Italians in inalienable holdings of thirty *jugera*. The measure was only carried after the deposition of a tribune who interposed his veto; and in seeking re-election the following year Gracchus was killed by his political opponents. In 123 Gaius Gracchus brought forward a more comprehensive scheme of reform. Besides re-enacting the agrarian law of his brother, the execution of which had been suspended after farms had been given to 80,000 citizens, he struck directly at the power of the senate by restricting its control over the government of the provinces. As a counterpoise to the senate, he sought to strengthen the influence of the equestrian order, a class of wealthy capitalists to whom the collection of the provincial taxes was let. The people were won over by public sales of grain at a reduced price. Gracchus hoped to direct the policy of the state by securing his regular re-election to the tribunate, but he was defeated in 122 and soon afterward murdered. After the death of Gracchus the selfish policy of the nobles ruled supreme. The occupied public land was granted to the possessors as absolute private property, and the condition of Italy and the provinces grew steadily worse. The crowning example of aristocratic misrule is seen in the war with Jugurtha, King of Numidia, who bribed one after another of the inefficient generals sent against him. The war was finally brought to an end by Gaius Marius, a man of humble origin, whose further success in repelling the invasion of the Cimbri and Teutones made him the leading man at Rome. Marius was the first of the line of military heroes under whom the republic went out and the empire came in. He lengthened the term of enlistment and abolished the

THE ROMAN EMPIRE



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Udon Fl.
MARE CASPIUM
Caucasus Mons
Colchis
Phasis
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Iberia
Harmozica
Cyrus Fl.
Gogarene
Armavira
Artaxata
Araxes F.
Ister Fl.
Heraclea Chersonesus
Theodosia
DACIA
Apulum
Porolissus
Buridava
Acidava
Durostorum
Troesmis
Istria
Tomi
Callatis
Odessus
Mesembria
Apollonia
Appiaria
MŒSIA
Haemus M.
Serdica
THRACIA
Adrianopolis
Abdera
Perinthus
Byzantium
Chalcedon
Nicomedia
Propontis
MACEDONIA
Pella
Thessalonica
Thessalia
Larissa
Pharsalus
Delphi
Athenae
Corinthus
Argos
ACHAIA
Sparta
Euboea
Lesbos
Chios
Samos
Smyrna
Sardes
Ephesus
Miletus
Halicarnassus
Cnidus
Rhodus
Patara
Myra
Olympus
LYCIA
Caria
Pamphylia
Pisidia
Lycaonia
Iconium
Synnada
Pergamum
Mysia
Dorylaeum
Cotyaeum
Pessinus
Ancyra
Gangra
GALATIA
Tavium
PONTUS EUXINUS
Heraclea
Tium
Amastris
Cytorus
Sinope
Amisus
Halys Fl.
Polemonium
Cotyora
Pharnacia
Cerasus
Trapezus
PONTUS ET BITHYNIA
PONTICA
CAPPADOCIA
Sebaste
Caesarea
Archelais
Comana
Nicopolis
Satala
Zimara
Melitene
Tomisa
Elegia
ARMENIA
Thospitis L.
Carana
Ararat M.
Matiana L.
MEDIA
Gordiaea
Amida
Nisibis
Arbela
Samosata
Edessa
Nicephorium
Zeugma
Cyrrhus
Alexandria
Beroea
Tarsus
Soli
Seleucia
Antiochia
Laodicea
Apamea
Epiphania
Chalcis
Thapsacus
Circesium
Dura
Zautha
Singara
Hatra
MESOPOTAMIA
Tigris Fl.
Artemita
Ctesiphon
Seleucia
Babylon
Is
Anatho
Euphrates Fl.
Palmyra
Damascus
Salamis
Paphos
CYPRUS
Celenderis
Anemurium
Trajanopolis
Tripolis
Sidon
Tyrus
Ptolemais
Caesarea
Joppe
Gaza
Hierosolyma
Philadelphia
Philippopolis
Petra
ARABIA DESERTA
ARABIA PETRAEA
Aelana
Nabataea
Onne
ARABIA
Leuce come
SINUS ARABICUS
Albus portus
Gnossus
CRETA
Carpathus
INTERNUM
Apollonia
Chersonesus
Cyrene
Barca
Menelaus
CYRENAICA
Libya
Marmaridæ
Alexandria
Derris
Rhinocolura
Pelusium
Heroopolis
Heliopolis
Memphis
Aphroditopolis
Heracleopolis
Oxyrynchus
Antinoopolis
Hermopolis
ÆGYPTUS
Philotera
Lycopolis
Panopolis
Tentyra
Coptus
Thebae Diospolis
Veneris portus
Apollinopolis
Berenice
Syene
Nilus Fl.
Hierosycaminus
Ammonium
Augila

property qualification for service in the army, so that military service became a regular profession, and the interests of the soldiers were bound up with those of the general. At this time Rome's Italian allies, while they possessed the private rights of citizenship, did not have the suffrage, and were largely at the mercy of the Roman magistrates at home and in war. Repulsed in their demands, they arose in revolt in the year 90, establishing an independent state under the name of Italia, and were only subdued after the rights of citizenship had been extended to all of Italy south of the Po. Scarcely had Rome put an end to the Social war, as the war with the allies was called, when an important war broke out in the East, led by Mithridates, King of Pontus. The command was intrusted to Sulla, a brilliant member of the aristocratic party, who had already distinguished himself against Jugurtha and in the Social war. While Sulla was absent in the East, Marius, Cinna, and Carbo, the leaders of the popular party, raised a revolt in Rome and put to death many of their opponents. On Sulla's return in B. C. 83 a civil war ensued, and Sulla's victory resulted in a series of cruel proscriptions in which several thousand citizens perished. Master of Rome, Sulla devoted his attention to restoring the shattered government. He re-established the power of the senate, and took away those functions of the tribunate which had made it so effective an engine of revolution under the Gracchi. At the same time the system of provincial government was reorganized, and important reforms were made in the courts of law.

Useful as was the Sullan constitution in restoring orderly government, it could not stand the strain of the age that followed. The people were "divided into two opposing factions, each hating the other and struggling to secure its own advantage," while the foreign difficulties of the period made necessary the creation of extraordinary commands, wholly inconsistent with the republican constitution. After the death of Sulla, Pompey was the leading general of Rome. Victorious over the remnant of the Marian party in Spain, he cleared the Mediterranean of pirates, put an end to the wars with Mithridates, and annexed Syria as a Roman province. While Pompey was absent in the East, the dangerous conspiracy of Catiline was suppressed by the prompt action of the consul Cicero. On Pompey's return to Rome he was coldly received by the senate, and formed a coalition with Cæsar and Crassus, the leaders of the popular party—the so-called First Triumvirate—B. C. 60. The death of Crassus in a war against the Parthians (B. C. 55) left Cæsar and Pompey sole rivals for the headship of Roman affairs. While Cæsar was engaged in conquering Gaul and thus establishing Roman influence in the heart of Western Europe, Pompey remained at Rome, where the course of events brought him into close alliance with the senatorial party. War broke out upon the expiration of Cæsar's command in Gaul, and Pompey was defeated at Pharsalus in 48, and shortly after murdered. After the overthrow of the Pompeian party in the battles of Thapsus and Munda, Cæsar was created perpetual dictator, with the title of Imperator. He began a series of important reforms which were cut short by his assassination in B. C. 44. Cæsar's murderers, led by Brutus and Cassius, were vanquished at Philippi, and the defeat of his principal rival, Antony, at Actium left Cæsar's nephew Octavian master of Rome (B. C. 31).

The Early Empire (*27 B. C.–180 A. D.*).—While the extraordinary commands of the last century of the republic had accustomed the people to imperial methods, and while the authority conferred upon Cæsar had been essentially imperial in character, the formal establishment of the Roman empire is usually dated from the year 27 B. C., when Octavian laid aside his exceptional powers and took the title of Augustus. More cautious than Cæsar, Augustus was careful to preserve the forms of the republican constitution. The magistrates were still elected, although their powers were by successive acts conferred upon the emperor; the senate was given a share in the government, and regularly consulted; but the real authority lay in the hands of the emperor, who alone controlled the army. Under Augustus the frontier was pushed north and east to the Danube, but in the west the Romans were compelled to withdraw from Germany after a disastrous defeat in the Teutoburg forest (A. D. 9). Augustus's stepson and successor, Tiberius, was an able administrator, but grew morose, and disfigured his reign by many acts of cruelty. He was followed by three other emperors of the Claudian house—Caligula, Claudius, and Nero. Britain was made a Roman province under Claudius. Under Nero the burning of Rome was followed by a cruel persecution of the Christians. After a year of revolutions marked by the brief reigns of Galba, Otho, and Vitellius, the imperial authority was restored by Vespasian, whose sons, Titus and Domitian, were the last of the so-called Twelve Cæsars.

The reigns of the "five good emperors"—Nerva, Trajan, Hadrian, Antoninus Pius, and Marcus Aurelius—who ruled from 96 to 180, constituted a period of peace and prosperity. The emperors were in themselves good rulers, and they were not thwarted by the opposition of the republican faction, which had been a serious obstacle in previous reigns. The Romanization of the provinces and the consequent unification of the various parts of the empire went on rapidly; men from the provinces even acquired the imperial dignity. The conquests of Trajan in Dacia and the East extended the Roman empire to its widest limits; but Hadrian gave up the newly acquired province of Mesopotamia, and the wars of Marcus Aurelius with the Marcomani began the long conflict with the Germanic invaders. See map of Europe under the Romans.

The Age of Transition (*A. D. 180–284*).—The century which followed the death of Marcus Aurelius marks the transition from the early empire to the absolute monarchy of Diocletian and Constantine. The practice of associating a capable administrator as colleague and prospective emperor came to an end with the accession of Commodus, son of Marcus Aurelius, and no fixed rule of succession took its place. The reigns which followed were generally short and troubled; of the twenty-three emperors who actually held the throne between the years 180 and 284, excluding claimants and the so-called Thirty Tyrants, all except three met a violent death. The "barrack emperors" of this period were mostly soldiers who rode rough-shod over the forms of the older constitution, and devoted their energies to defending the frontier against the Germans in the North and the rising power of the Sassanidæ in the East. The Franks and Alemanni crossed the Rhine, the Goths plundered the eastern provinces and settled in Dacia. The assimilation of Italy and the provinces, hastened by the edict of Caracalla, which conferred citizenship on all free inhabitants of the empire (212), was accompanied by a decline in patriotism and public spirit. The free Roman population steadily decreased, and large numbers of Germans entered the empire as soldiers or as *coloni*. The empire was rapidly falling to pieces.

The Later Empire (*A. D. 284–476*).—The reign of Diocletian (284–305) begins a new era in the history of Rome. A series of reforms inaugurated by him and carried out by Constantine checked the disintegration of the empire and enabled it to hold out for two centuries longer. In order to counteract the tendency of the various parts of the empire to split off into independent kingdoms, the provinces were grouped into thirteen dioceses, and these again into the four prefectures of Gaul, Italy, Illyricum, and the East. Over each of these divisions were placed separate civil and military heads directly responsible to the emperor, in whom the official hierarchy culminated. Italy took its place in the new organization on a footing of complete equality with the rest of the empire, and Rome ceased to be the capital. The senate lost all importance, and the emperor became an absolute despot surrounded by an Oriental court. At the same time the government attempted to check the dissolution of society by encouraging the formation of fixed social classes, each with its own legal privileges and disabilities. Effective as was the new political machinery in certain directions, the growth of the imperial bureaucracy destroyed what still remained of local independence in the cities of the empire, and increased the financial burdens which fell with crushing weight upon the local units. Besides completing the political reorganization begun by Diocletian, Constantine founded a new capital at Constantinople and issued an edict granting toleration to Christianity, which soon became the official religion of the state.

After the death of the Emperor Theodosius in 395 the empire was administered by his sons Honorius and Arcadius, ruling respectively at Milan and Constantinople. In law there was still one empire, but the two administrative divisions corresponded to deep-seated differences of civilization, and were never again united except in name. While the East remained Greek, the western provinces fell away to the Germanic invaders who poured into the empire. Rome was sacked by the Visigoths in 410 and by the Vandals in 455. The Visigoths founded a permanent kingdom in Southern France and Spain, the Vandals took possession of Africa, and the Burgundians occupied the valley of the

Rhone. With scarcely an exception the emperors of this period were weak and incompetent; control passed more and more into the hands of German leaders, until in 476 Odoacer deposed the Emperor Romulus Augustulus and ruled Italy as a German king. The sovereignty of the emperor at Constantinople was nominally recognized in the West, but the real power was in the hands of the kings of the German tribes.

Authorities.—The best general history of the Roman republic is that of Mommsen. Use should be made of Ihne's *History of Rome* and Nitzsch's *Geschichte der römischen Republik*. For modern views on early Roman history, Niebuhr's *History of Rome*, Schwegler's *Römische Geschichte*, and Lewis's *Credibility of Early Roman History* should be consulted. Arnold's *History of Rome* follows Niebuhr on the earlier period; it is most useful for the Punic wars (to 206). Long's *Decline of the Roman Republic* is a careful narrative of the last century of the republic. Drumann's *Geschichte Roms* treats the same period biographically.

There is no work on the empire equal to Mommsen's on the republic. Merivale's *History of the Romans under the Empire* extends to the death of Marcus Aurelius, where the narrative of Gibbon's *Decline and Fall of the Roman Empire* begins. Schiller's *Geschichte der römischen Kaiserzeit* covers the period to the death of Theodosius. Duruy's *History of Rome* contains a fairly complete account of the empire. The work is particularly useful because of its illustrations. Bury's *History of the Roman Empire* covers briefly the same period as Merivale. Clinton's *Fasti Romani* is of value to the student of the chronology of the empire. Hertzberg's *Geschichte des römischen Kaiserreichs* is valuable, as are also the volumes of Ranke's *Weltgeschichte* which treat of the empire. Mommsen's *Provinces of the Roman Empire* describes an important phase of imperial history. For the years after the death of Theodosius, see Kuhn's *Städtische und bürgerliche Verfassung des römischen Reichs*, Bury's *History of the Later Roman Empire*, and Hodgkin's *Italy and her Invaders*. Among the accounts of particular periods, Gardthausen's *Augustus und seine Zeit* and Burckhardt's *Die Zeit Constantin's des Grossen* should be mentioned. Representative works on the social history of the period are Friedländer's *Sittengeschichte Roms* and Schultze's *Geschichte des Untergangs des griechisch-römischen Heidenthums*.

Roman institutions are most completely presented in the great work of Marquardt and Mommsen, *Die römischen Staatsalterthümer*. Good briefer works are Mommsen's *Abriss des römischen Staatsrechts*, Schiller's *Römische Staats- und Rechtsalterthümer* (in Müller's *Handbuch der klassischen Alterthumswissenschaft*), Madvig's *Verfassung und Verwaltung des römischen Staates*, Willem's *Droit Public Romain*, and Bouché-Leclercq's *Manuel des Institutions Romaines*. Herzog's *Geschichte und System der römischen Staatsverfassung* is a valuable work which treats the Roman constitution historically as well as descriptively.

For a study of the original sources of Roman history, Schäfer's *Abriss der Quellenkunde der römischen Geschichte* gives useful material. Charles H. Haskins.

II. Rome from 476 to 1870.

Upon the ruins of the ancient Roman empire, which fell in 476, there arose gradually a new empire, which soon became all the more powerful as it claimed control over the souls of men as well as over their bodies. Rome became, after a short interregnum, once more the seat of the central power in Europe, and thus earned its historic name of the Eternal City. It owed this supremacy to the gradual development of Christianity. The full supremacy of Rome as the capital of the new Church-empire may be referred to the time of Pope Gregory I. (590–604), through whose energy and political wisdom the authority of the Church was everywhere established.

Rome itself—and with Rome the whole of Italy—had in the meantime been the easy prey of the new races which at that time broke forth from their unknown home in the East, overran the whole of Europe, and gradually obtained the supreme power. Under various names, as Goths and Germans, as Lombards, Franks, and Avares, they conquered one province after another. Large portions of Italy were laid waste, cities were sacked and razed to the ground, and whole populations butchered or carried into captivity. The surviving inhabitants remained in possession of the land, which they were forced to cultivate for the benefit of the conquerors. The ancient laws of Rome ceased to be enforced, the municipalities became extinct, the country was divided into duchies and governed by foreign masters. Although the Lombards at no time were masters of the whole of Italy, their influence was powerful enough to give a new German character to the whole peninsula. Repeated efforts made by the Roman emperors at Constantinople to recover possession of Italy led to bloody wars, but remained unsuccessful. A greater danger threatened Rome when the Church was violently agitated by a great schism between the followers of Arius, who denied the divinity of Christ, and the Roman Catholics, who condemned Arianism. Thanks to the skillful management of Gregory the Great and his influence over Theodelinda, the Queen of the Lombards, the latter were won over to his side, Rome was saved from destruction, and Roman Catholicism became supreme in Italy. This great triumph not only relieved the Church in Rome, but enabled it to increase its strength at home and to extend its power abroad, untrammeled by the irksome authority of Greek emperors or the barbarous interference of German invaders. About the same time that the laws of the Lombards were collected (644) the decrees of councils and the canons of the Church also were codified.

The influence of Rome grew with the power of the popes. The Germans were converted by St. Boniface, and even the Eastern nations of the Slavonic race began to acknowledge the authority of the Church, but the appeal of the Frankish king, Pepin, first established the claim of the popes to judge in secular matters as well as in matters of faith. Pepin rewarded the pope's assistance by a grant of land in Italy, and thus the foundation of the secular power of the popes was firmly laid. Pepin's successor, Charlemagne, relieved the pope of great danger, defeated his enemies the Lombards, and after several bloody campaigns entered Rome, where he accepted at the hands of Pope Leo III. the dignity of Emperor of Rome and protector of Christendom (800). It was little more than a restoration in name of the old Roman empire; Charlemagne acquired no new provinces and no new powers, but the deep-rooted reverence felt all over the world for ancient Rome was silently transferred to the new Cæsar. Thus the emperors gained much by this consecration of their power, while Rome resumed its sway over the world.

Italy was, however, not long to enjoy this newly won greatness in peace. New enemies arose on all sides, and in 846 the Saracens invaded the country and threatened Rome. Leo IV., a Roman by birth and a man of extraordinary vigor, inclosed that part of the city which has ever since been known as the Leonine City with strong walls, and made it for a time impregnable. After a period of turbulent warfare an appeal was made by John XII. to Otho, the German emperor, and the journey of the latter to Rome inaugurated a series of expeditions made by the emperors of Germany into Italy. Otho was, like Charlemagne, crowned in Rome (962), and confirmed and enlarged the donations made by his predecessors, but reserved to himself and his successors the sovereignty of Rome. Unfortunately, this divided authority led to the commission of atrocious political crimes by the popes and the three Othos, and this period of Roman history is full of shame and disgrace. The papal party and the imperial party—later known as the Guelphs and the Ghibellines—were in constant conflict, and Italy was the blood-stained battle-field on which the war was waged. At times the popes triumphed, as when the celebrated Hildebrand (Gregory VII.) compelled the Emperor Henry to do penance at Canossa, a fortress in Lombardy, and, kissing the pope's foot, to swear a formal oath of submission. Hildebrand was deposed, Rome devastated by Norman troops under Guiscard, the city burned, the inhabitants slaughtered or sold into slavery, and he himself driven to seek refuge at Salerno, where he died (1085). Crusaders, German armies, and lawless bands of soldiers ravaged Rome by turns, and in the thirteenth century, a period of unbroken faction and fighting, the city suffered fearfully. Ancient tombs and monuments were transformed into fortresses, towers were built everywhere, and the houses of the tyrannical nobles were so many impregnable strongholds. Within the walls vast districts were lying waste, gardens were planted where once stood the proudest temples and loftiest palaces, and the inhabited portions of the city were filled with perpetual tumult. The popes were confined to their castle, and yet their power abroad was greater than ever. Emperors, kings, and princes bowed before Innocent III., who claimed the government of


ROME
SCALE
0 ⅛ ¼ ⅜ ½ Mile
Names of Antiquities underlined thus: Minerva Medica.
A
B
C
1
2
3
4
5
M. Vaticano
Pal. Vaticano
S.Pietro in Vaticano
Piazza di S.Pietro
Pza.da Sagrestia
Pta.Fabbrica (Nuova)
Pta.Cavalleggieri
Pta.Angelica
Borgo Pio
Borgo Nuova
Pal.Torlonia
Mausoleo di Adriano
Castello St.Angelo
Pte.St.Angelo
Pons Aelius
Pza.dei Quiriti
Piazza Cavour
Pal. di Giustizia
Piazza della Liberta
Pta.Flaminia
Sta.Ma.de Miracoli
P.Umberto I.
Via Aurelia
Villa Barberini
Madonna della Stella
Madonna delle Fornaci
St.Onofrio
Collegio Militare
Va.Lovatti
Va. Lanciani
Villa Fiore
Acqua Paola
Villa Pamfili
Quatro Venti
Porta S.Pancrazio (Porta Aurelia)
S.Pancrazio
Mon. Garibaldi
S.Pietro in Montorio
Villa Sciarra
Pal. Corsini
Lungara
Sta.Maria in Trastevere
S.Crisogono
S.Cecilia in Trast.
S.Francesco a Ripa
Porta Portese
Va.Mattei
V. de Dominicis
Va.Finocchi
Va.Fuzzini
Va.Carminati
Va.Merluzzi
Va.di S.Michele
Stat. Trastevere
Va.Bolosco
Va.Costa
Va.Chiretti
Va.Pellegrini
Va.Vigneri
Va.Fajella
Emporio
Monte Testaccio
Piramide di Cajo Cestio
Porta S.Paolo
Via Ostiense
STRADA FERRATA DA CIVITA VECCHIA
Tevere (Tiber)
M te Aventino
S.Sabina
S.Alessio e Bonifazio
Sta.Maria Aventina
Pons Fabricius
Pons Cestius
Pont. Rotto
S.Bartolomeo
Lungaretta
Pantheon
S.Agostino
Pal. Farnese
Pal. Spada
Pal. Cancelleria
Chiesa Nuova
Circo Agonale
V. de' Coronari
V.di Tordinona
Ospedale
S.Giovanni de Fiorentini
Ripetta
Porta di Ripetta

E
F
G
1
2
3
4
5
Villa Borghese
Pta.Ma.d.Popolo
Monte Pincio
Pta.Pinciana
Corso d'Italia
Villa Torlonia
V.Alberoni
V.Torlonia
Osteria
Viale della Fontana
Vicolo della Nomentana
Via Regina
Pta.Salaria
V.Salaria
Via Po
Porta Pia
Villa Patrizi (Pta. Nomentana)
V.Beradi
Sardegna
Sicilia
Boncompagni
Sallustiana
V. Ludovisi
V.Condotti
Pza.di Spagna
S.Trinità dei Monti
V.del Babuino
V.Frattina
Posta S.Silvestro
Chiesa Protestante
Tritone
Via Sistina
Convento de Cappuccini
Pal.Barberini
Via Venti Settembre
Ministero d.Finanze
Cernaia
Campo Militare il Macao (Castro Pretorio)
Polveriera
Sta.Ma.degli Angeli
Terme di Diocleziano
Pza.di Termini
Pza.dell Indipenda.
Pza.Viminalis
V.Vicenza
V.Marghera
Stazione
Via di Porta S.Lorenzo
Caserma Ferd. di Savoia
Va.Balduino
Va.Guerrini
Va.Ventuni
Pal.del Quirinale
Font Trevi
Pal.Sciarra
Corso
Pza.del Quirinale
Via Nazionale
Via Quattro Fontane
Mte.Quirinale
Esposizne. Belle Arti
Mte. Viminale
Via Cavour
S.Pudenziana
Piazza dell Esquilino
Sta.Maria Maggiore
Via Principe Amedeo
Viale Principessa Margherita
S.Eusebio
Pta.S.Lorenzo (Pta.Tiburtina)
Via di S.Lorenzo
Cappella
Pal.di Venezia
Col.Trajana
Forum Trajanum
Torre de Millizie
V.di S.Lorenzo in Pane e Perna
Sa.Agata in Suburra
Sta.Ma.in Araceli
Campidoglio
V. Baccina
V. Cavour
S.Francesco di Paola
S.Pietro in Vincoli
S.Prassede
S.Vito
S.Alfonso
Trofeidi Mario
Piazza Vittorio Emanuele
Mte. Esquilino
Terme di Tito
Settizonio
Arco di Sett.Severo
Forum Roman
Campo Vaccino
Basa.di Costantino
S.Francesca Roma.
Colosseo
Arco di Tito
Arco di Costantino
Palazzo dei Cesari
Mte.Palatino
Via Merulana
Piazza Dante
Tempio di Minerva Medica
Via Conte Verde
Via Labicana
Via Eugenio
Pta.Maggiore (Pta.Prenestina)
S.Clemente
Via S.Giovanni in Laterano
S.S.Quattro Coronati
Tempio di Claudio
S.S.Giov. e Paolo
Nuovo Ospedale Militare
S.Gregorio Magno
Sta.Maria in Domnica
Mte.Celio
S.Stefano Rotondo
Villa Mattei
Ospedale di S.Salvat. in Laterano
S.Salvatore da Scala Santa
Piaz.di S.Giov. in Lat.
Pal.Lateranense
S.Giovanni in Laterano
S.Croce in Gerusaleme
Anfiteatro Castrense
Pta.S.Giovanni (Pta.Asinaria)
Porta Metronia
Via Appia Nuova
Va.Girelli
Va.Castellano
Va.Colonna
Va.Belli
Va.Galassini
Vicolo delle Tre Madonne
Marrana S.Giovanni
S.Balbina
S.S.Nereo ed Achilleo
Terme di Caracalla
S.Sisto
Via S.Sebastiano
S.Cesareo
Via Latina
S.Giovanni a Porta Latina
S.Giov. in Oleo
Porta Latina
Sepolcro d.Scipioni
Arco di Druso
Porta S.Sebastiano
Va.Ruspoli
N. SOLMONA
STRADA FERRATA DU CIVITA VECCHIA

the whole world, basing his rights upon divine ordinance and sustaining them by the fearful weapons of excommunication and interdict. When, by a turn of fortune, his successors were compelled to abandon Rome and to reside in France at Avignon (1309–77), the city became a prey to complete anarchy, a fate which the adjoining country shared. Rome was virtually left without a government, the Guelphs and the Ghibellines, Neapolitan and German armies, and the noble families of Orsini and the Colonna being alternately masters. The provinces were ravaged by robbers and freebooters, and commerce and industry ceased to exist. For a time peace was restored, order secured, and law resumed by the marvelous success of Cola di Rienzi, a a man of the people, who by the rare power of genuine enthusiasm made himself master of Rome, and even of most of the Italian states (1347). But this last "tribune of the people," as he called himself, was murdered, and when he fell Rome had been so depopulated by wars and tumults that it counted less than 20,000 inhabitants. Herdsmen pastured their cattle on the Forum, flocks of wild fowl haunted the streets, and beasts of all kinds roamed through the deserted quarters. The record of this period is one of unbroken violence, murder, and battle. The family of Borgia, which furnished two popes, became identified with the most shameful crimes. With the termination of the great schism (1378–1417) began a new era, during which vast wealth accumulated in Rome, and all Italy bloomed forth in the Renaissance. Popes like Julius II. and Leo X., one of the Medici, encouraged these efforts by their liberality, and thus Rome was enabled to recover from a terrible calamity—the pillage of the city by the infuriated troops of the constable of Bourbon (1527). But still the popes were either unable to restore peace and order or were held in subjection by foreign powers; for in the meantime the end of the long wars between France and Spain had secured the supremacy in Italy to the latter power. Milan and Naples, Sicily and Sardinia, were Spanish provinces, and the other princes of Italy willingly yielded to the paramount influence of Spain. The increasing power of Protestantism absorbed all the energies of the popes; Pius V. in vain persecuted heretics with increased rigor, and Gregory XIII. was rendered almost powerless by the overwhelming number of banditti. His reform of the calendar, known henceforth as the Gregorian, though at first rejected by Protestant nations and never adopted by the Greek Church, gave him unusual eminence in the annals of Rome. At last the papal scepter fell into the hands of Sixtus V., whose restless energy and stern administration of justice once more restored peace to Rome. From this time the aspect of the city was changed, the reckless power of the nobles was broken, brigandage was rooted out, and property and life were once more safe. The next epoch, the seventeenth century, was a period of political death in Italy. The popes lost their influence in the world; inveterate libertinage took the place of political strife, and nepotism prevailed in the Church. At last, the French Revolution broke out, and the overflowing current of loosened passions found its way to Rome also. A French army entered Italy (1796), conquered the northern provinces, and threatened Rome. For a time the payment of large sums of money averted the storm, but soon after Gen. Berthier invaded the papal states and took possession of Rome. The pope, Pius VI., became a prisoner—first at home and then in France—and Rome was formally annexed to France (1809). It was not until 1814 that the city became free once more and saw the pope return to his palace. In 1848, however, the people rose in rebellion, drove out Pius IX., and established a republic under the triumvirate of Mazzini, Armellini, and Saffi. An appeal to France brought once more a French army to the gates of the city, and a siege was begun. Garibaldi was in the open field with his soldiers, and the Romans within fought with the valor of their ancestors—so bravely that the French were disgracefully defeated. Overwhelming numbers, however, soon put an end to the short-lived republic. Rome was taken, the assembly, convened at the Capitol to meet the invaders, was dispersed, and the pope brought back to Rome. For twenty years French troops garrisoned the Eternal City, and when they were at last withdrawn (1870) Italy had become a nation. Soon afterward Rome, having been made the capital of the new kingdom, saw the temporal power of the Holy See abolished, and Victor Emmanuel enter as its new master. It presents the strange anomaly of being the residence of two sovereigns, the King of Italy and the pope —the one ruling over the whole peninsula from the Alps to the island of Sicily, the latter ruling in undiminished authority over the consciences of all the members of the Roman Catholic Church.

Literature.—On the mediæval history of Rome few books of value have been written since Gibbon published his *Decline and Fall of the Roman Empire*. The work of F. Gregorovius, *Geschichte der Stadt Rom im Mittelalter, V.–XVI. Jahrhundert* (Stuttgart, 1859–72, 8 vols.; 4th ed. 6 vols., 1886–93), refers mainly to the city; T. Dyer's *History of Rome* (London, 1865) is more comprehensive. Bryce's *Holy Roman Empire* (1864; 9th ed. 1888) is a standard authority on the theory of the restored empire, and on the points at issue in the great papal-imperial struggle. The Very Rev. Dr. Donovan's *Rome, Ancient and Modern* (Rome, 1842), is specially rich in matters of interest to English students and in information on Christian edifices and worship in early times. P. M. Letarouilly's *Édifices de Rome moderne* (Paris, 1840–57, 3 vols.) mentions incidentally much of the history of the great noble families whose palaces form the subject of the work. Valuable information may also be obtained from the works of Sir George Head, Burgess, and Burton, while the *Beschreibung der Stadt Rom*, by Bunsen and others (Stuttgart, 1830–42, 3 vols.), gives the fullest description of the city. By far the most valuable contribution made to the subject in our day is A. de Reumont's *Geschichte der Stadt Rom* (Berlin, 1867–69, 3 vols.). William W. Story's *Roba di Roma* or *Walks and Talks about Rome* (Philadelphia, 1862) and Augustus Hare's *Walks in Rome* (London, 1871) are of great value, though more confined in their purpose. For the ecclesiastical features of the history, see C. F. B. Allnatt, *Cathedra Petri* (2d ed. 1878); A. Harnack, *Dogmengeschichte* (Freiberg im Breisgau, 2d ed. 1888); and Rudolph Sohm, *Kirchenrecht* (Leipzig, 1892, vol. i.). For additional information, see the articles on Italy, Papal States, Pope, and Roman Archæology.

Revised by S. M. Jackson.

III. Rome since 1870.

Rome, the capital of the kingdom of Italy, is situated on both sides of the Tiber, about 15 miles from its mouth, in lat. 41° 53′ 52″ N., lon. 12° 28′ 40″ E. (observatory in the Collegio Romano). It lies in an undulating volcanic plain, which, with a breadth of 25 miles between the Apennines and the sea, extends from Capo Linaro to Promontorio Circeo, a distance of about 85 miles. The city is surrounded by walls about 14 miles in circuit, of which 10 are on the left bank of the Tiber. These are constructed of brick, about 55 feet high on the outside, generally less than 30 feet on the inside, and surmounted with 300 towers and pierced by 13 gates, besides two that have been walled up. The wall on the left side of the river was begun in 271 by Aurelian and completed by Probus; the principal restorations are due to Honorius, Theodoric, Belisarius, and several of the popes. The wall on the right side dates mainly from Pope Urban VIII. Since 1870 Rome has been further surrounded by forts forming a circle about 30 miles in circumference.

Of the gates the most remarkable is the Porta del Popolo, through which passes the road which crosses the Tiber by the Ponte Molle, a mile and a half distant, and leads to Northern and Eastern Italy. In the S. E. is the Porta Maggiore, originally an archway of the Aqua Claudia; it was made a city gate by Aurelian and was used as a fort by the Colonnas. Near this gate passes the railway which starts from the central station on the Quirinal and joins the railways proceeding to all parts of Italy.

The Tiber traverses the city from N. to S. in three wide curves, and is spanned or partially spanned by twelve bridges. Among these are Ponte Sant' Angelo, the ancient Pons Ælius, built by Hadrian; Ponte Sisto, built by Sixtus IV. in 1474 on the ruins of the ancient Pons Janiculensis, and crossing from the Trastevere; Ponte Cestio, the ancient Pons Cestius, connecting the Trastevere with the island of the Tiber (Isola Tiberina di Bartolomeo); Ponte de' Quattro Capi, or Ponte Fabricio, the ancient Pons Fabricius, the oldest bridge of Rome existing, built in B. C. 62 by L. Fabricius—it leads from the island of the Tiber to the left bank of the river; and the Ponte Rotto, below the island, a suspension bridge, which replaced an older bridge that was partly composed of the ancient Pons Æmilius, built in 181 B. C. The city is divided into two unequal parts by the river. The smaller and more modern part, situated on the right bank, consists of a northern and southern portion. The former contains the palace of the Vatican (*q. v.*), the Church of St. Peter (see Peter's, St.), and the castle of Sant'

Angelo. The last structure (*Moles Hadriani*), commenced by Hadrian and finished in 140 by Antoninus Pius, was intended for a mausoleum for Hadrian and his family, and connected with the Monte Pincio by the Pons Ælius. When the Goths conquered Rome under Vitiges, it was used as a fortress, and during the feuds of the early Middle Ages constantly formed a stronghold in the hands of the ruling faction. Urban V. constructed the outworks; in 1500 the covered passage which connects it with the Vatican palace was built; and in 1527 Clement VII. sustained here a long siege, in which Benvenuto Cellini was engaged and the constable of Bourbon was killed. The later popes used the structure principally as a dungeon. The southern portion of the city on the right bank, Trastevere, occupies the ancient Mons Janiculus. Here was in the oldest time a fortified outpost against the Etruscans, and in the time of Augustus a populous suburb. The Trastevere is mostly inhabited by workingmen, who claim to be the descendants of the ancient Romans. The most remarkable points here are the Church of S. Pietro in Montorio, erected in 1500 by Ferdinand and Isabella of Spain on the spot where St. Peter is said to have suffered martyrdom, and the magnificent fountain Acqua Paola, built in 1611, under Paul V., by Fontana and Maderno, after the restoration of the ancient Aqua Trajana, an aqueduct erected by Trajan for the purpose of carrying the waters of the Lago di Bracciano (*Lacus Sabatinus*), over 30 miles distant, into the city. These two portions of the western part of the city are connected by the Via della Lungara, three quarters of a mile long, constructed by Sixtus V. It contains the Villa Farnesina, which was built in 1506 by Baldassare Peruzzi, and came into the possession of the Farnese family in 1580, and the Palazzo Corsini, in which Queen Christina of Sweden died Apr. 19, 1689. The Villa Farnesina contains a celebrated series of frescoes representing the myth of Psyche, after designs by Raphael, and the Palazzo Corsini, which has been assigned by the Government to the R. Accademia dei Lincei, contains a picture-gallery, one of the largest collections of engravings in the world, and a valuable library.

The larger, eastern part of the city, situated on the left bank of the Tiber, occupies the famous seven hills. Farther to the N., near the Porta del Popolo, rises Monte Pincio (*Collis Hortorum*), 175 feet above the level of the sea, which in ancient times was covered with gardens and not reckoned a part of the city; the famous gardens of Lucullus were situated here. Here are the Pincian gardens, a fashionable drive and promenade, which command a fine view of the city. Separated from Monte Pincio by the Piazza Barberini extend the Esquiline hill, the Quirinal, and the Viminal. Farther to the S. rises the Cælian, and between this and the river the Aventine. In the southern part of the plain, between this range of hills and the Tiber, rise, isolated, two other hills—the Palatine and the Capitoline. The latter formed the most prominent point of ancient republican and imperial Rome, the principal part of which extended over the Capitoline, Aventine, Cælian, and the southern part of the Esquiline. On the Capitoline hill are the Church of Sta. Maria in Araceli, which was erected before the tenth century on the site of the temple of Juno Moneta; the Piazza del Campidoglio, designed by Michelangelo, and begun in 1536 by Paul III., with a bronze equestrian statue of Marcus Aurelius in its center; the Palazzo del Senatore, erected by Boniface IX., with steps by Michelangelo—it contains a hall for the meetings of the municipal council, offices, etc.; the Palazzo dei Conservatori, containing the Protomoteca, a collection of busts of celebrated Italians, the new Capitoline Museum, in which are antiquities chiefly found during the construction of the new streets in the east quarter of the city, and a picture-gallery founded by Benedict XIV.; and the Capitoline Museum, founded by Innocent X., which is rich in admirable specimens of ancient sculptures and other antiquities. From the Capitoline, toward the Palatine, extends the ancient Forum Romanum. The Palatine contains the ruins of the ancient imperial palaces. Between the Palatine and the Aventine lay the Circus Maximus; to the S. E. of the Aventine the baths of Caracalla. In the depression between the Palatine, Esquiline, and Cælian stands the Coliseum. (See AMPHITHEATER.) Between the Cælian and the Esquiline stand San Giovanni in Laterano, the oldest church of Christendom, and the Museum Gregorianum Lateranense. (See LATERAN.) The latter contains statues and mosaics, and a large collection of sculptures and inscriptions from the Catacombs. Near the Lateran is the building containing the Scala Santa, a flight of twenty-eight marble steps brought from the palace of Pilate at Jerusalem by the Empress Helena in 326. Beyond the southern slope of the Esquiline the ruins of ancient Rome become scarcer and the monuments of mediæval and modern Rome more frequent. Here are the Church of Sta. Maria Maggiore, also called the Basilica Liberiana, erected by Pope Liberius 352–366, altered in 432 by Sixtus III., enlarged in 1292 by Nicholas IV., and restored in 1575 by Gregory XIII.; the Palazzo Rospigliosi, founded in 1603 by Cardinal Scipio Borghese, and the Casino Rospigliosi, containing many fine frescoes and pictures: the Palazzo Barberini, begun by Maderno, finished by Bernini, with a library containing 7,000 MSS. of Latin and Greek authors; the Villa Albani, built in 1760 by Cardinal Albani, with admirable works of art collected with the co-operation of Winckelmann; the railway station, opposite the Thermæ Diocletiani; and the Porta Pia, designed by Michelangelo in 1564, and restored by Pius IX. 1861–69. Through the Porta Pia the Italian army entered Rome Sept. 20, 1870.

The modern city, occupying the space between the river and the hills, is divided into two parts by the Corso, which, running in a straight line for a distance of nearly a mile from the Piazza del Popolo to the Piazza di Venezia, is the finest and gayest street of the city. Among the many elegant buildings which line it on both sides are the Palazzo Doria, one of the most extensive and most magnificent palaces of Rome, containing the Doria Gallery, a fine collection of pictures of different schools, and the Palazzo Colonna with rooms beautifully decorated and a collection of pictures. The portion of the city situated between the river and the Corso contains many admirable monuments, among which is the mausoleum of Augustus, erected by that emperor as a burial-place for himself and his family; it consists of an immense substructure containing the burial-chambers, and covered with a terraced mound of earth adorned with cypresses and a statue of the emperor. It was used in the Middle Ages as a fortress by the Colonnas, and is fitted up as a theater. Here is the Palazzo Borghese, built in 1590 by the elder Longhi; the Church of Sta. Maria Rotonda, or the PANTHEON (*q. v.*), the only ancient edifice in Rome which has been preserved entire. Near the Pantheon is the church of Sta. Maria sopra Minerva, erected about 1285 on the ruins of a temple of Minerva; it contains Michelangelo's *Christ with the Cross.* Here is also the Palazzo Farnese, one of the finest palaces of Rome, begun under Paul III. after the designs of da Sangallo, continued under the direction of Michelangelo, and completed by della Porta. It afterward came into the possession of the Kings of Naples, and many of the sculptures and antiquities which it contained were removed to Naples. It is now the home of the French embassy to the papal court. It contains a series of fine frescoes by Annibale Caracci and Agostino. Here are the Palazzo di Venezia (now the Austrian embassy), the Palazzo Massimi alle Colonne, containing the chapel of S. Filippo Neri, and many other palaces of the papal nobility. The splendid new streets Corso Vittorio Emanuele and Via Nazionale connect the head of the Corso with the Ponte Sant' Angelo and with the central railway station respectively. Important streets too are the Via 20 Settembre from the Porta Pia to the Quirinal, and the Via Cavour, which leads from the railway station to the Forum. From the Piazza del Popolo the Via di Ripetta diverges from the Corso on the right, and on the left the Via del Babuino leads to the Piazza di Spagna.

Among churches not already mentioned is S. Paolo fuori le Mura, originally founded in 388, burnt in 1823 and rebuilt in a magnificent style. S. Lorenzo fuori le Mura, rebuilt in 578 on the site of a church founded by Constantine, and remodeled afterward, still retains its ancient columns; Sta. Agnese fuori le Mura, founded by Constantine and rebuilt in the seventh century, has many early inscriptions; Sta. Croce is a basilica said to have been founded by the Empress Helena; S. Clemente is remarkable in that it consists of three structures—the upper one is a twelfth-century church, underground is a church of the fourth century, and below this are remains dating from the imperial and republican periods; Sta. Maria in Cosmedin retains ten of the columns of the temple of Ceres, out of which it was partly built. Outside the Porta Pia is Sta. Constanza, founded by Constantine, with mosaics of the fourth century. On the Cælian is SS. Giovanni e Paolo, founded in the fifth century and rebuilt in the twelfth; also S. Gregorio, founded in 575 on the site of the house of the father of Gregory the Great. On the Esquiline is Sta. Pudenziana, with mosaics of glass cubes dating from

the fourth century; also S. Pietro in Vincoli with ancient Doric columns, containing Michelangelo's statue of Moses. On the right bank of the Tiber is Sta. Maria in Trastevere, dating from the fifth century and rebuilt in the twelfth, with ancient columns, mosaics, and a fine marble pavement; also S. Crisogono with a mosaic pavement of the twelfth century. Among modern churches is the gorgeous Gesù, on the Corso Vittorio Emanuele, with the tomb of Ignatius Loyola. Among Protestant churches are All Saints, in the Via del Babuino, and the American Episcopal Church of St. Paul, a brick edifice by Street in the Via Nazionale.

Among the public libraries are the Biblioteca Alessandrina in the university, the Biblioteca Angelica with over 100,000 volumes and 2,945 MSS., and the Bibliotheca Casanatensis with 200,000 volumes and 1,000 MSS.; but the principal one is the Biblioteca Centrale Vittorio Emanuele in the Collegio Romano. It was originally formed in 1871 from the library of the Jesuits and those of the suppressed convents; it contains 500,000 volumes and several thousand MSS. In the Collegio Romano there is also the Museo Kircheriano with a collection of antiquities. Since 1876 it has been united with a rich and extensive ethnographical and prehistoric collection. Besides the new Capitoline museum for the results of the new excavations there are also the museums in the Thermæ of Diocletian and at the old villa of Pope Julius III. The Villa Medici contains a large collection of casts from ancient statues. The university (Università della Sapienza) was founded by Boniface VIII. in 1303, and prospered greatly under Leo X.; it has faculties of law, medicine, physics, and philology. In 1891 it had 1,543 students and 81 teachers.

The manufactures and industries are of little importance. Woolens, silks, velvets, leather, hats, gloves, and neckties are made, but the principal manufactures are of mosaics, bronzes, casts of statuary, and other articles connected with the fine arts. All the necessaries of life have to be brought from a distance, as the Campagna surrounding Rome is barely habitable on account of malaria. The Campagna is an open, untilled space, over which herds of half-wild cattle roam. The prosperity of the city depends upon the expenditure of the courts of the Quirinal and the Vatican, of the large number of officials, and of the visitors who fill the hotels in the winter. The city is fairly healthful. The rainfall is slight, averaging $16\frac{1}{10}$ inches annually. In the winter the mean temperature is about 46° F., and in July and August 75° F. In the latter month and September the malaria is prevalent, but there are several parts of the city in which it is not found. The water-supply is exceptionally good, and few towns are better supplied with public fountains. There is a good omnibus service, and horse-cars traverse the more important streets. The streets are mostly well lighted and well paved with hard lava.

The area within the walls is 3,880 acres. The population of Rome has increased rapidly since it became the capital of Italy: in 1870 it was 226,022; in 1880, 300,467; in 1891, 407,936; in 1899, 512,423. During that period over 3,000 houses have been built, 82 miles of streets formed, and 140,000,000 lire expended in the improvement of the city. The villas of the nobility, with the extensive gardens surrounding them, have been to a great extent destroyed and replaced by modern houses and blocks of buildings. The Tiber has been embanked and its channel deepened and straightened; but the further reconstruction of the city, which had been planned upon a magnificent scale, has been abandoned owing to the financial difficulties of the municipality.

History.—On Aug. 19, 1870, the last detachment of the French garrison evacuated Rome, and the following month an Italian corps entered the papal territory. After a slight resistance Rome surrendered on Sept. 20. A provisional government was formed and a popular vote on the question of annexation to the kingdom of Italy was decreed. This was carried in the affirmative by an overwhelming majority, and on Dec. 21 the Italian parliament, then sitting in Florence, decided to transfer the seat of government to Rome. Accordingly, on July 2, 1871, King Victor Emmanuel, accompanied by the officers of state and the members of the foreign diplomatic corps, made his formal entry into the new capital, and on Nov. 27 opened the first session of the Italian parliament in Rome. R. A. Roberts.

Rome: city (incorporated as a city in 1847); capital of Floyd co., Ga.; at the confluence of the Etowah and the Oostenaula rivers, which form the Coosa river; on the Chattanooga, Rome and Columbus and the Rome railways; 39 miles S. by W. of Dalton, 79 miles N. W. of Atlanta (for location, see map of Georgia, ref. 2–F). It occupies an elevated and picturesque site, is in an agricultural region, and is an important business center for the northwest part of the State. The Etowah and Oostenaula rivers are navigable to this point, and both are here crossed by iron bridges. The city has excellent water and sewerage systems, electric-lighting plant, several public parks, 2 cotton-compressing works, and a large trade by rail and water in grain, grass, cotton, and lumber. There are 9 churches for white and several for colored people, a public high school, and 3 grammar schools; Shorter College for Women (Baptist, opened 1873), the Rome Female College (founded 1845), a gynæcologic infirmary, 2 national banks, and 2 daily and 4 weekly newspapers. Pop. (1890) 6,957; (1900) 7,291.

Rome: city (incorporated as a village in 1819, chartered as a city in 1870); Oneida co., N. Y.; on the Mohawk river; at the junction of the Erie and Black river canals; on the Rome, Watertown and Ogdensburg, the N. Y., Ont. and W., and the N. Y. Cent. and Hud. River railways; 15 miles N. W. of Utica, 109 miles W. of Albany (for location, see map of New York, ref. 4–H). It is built on a plateau at the head of the Mohawk valley and at an elevation of 445 feet above sea-level, and is laid out in the form of a polygon, the principal streets being 100 feet wide, with road-beds of 65 feet. The water-supply for fire and domestic purposes is from the Mohawk river at Ridge Mills, 2 miles N., where the water is pumped into a reservoir and distributed thence by pipe. The city is lighted by electricity, and a complete system of sewers gives the city thorough drainage. It contains 16 churches, high school, 8 graded public schools, a hospital, State Custodial Asylum for Incurable Insane, the Central New York Institution for Deaf Mutes, St. Peter's Academy (Roman Catholic, opened in 1865), 3 libraries (the Jervis, the Union Free School, and Y. M. C. A.), 2 national banks with combined capital of $250,000, 2 savings-banks with deposits of more than $3,500,000, and a daily, a monthly, a tri-weekly, 2 semi-weekly, and 1 weekly periodicals. Rome is in a noted dairying region, and the central factory system of cheese and butter making originated here. The other industries include locomotive-works, brass and copper mills, metal bedstead works, knitting-mills, brick-yards, breweries, canning-factories, etc. The assessed valuations in 1900 aggregated $7,279,540, and the debt in Jan., 1900, was $427,564, nearly all on account of the water-works and sewers. The heart of the city is the site of Fort Stanwix, erected in 1758, at a cost of about £60,000, which was a formidable work, and a post of great importance during the French war of that year, as it was the chief protection of the "carrying place," as the region was then called, because it was the only break in a continuous water-communication between the Atlantic Ocean and the Great Lakes. The fort was also the scene of stirring events in July and Aug., 1777, when the British under St. Leger were defeated by the Tryon County militia under Gen. Herkimer in the battle of Oriskany. The first United States flag unfurled before the enemy is claimed to have been raised on Fort Stanwix August 3, 1777. Official description of the flag had just reached the fort from Philadelphia. The garrison made the flag from white shirts, a woman's red petticoat, and a blue camlet cloak. The U. S. Government in 1814 established in Rome an extensive arsenal-plant, which was sold in 1873 and converted into a factory building. Pop. (1890) 14,991; (1900) 15,343. A. C. Kessinger.

Romeo: village; Macomb co., Mich.; on the Grand Trunk railway; 50 miles N. of Detroit (for location, see map of Michigan, ref. 7–K). It contains flour and planing mills, iron-foundries, carriage-factories, agricultural-implement and steam-engine works, 2 national banks, and 2 weekly newspapers. Pop. (1890) 1,687; (1900) 1,580.

Römer, or **Roemer**, Ole: mathematician and astronomer; b. at Aarhuus, Denmark, Sept. 25, 1644; studied mathematics and astronomy at the University of Copenhagen; attracted the attention of Picard, who went to Denmark to visit Uranienborg; was invited to Paris by him and Colbert in 1672; appointed teacher in mathematics to the dauphin, and made a member of the Academy of Sciences; assisted Picard in his meridional measurements, invented the transit instrument, and determined the velocity of light (see Light); was appointed Professor of Mathematics and Astronomy at the University of Copenhagen in 1681, and held several civil offices in Copenhagen, where he died Sept. 19, 1710.

Romero, Matias: See the Appendix.

Romescot: See Peter's Pence.

Rom'illy, John, Baron Romilly of Barry: lawyer; son of Sir Samuel Romilly; b. in London in 1802; graduated at Cambridge, 1826; called to the bar at Gray's Inn 1827; sat in Parliament as a Liberal 1832–35 and 1846–52; knighted and made solicitor-general 1848, attorney-general and privy councilor 1850, and was master of the rolls 1851–72, in which capacity he was instrumental in causing the publication of the very valuable Rolls Series of *Calendars of State Papers* and other documents illustrating the earlier history of England; was made Baron Romilly of Barry, Glamorganshire, Jan. 3, 1866. D. in London, Dec. 23, 1874.
Revised by F. Sturges Allen.

Romilly, Sir Samuel: statesman and jurist; b. in London, England, Mar. 1, 1757; entered Gray's Inn May 11, 1778; was called to the bar 1783; became eminent as a chancery lawyer, and was appointed king's counsel in 1800; chancellor of the county palatine of Durham 1805; knighted, and made solicitor-general and elected M. P. 1806; enjoyed the friendship of Mirabeau, and through him acquired the friendship and patronage of Lord Lansdowne. His great work was his attempt to reform English criminal law, which he began in 1807, and urged in Parliament with great eloquence and persistence; besides which he advocated the abolition of the slave-trade, Catholic emancipation, and electoral reform. The number of capital offenses without benefit of clergy in 1797 was 160, and it rose to 222, when the efforts of Sir Samuel Romilly for reform succeeded only so far as to have pocket-picking, which was capital if above five shillings, taken out of the list. Although his bills reducing the number of capital offenses repeatedly failed to pass, being opposed by the Government of the day, by the bishops, and even by the most eminent judges, as Lord Ellenborough, as dangerous innovations, his perseverance, his continual protesting against the severity of the criminal law, and the barbarous frequency of capital punishment (which was the cause of the laxity in its enforcement), led to the final reformation of the criminal law of England. D. Nov. 2, 1818. His speeches were published in 1820, and his biographical memoirs in 1840, with notes by his sons. He wrote *Thoughts on the Probable Influence of the Late Revolution in France upon Great Britain; Observations on the Criminal Law of England as it relates to Capital Punishments, and on the Mode in which it is administered* (London, 1810), an able pamphlet. Revised by F. Sturges Allen.

Rommany Race and Language: See Gypsies.

Romney, George: portrait-painter; b. at Dalton, Lancashire, England, Dec. 26, 1734. He was apprenticed to a Cumberland painter named Steel. At the age of twenty-two he married. For some years he wandered about the north of England painting portraits—heads for two guineas, as is related—and at last went to London, leaving his wife and two children in Lancashire. From 1762 to 1798 he was either traveling on the Continent or residing and painting in London. He gained fame and popularity as a portrait-painter, and was able to secure prices as high as those paid to Reynolds, especially after Reynolds's abandonment of his art, about 1788. He was far less skillful and accomplished than either Reynolds or Gainsborough, and his pictures, other than portraits, have but little value. In 1798, broken in health, he joined his wife at Kendal, Lancashire; soon afterward he sold his studio and his collection of works of art, and settled in the north. D. at Kendal, Nov. 5, 1802. Among his best pictures are a number of portraits of the celebrated Lady Hamilton. The National Gallery in London has one of these in the character of a Bacchante, and a fancy portrait, *The Parson's Daughter*. In the National Portrait Gallery at South Kensington is another *Lady Hamilton* and a *Portrait of Flaxman*, the sculptor. Romney's portraits are mostly in private hands. Russell Sturgis.

Rom'ulus: mythical founder of the city of Rome; the twin-brother of Remus and a son of Mars by Rhea Silvia, who was a descendant of the Trojan Æneas, and had been made a priestess of Vesta when her father, Numitor, King of Alba Longa, was dethroned by his brother, Amulius. The two infants were thrown into the Tiber by the order of Amulius, but the river landed them safely at the foot of the Palatine Hill; a she-wolf carried them to her den and suckled them, and a shepherd afterward found them and educated them together with his own children. The legend goes on narrating how the two brethren discovered their descent, reinstated Numitor, emigrated from Alba Longa, determined to build a city on the Palatine Hill, but then fell out with each other; how Romulus killed Remus, built the city, procured wives for the citizens, carried on many wars, and was finally translated and worshiped as a god under the name of Quirinus. It is impossible to distinguish the ætiological and mythical from the truly traditional element in these stories, though there can be no doubt that the latter is present. See Rome. Revised by G. L. Hendrickson.

Roncesvalles, rōn-thes-vaal'yes (Fr. *Roncevaux*): a small Spanish village, province of Navarre; in a narrow valley on the southern side of the Pyrenees. It is famous as the place where Charlemagne, on his retreat from his campaign against the Mohammedans in 778, was attacked and his whole rearguard destroyed. Among those slain in this battle was the half-mythical hero Roland, whose name became the center of the romantic poetry which sung of Charlemagne and his paladins. In the French-Spanish wars several bloody encounters (in 1793, 1794, and 1813) occurred in the same valley, and in 1833 Don Carlos was first proclaimed king here.

Ron'da: town of Southern Spain, 42 miles W. of Malaga; at an elevation of 2,300 feet above the sea, on a precipitous promontory of the Sierra Nevada, on the Guadiaro, which here is crossed by lofty bridges built by the Moors (see map of Spain, ref. 19–D). A large annual fair is held here in May, attended by a great number of merchants, and enlivened by bull-fights. Elegant arms, fine woolen fabrics, and saddlery are the principal manufactures of the city. Pop. 19,181.

Rondo [from Ital. *rondò*, from Fr. *rondeau* < O. Fr. *rondel*, dimin. of *rond*, round, a round]: in music, a composition, in which the theme, as it is given in the first strain, returns upon itself in the last, after passing through various expansions and elaborations.

Ronge, rōng'e, Johannes: religious leader; b. at Bischofswalde, Prussian Silesia, Oct. 16, 1813; studied theology at Breslau; appointed a chaplain at Grottkau in 1840, but was opposed by the ultramontane clergy on account of his liberal views, and was suspended in 1843 because of an article, *Rom und das breslauer Domkapitel*, which he published in the *Sächsische Vaterlandsblätter*. In 1844 he was excommunicated on account of a letter to Bishop Arnoldi, denouncing as idolatrous the exhibition at Treves of the holy coat. Through a number of pamphlets, and by traveling from town to town preaching and lecturing, he exhorted people to secede from the Roman Catholic Church, and, supported by the general irritation against the ultramontane hierarchy he succeeded in forming several congregations of the so-called German Catholic denomination. By degrees he was himself attracted by the political fermentation, sided in 1848 with the radicals, and fled in 1849 to England. Returning in 1861, he lived at Breslau and Frankfort-on-the-Main, where he founded a reform association in 1863; after 1873 at Darmstadt. D. in Vienna, Oct. 26, 1887.

Ronsard, rōñ'saar', Pierre, de: poet: b. at the Château de la Poissonnière, Vendômois, France, Sept. 11, 1524: was educated at the French court as page to the Duke of Orleans: followed James V. to Scotland and lived nearly three years at his court (1538–41); returned to the Duke of Orleans, and was sent on various embassies to Flanders, Holland, and England; ruined his health and lost his hearing, and retired to the Collège de Coqueret, where he spent seven years studying the Latin and Greek languages and literatures. Among his companions here were Baïf, Belleau, Muret, Jodelle, and Du Bellay, and among them sprang up that new literary ideal whose first representative Ronsard became, and which for centuries reigned not only in France, but in all European literatures. It broke completely with the ideals and traditions of the Middle Ages and the older native literature, and substituted the classical models of the Latin and Greek literatures. Ronsard and his eager followers, styling themselves the *Pléiade*, threw themselves upon the task of creating a French literature in the image of the classical models. In 1550 appeared four books of *Odes*; in 1552 his *Amours*; in 1555 his *Hymnes*; other poems, including *Élégies* and *Discours*, at intervals; and in 1572 four books of his epic, *La Franciade*, never finished. The enthusiasm he awakened at home and abroad was extraordinary. His influence on the French language and letters was enormous, though his popularity waned rapidly after the advent of Malherbe. D. Dec. 27, 1585. Good editions of his works are by P. Blanchemain (8 vols., Paris, 1857–67) and Marty-Laveaux (6 vols., Paris, 1887 ff.). A. G. Canfield.

Röntgen (or **Roentgen**), Wilhelm Conrad, Ph. D.: physicist; b. near Zurich in 1845; educated there and at Utrecht; became Assistant Professor of Physics in Strassburg in 1873; Professor of Mathematics and Physics in the Agricultural Academy at Hohenheim, near Stuttgart, in 1875; professor and director of the University and Institute of Physics in Giessen in 1879; and Professor of Physics at Würzburg, Bavaria, in 1888. In 1896 he made use of the power of penetrating metals and other opaque bodies, possessed by certain rays emanating from tubes with high vacua (see Geissler's Tubes), to photograph hidden objects, such as the bones of the hand within the flesh, a set of weights in a box, a compass-card and needle inclosed in a metal case, etc. This property was first noted by Hertz (*q. v.*), and in 1894 Lenard published a memoir upon it (see Wiedemann's *Annalen*, vol. li., p. 225), in which he showed, among other things, that photographs could be taken by means of these rays through an intervening shutter of aluminium. See *Nature*, vol. liii., p. 274. See X-rays.

Rood, Ogden N., LL. D.: physicist; b. at Danbury, Conn., Feb. 3, 1831; graduated at Princeton 1852; studied at Sheffield Scientific School and at the Universities of Munich and Berlin; elected Professor of Physics and Chemistry in Troy University 1858; Professor of Physics in Columbia College, New York, 1863; member of the National Academy of Sciences, 1864. He was among the first to apply photography to the microscope, and the first to construct fluid prisms of highly dispersive power for the study of the spectrum. He has made several original investigations in photometry and physiological optics. See his *Modern Chromatics* (1881).

Roodhouse: city; Greene co., Ill.; on the Burlington Route and the Chi. and Alton R. R.; 21 miles S. W. of Jacksonville (see map of Illinois, ref. 7–C). It is in an agricultural region, and has 2 private banks, a daily and 2 weekly newspapers. Pop. (1890) 2,360; (1900) 2,351.

Rood-screen: See Choir.

Roof [M. Eng. *rof* < O. Eng. *hrōf*]: the covering of a building. As generally used, the term includes the covering and the framework which supports it, though in carpentry the use of the word is restricted to the latter meaning. Roofs vary greatly in form and material, and require a higher degree of skill and science than any other part of a building. Greek temples were covered with long thin pieces of marble; the roofs of the halls of the ancient Assyrians and Babylonians consisted of exceedingly large stones, some of them so big as to cover a whole room singly. In the East there are remains belonging to prehistoric times of buildings of a circular shape, in which a column standing in the center was evidently intended to support rafters whose outer ends rested upon the inclosing wall.

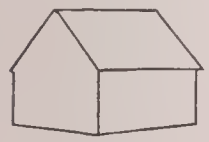
Fig. 1.

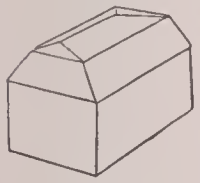
Fig. 2.

The inclination or pitch of a roof is generally a matter of taste alone, and not of climate, though with some coverings a certain inclination is necessary. In England and in France in the later times of mediæval architecture the roof underwent a very different development; in the former country, though of a higher latitude, it became flatter; in France and in Germany high and steep. To the flat roofs were added parapets, and the church-towers were built without spires and were furnished with parapets. In France the roof grew with the rest of the building, and on the tower, when spires had fallen into disuse, it assumed almost the inclination if not the place of the spire. In Persia and Arabia the roofs are flat; in Greece invariably sloping, made on an angle of about 16° with the horizon; in Rome on an angle of about 24°. In hot climates the chief reason for the flatness of the roofs is that they may serve as terraces in the cool of the evening and morning, and for this purpose they are covered with concrete or cement carried on joists like a floor.


Fig. 3.

When the base is a circle, an ellipse, or a polygon, and its vertical section a curved line concave toward the interior, the roof is termed a dome or cupola. Different names are given to roofs according to their forms; thus Fig. 1 is a gabled roof; Fig. 2 a gambrel, curb, or mansard roof (the term mansard is from a French architect, Mansart, who died in 1666); Fig. 3 a conical roof. Fig. 4 shows a very simple frame for a roof, consisting of two rafters resting at their lower ends upon the wall or frame of the house; sometimes the rafters are prevented from spreading by a collar-beam uniting them near their lower ends. Fig. 5 is a king-post frame or truss, suitable for a span of 35 to 40 feet, where A is the ridge; B, purlin (a beam at right angles to the rafters); C, king-post; D, strut; E, tie-beam; F, pole-plate; G, wall-plate; H, common rafter; I, principal rafter. Fig. 6 is a Norman roof. Fig. 7 is the celebrated roof of Westminster Hall, completed in A. D. 1399, of which the span is 68 feet. The horizontal pieces resting upon the walls are termed hammer-beams. This span is unusually large, as the span of the Gothic roofs seldom exceeded 35 feet. The builders of these roofs aimed to construct them of very short pieces of timber, always oak or other hard wood, which were very strongly fastened together. The thrust of this roof against the walls is prevented to a great extent by the rigidity of the frame, which causes it to act somewhat as a beam. The woodwork of the Gothic roofs was very elaborately carved and ornamented. In the roof of St. Paul's, Rome (Fig. 8), destroyed by fire during the nineteenth century after having stood over 400 years, the king and queen posts were not framed into the tie-beam, but attached by iron straps. This is one of the earliest instances where iron has formed a feature in the construction of roofs. The span of this was 78 ft. 4 in.

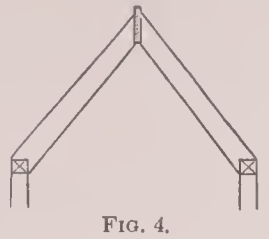
Fig. 4.

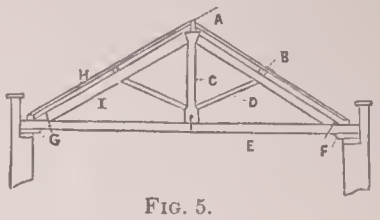

Fig. 5.

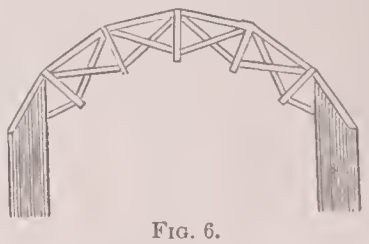
Fig. 6.

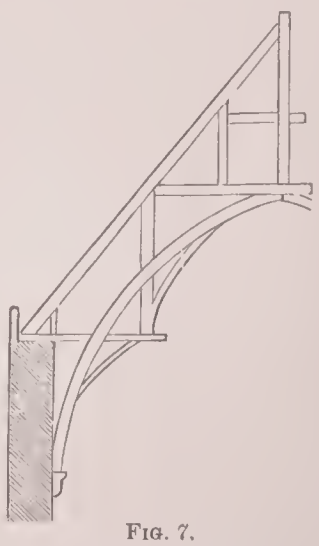
Fig. 7.

The use of iron for roofs has become very general on account of the many advantages which it possesses, such as economy, lightness, and facility of transportation and erection. Figs. 9, 10, 11, and 12 illustrate some of the simpler and more generally used forms of trusses made of iron; they are so tied as to prevent any outward thrust against the walls. The roof over the central transept of the Crystal Palace, Sydenham, England, is arched and composed of two semicircular ribs connected by double-lattice bracing. The whole of the roof is of wrought iron, the covering being entirely of glass on the ridge-and-furrow principle. The span is 120 feet, and the arch is of such depth that it exerts but little horizontal thrust upon the supporting walls. The roof of the Royal Albert Hall, Kensington, is oval, with four centers; the half of one of the trusses is shown in Fig. 13, the span being 219 feet by 185 feet. The roof of the rotunda of the Vienna Exhibition of 1873 was conical, the span being 343 ft. 9 in. One of the largest roofs ever built is that of the machinery hall of the Paris Exposition of 1889, whose length is 1,390 feet, and whose trusses have the span of 346 feet, each side being flanked by a gallery which increases the total width to 492 feet.

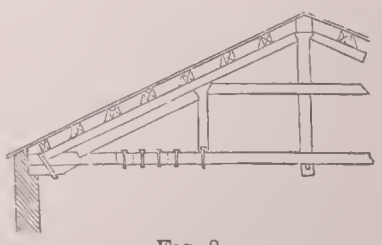
Fig. 8.


Fig. 9.


Fig. 10.

The trainshed of the Pennsylvania Railroad at Jersey City, N. J., has roof-trusses with a span of 252 feet, while its total length is 650½ feet. The roof of the St. Pancras Station in London is 690 feet long, with a span of 243 feet. The dimensions of the building for the exhibition of manufactures at the Columbian Exposition of 1893 in Chicago were 787 feet by 1,687 feet, and the main roof-trusses had a span of 368 feet.

Fig. 11.

Fig. 12.

Fig. 13 shows the iron framing of a mansard roof. These roofs (which have since their invention formed so common a feature of French architecture) of different styles, slopes, and coverings have been very generally adopted for many classes of buildings both in the city and in the country. They were at first built almost exclusively of wood and covered with slate, but the great liability to take and communicate fire has caused the use of iron and steel for framing purposes.

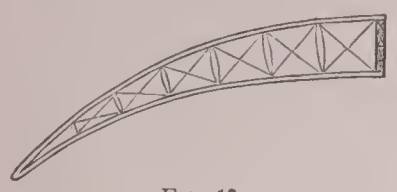

Fig. 13.

The coverings for roofs are made of various materials, among which may be mentioned the following: Thatch of straw, reeds, and heath, used probably in primitive times, and even in the present age, in rude dwellings; tiles of various shapes, which have been used from the Roman period to the present, and which probably covered the Saxon buildings; thin slabs of stone or flag; slate; lead, which was always used on mediæval roofs; tin, iron, zinc, copper; asphalted felt coated with a hot preparation of tar on which gravel is spread; shingles; canvas covered with cement and glass.

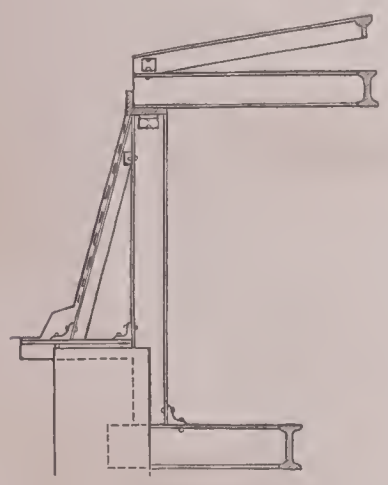

Fig. 14.

The principles governing the design of roof-trusses are similar to those for bridge-trusses, the main differences being in the data regarding snow and wind loads. The snow load is taken at various values, depending on climate, up to 15 or 20 lb. per square foot of horizontal area. The wind pressure on a vertical plane is taken at from 30 to 50 lb. per square foot. See the articles Arch, Bridges, and Stresses; also Greene's *Graphical Analysis of Roof Trusses* (1876); and Ricker's *Construction of Trussed Roofs* (1885).

Revised by Mansfield Merriman.

Rook [O. Eng. *hrōc*: O. H. Germ. *hruoh*: Icel. *hrōkr*; cf. Goth. *hrukjan*, to crow: Sanskr. *kruç-*, cry out, croak]: a bird (*Corvus frugilegus*) of the family *Corvidæ*, closely related to the common crow, which it also resembles nearly in size (it is a little smaller), as well as black color; but distinguished therefrom by the bill being little longer than the head, and in the adult naked at the base; the first primary is shorter than the eighth, the second shorter than the fifth, and the third and fourth are the longest. It is generally distributed throughout Europe and Eastern Asia. It lives in communities known as rookeries; these sometimes are very populous, occasionally containing from 2,000 to 3,000 nests, and a corresponding number of birds of different ages and sizes. In Great Britain they are considered by many an attractive feature in the landscape, and are therefore protected. The nests are generally made in tall trees. The female lays, early in the spring, about four or five greenish-blue and spotted eggs. The species is omnivorous, but does not trouble the farmer, like the crow. It is capable, like its congeners, of mimicking the sounds of other animals. The young are to some extent used as food in Great Britain and on the Continent.

Revised by F. A. Lucas.

Roon, rōn, Albrecht Theodor Emil, Count von: soldier; b. near Kolberg, Prussia, Apr. 30, 1803; entered the army in 1821; attended the military school of Berlin 1824–27; appointed teacher to the cadets in 1828, member of the topographical survey of the staff in 1833, teacher in the military school in 1835, and captain on the staff in 1836. In 1842 he was made a major, and subsequently took charge of the military instruction of Prince Frederick Charles. During the campaign in Baden he was chief of the staff of the Eighth Army-corps; was made a colonel in 1851, commander of the Twentieth Brigade of infantry in 1856, and commander of the Fourteenth Division at Düsseldorf in 1858. On Dec. 5, 1859, the prince-regent called him to take charge of the ministry of War, and (Apr. 16, 1861) also of the ministry of the Marine. After the war of 1866, which gave evidence of his talent for organization, he received from the king the cross of the Black Eagle and a dotation, and after the war with France (1870–71) he was made a count and received a new dotation. The office of Minister of the Marine he resigned Dec. 31, 1871. In the Prussian Government he represented a specific Prussian tendency in opposition to the policy of Prince Bismarck, and (Dec. 21, 1872), having handed in his resignation, he was made president of the cabinet, and a few days afterward field-marshal, but resigned in 1873. D. in Berlin, Feb. 23, 1879. See von Gossler, *Graf Albrecht von Roon* (Berlin, 1879).

Roosa, D. B. St. John: See the Appendix.

Roosevelt, Robert Barnwell: Congressman and author; b. in New York, Aug. 7, 1829; studied law, and was engaged in active practice for many years, but finally devoted himself to literature, rural sports, and politics, and in 1870 was elected to Congress; became president of the New York Sportsmen's Club; was one of the State commissioners of fisheries for many years; U. S. minister to the Netherlands 1888–89; edited *The Citizen*, a weekly journal devoted to literature and politics; published *The Game Fish of North America* (New York, 1860), *The Game Birds of the Coast and Lakes of the Northern States* (1866), and similar works; and edited, with a biographical sketch, *The Poetical Works of Charles G. Halpine* (1869).

Roosevelt, Theodore, LL. D.: twenty-sixth President of the U. S.; b. in New York city, Oct. 27, 1858. His father, also named Theodore, a merchant and philanthropist, was of Knickerbocker stock, and his mother was a descendant of Archibald Bulloch, the first President of Georgia in the Revolution. He was prepared for college in private schools, and was graduated at Harvard in 1880. After traveling in Europe he began the study of law, but abandoned it for politics. In 1881 he was elected by the Republicans to the Assembly from the Twenty-first District of New York city, and was twice re-elected. The first two Legislatures in which he sat were Democratic. In his second year he was leader of the minority in the Cities Committee, and he became its chairman in the Republican Legislature of 1884, after being an unsuccessful candidate for Speaker. He was active in promoting the passage of the first New York civil-service laws, was chairman of a committee that investigated abuses in New York city, and secured acts abolishing the fee system in county offices and depriving the aldermen of veto power over the mayor's appointments. He favored a bill reducing elevated-railroad fares, but when Gov. Cleveland vetoed it he sustained the veto. In 1884 he was a delegate at large to the Republican National Convention, where he advocated the nomination of George F. Edmunds, but he supported Mr. Blaine in the campaign. The Republicans nominated him for mayor of New York in 1886 against Henry George, the United Labor candidate, and Abram S. Hewitt, the Democratic candidate, who was elected. President Harrison appointed him a civil-service commissioner in 1889. He served efficiently until May, 1895, when he resigned, and became president of the New York city Board of Police Commissioners in the administration of Mayor Strong. He established a policy of strict enforcement of liquor and Sunday laws, which aroused much opposition.

Mr. Roosevelt was appointed Assistant Secretary of the Navy in April, 1897, and took an important part in the preparations for the Spanish War. At the outbreak of hostilities he resigned his office and raised, largely among the Western cowboys, a regiment of volunteer cavalry, who were popularly known as Rough Riders. He became lieutenant-colonel, with Dr. Leonard Wood, of the regular army, in command. From 1884 to 1888 he had been a member of the Eighth Regiment, National Guard of New York. The Rough Riders (unmounted) were with the army before Santiago, and took part in the fight at Las Guasimas, June 24,

1898, and in the capture of San Juan Hill on July 1. Col. Wood was promoted brigadier-general on July 8, and Lieut.-Col. Roosevelt became colonel. He was mentioned in the reports for gallant conduct in battle, and was distinguished for care of his men in camp.

Col. Roosevelt returned with his regiment to Montauk Point in August, 1898, was nominated for Governor of New York by the Republicans at Saratoga, Sept. 27, 1898, and was elected for the two years' term beginning Jan. 1, 1899, by a plurality of 17,786 over Augustus Van Wyck, Democrat. As Governor he reformed the administration of the canals, favored the enactment of an improved civil-service law, and applied the merit system in county offices. By a special message he induced the Legislature of 1899, at the end of the session, to pass an act taxing as real estate the value of railroad and other franchises to use public streets. Corporations and Republican leaders protested, but the Governor said he would sign it as it stood unless they could improve it without destroying its essential features. He called an extra session, secured the passage of the bill in modified form, and established the principle of street-franchise taxation.

Columbia University made Gov. Roosevelt a doctor of laws in 1899. Early in 1900 he was mentioned for Vice-President, but he desired a second term as Governor, and repeatedly announced that under no circumstances would he accept the vice-presidency. But New York party leaders joined Western delegates who were enthusiastic over Gov. Roosevelt's military record, and at the Philadelphia convention on June 21, 1900, forced him to accept the nomination for Vice-President. He made an extended speaking tour through the Western States, and was elected for the term beginning March 4, 1901, receiving 292 electoral votes, while 155 were cast for Adlai E. Stevenson, the Democratic candidate.

After the assassination of President McKinley, Sept. 6, 1901, the Vice-President hurried to Buffalo, but he left the city upon the apparent assurance of the President's recovery. He returned upon the news of President McKinley's death, Sept. 14, 1901, and on the afternoon of the same day, at the residence of Mr. Ansley Wilcox, in Buffalo, took the oath as President of the U. S. He outlined his policy in these words, spoken to the cabinet members and a few friends gathered for the occasion: "In this hour of national peril and sorrow I will say that it is my purpose to continue unbroken the policies of President McKinley for the peace, prosperity, and honor of the United States."

In 1882 he published a *Naval History of 1812*. This was followed by *Hunting Trips of a Ranchman*, in 1885; a *Life of Thomas H. Benton* in 1886, and a *Life of Gouverneur Morris* in 1887, both in the American Statesmen Series; and in 1888 by *Essays in Practical Politics* and *Ranch Life and Hunting Trail*. The first two volumes of his most important work, *The Winning of the West*, were issued in 1889. In 1890 he wrote a *History of New York City* for the Historic Towns Series; in 1893, *The Wilderness Hunter*; and the next year published the third volume of *The Winning of the West*. In 1897 he collected a volume of essays entitled *American Ideals*, which he followed with *The Rough Riders* in 1899, and *Oliver Cromwell* and a volume of addresses entitled *The Strenuous Life*, in 1900. He is also the author, in collaboration with Henry Cabot Lodge, of *Hero Tales from American History*, and he was one of the assistants of William Laird Clowes in the preparation of *The Royal Navy*.

Root, Elihu: See the Appendix.

Root, George Frederick: See the Appendix.

Roots: See Botany.

Ropes and Rope-making [*rope* is from O. Eng. *rāp*, rope: O. H. Germ. *reif*, cord, circular band > Mod. Germ. *reif*, hoop, circular band]: Rope is a general name of the stouter forms of cordage, and especially of those whose circumference exceeds an inch. They are generally made of hemp, which is first hackled or combed out to remove the dust and tow. The hackle consists of a strong board with long vertical steel prongs sharply pointed and polished. The hackling is done by hand.

The preparation machines hackle the hemp still finer for spinning into yarn. The first of these is the spreader, a machine having two endless chains fitted with gill-bars and gill-pins (steel teeth), which combs or straightens out and evens the fibers. Its spreader is fed with the hackled hemp at one end, which it throws out in a sliver from the other. From the spreader the sliver is passed through two or more drawing-frames, by which it is drawn down still more and the fibers still further combed out straight, the size of the sliver being reduced at each step. The drawing-frame is similar to the spreader, but has only one chain. The sliver is then passed to the spinner, where it is spun into yarn, and at the same time reeled upon a bobbin. An improvement in the spinner, the invention of John Good, of Brooklyn, N. Y., tubes the yarn, rendering it smoother and more even than any process yet devised. The yarn is spun right-handed. The size of the yarn varies according to the kind of rope for which it is intended. Forties—so called because forty yarns will just fill a half-inch tube—are for the finer kinds of rope; twenties, requiring twenty to fill the tube, are for cables, hawsers, etc. From the spinning-room the bobbins containing the yarn are taken to the tar-house, where they are placed in frames conveniently arranged with reference to the tar-box. This is a long box filled with tar kept during the operation of tarring at a temperature of 220° F. by means of steam-heaters. The yarns are led from the bobbins in the frame through two or more guide-plates working in a vertical plane over the tar-box, and convenient for lowering into the tar; thence to the further end between metal rollers, which press out and return to the box the superfluous tar, on to a large wooden drum to cool them; through fair-leaders, and finally to a fresh set of bobbins, where they are wound up with the utmost regularity. The bobbins containing the tarred yarn go to the laying-ground, where they are placed in frames, when the yarns are ready for hauling down, or making into strands. The laying-ground, where the rope is laid up, occupies the entire length of the ropewalk. The yarns for the strands, generally three in

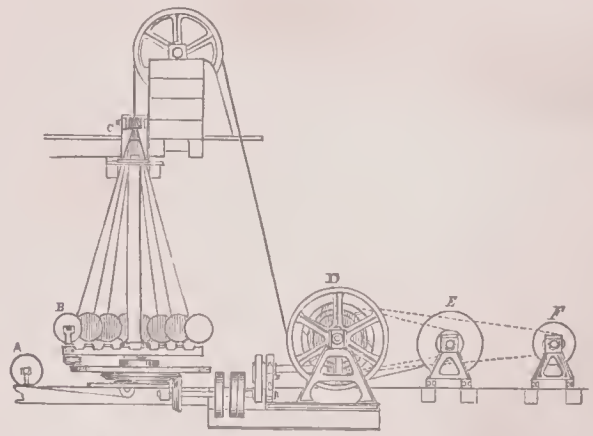

Fig. 1.—A twelve-flyer machine, for forming the strands: A, heart; B, bobbins; C, top and tube; D, draw-off drum; E, bobbin for larger sizes; F, bobbin for smaller sizes.

number, are led from the bobbins in the frame through holes bored on concentric circles in a metallic plate, thence through a tube adapted to the size of the strand, and attached to a hook on the end of a spindle in a movable machine like a car, called the former. There are a plate, a tube, and a hook for each strand, and the number of yarns to a strand is regulated by the size of the intended rope. When the machinery is put in motion, the former is drawn down the walk, and the yarns as they are hauled through the tubes are formed into left-handed strands. Closing the strands is the next step, for which two machines are used. The lower one—the layer—lays up or closes the rope, and is movable; the upper one, which keeps the proper twist in the strand while laying, is stationary. Each strand being secured to its proper spindle, the machinery is put in motion and the strands hardened. A press attached to the layer prevents too much drawing up, as the strands shorten in by the additional twisting. After hardening, the strands are placed together on a central spindle of the layer and closed, a top inserted between them preventing too rapid closing. The top is a wooden cone with grooves cut to hold the strands, while tails of soft rope attached to it, by being applied to the rope as it is made, still further prevent, by the additional friction, the too rapid closing of the strands. The layer makes two revolutions to one of the upper machine. The skill of the rope-maker consists in knowing how to gear his preparation machines so as to draw a clean and uniform sliver, in giving the proper degree of twist to the yarn and strand, the amount of hardening, and the speed of the top in closing. The foregoing process gives right-handed tarred rope of three strands (plain laid). By not tarring the yarns white rope is produced. This is the strong-

est, though when exposed to the weather not the most durable, of all in common use.

In the manufacture of manila rope the first step in the foregoing description, hackling by hand, is omitted, as unnecessary: the manila is oiled to enable the harsher fiber to pass the more readily through the preparation machines,

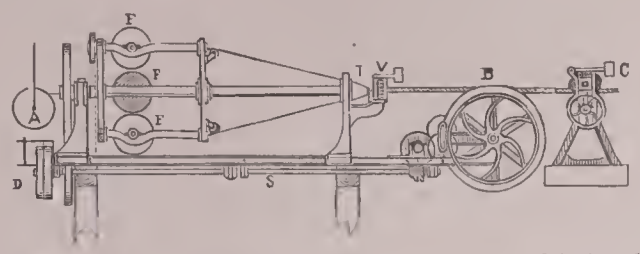

Fig. 2.—Wire rope: A, heart; B, draw-off drum; C, friction-drum; D, driving-pulley; F, bobbins; T, top; V, tube; S, driving-shaft.

and the yarns are not tarred; the remainder of the process is the same in both cases. The size of rope is designated by its circumference; when smaller than $1\frac{1}{4}$ inch it goes under the general name of small stuff. Three ropes laid up together form a cable or hawser of nine strands.

Wire rope may be made either of 49 coarse wires or 133 fine wires, put in 6 strands, and 7 or 14 hearts, and laid up right-handed; strands are laid left-handed. To make a 7-inch fine wire rope, as in the annexed diagram, fill the bobbins of a 6-flyer machine, similar to Fig. 1, with No. 8 wire, Birmingham gauge, and for the heart lead a single wire from its bobbin up through the vertical shaft. This will

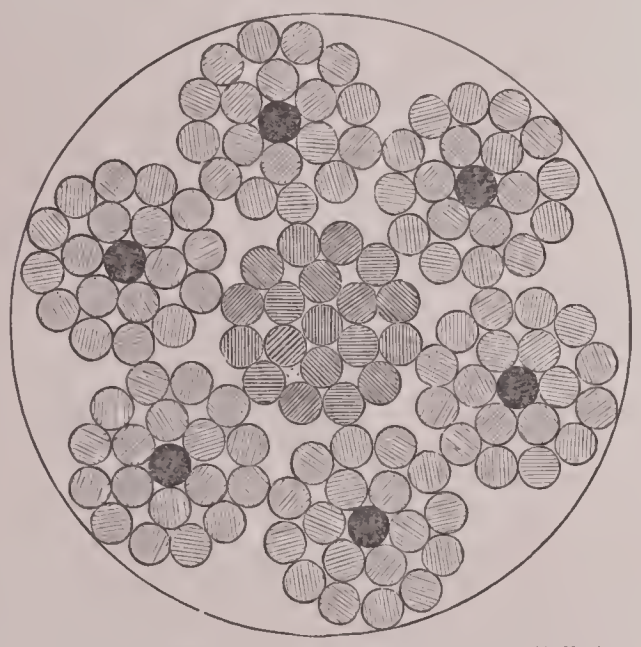

Fig. 3.—Cross-section of wire rope of 133 wires (full size).

form a 7-wire heart for the strands. Next fill the bobbins of a 12-flyer machine (Fig. 1) with the same size wire, placing the heart just made as in the figure. Pass all the wires up through holes past the top, arrange the wires through the grooves of the top, twist them together by hand, splice in a piece of rope, and pass it five or six times around the draw-off drum. Friction-straps attached to the bobbins preserve an equal tension on the wires. Putting the machine in motion, the 7-wire heart is drawn up the shaft, and at the same time the 12 single wires are wrapped about it as the disk revolves, each separate bobbin turning on its own center in an opposite direction, so as to avoid twisting the wire. As the strand is formed it is reeled upon a bobbin. Having filled 7 bobbins, 6 are placed in a machine similar to Fig. 2, and 1 in the rear for a heart. The heart, on motion being given to the machinery, is drawn through, and the 6 strands wrapped about it, giving 1 central and 6 outer strands of 19 wires each. In making strands for wire rigging it is the practice to substitute hemp for the single wire of the heart, and to make a hemp heart for the rope. It is plain from the preceding diagram that the diameter of the required rope, divided by 15, will give the diameter of the single wire, from which, by tables in common use, the proper gauge may be found.

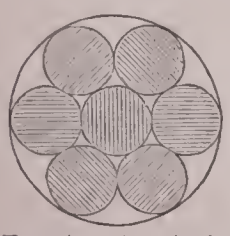

Fig. 4. — A single strand of a 49-wire rope.

Fig. 4 shows the cross-section of a single strand of a 49-wire rope, the 6 strands and the heart all being of the same size. The size of the required rope being given, divide the diameter by 9 to find the diameter, and from the tables the gauge of the wire to be used. Knowing by the old rules the proper size to make a given piece of hemp rigging for a ship, the corresponding size of wire rope may be found from tables giving the comparative strength of ropes of the two materials. When flexibility is required, annealed wire is used and hemp hearts supplant the wire ones, as indicated by the deeply shaded centers of the 6 strands in Fig. 3, and a hemp heart takes the place of the central strand or wire heart (Fig. 3). In this case there will be 18 wires to each of the 6 strands, making a total of 108 wires in all, instead of 133 as before. So, in Fig. 4, if a twine heart in each strand be substituted for the wire, there would be a wire heart in the rope of 6 wires, laid up in 6 strands of 6 wires each; total, 42 wires, instead of 49, as above stated. The size of the wire, it is evident, determines the size of the rope. Steel wire is about 56 per cent. stronger than iron wire and 65 per cent. stronger than annealed iron wire. Both steel and iron wire may be galvanized without detracting from its strength. S. B. Luce.

Roquefort, Fr. pron., rōk′fōr′: a small town in the department of Aveyron, France; on a mountain 4,800 feet high, 10 miles S. W. of Millau (see map of France, ref. 8–F). It is famous for its cheese made from ewe-milk. (See Cheese.) The limestone mountain is honeycombed with caverns, in which the cheeses are kept through the summer. Pop. about 1,000.

Roqueplan, rōk′plăăṅ′, Joseph Étienne Camille: painter; b. at Mallemort, department of Bouches-du-Rhône, France, Feb. 18, 1802; studied painting at Paris under Gros and Pujol; began to exhibit in 1822; attracted great attention in 1827 by two pictures for which he had chosen the subject from Walter Scott's romances, and became soon one of the leaders of the modern French school of painting. The most remarkable of his pictures are *The Amateur Antiquary*, in which there is very skillful painting of rich and varied objects of decorative art, and his genre pieces and landscapes from the Pyrenees, among which is *The Well near the Tall Fig-tree.* For several years in the latter part of his life he suffered much from ill-health. D. in Paris, Oct. 15, 1855.

Roraima: See the Appendix.

Rorqual: same as Fin-back (*q. v.*).

Rosa, Euphrosyne (*Parepa*): singer: b. in Edinburgh, Scotland, May 7, 1836; daughter of Demetrius Parepa, Baron de Boyescu, a Wallachian nobleman, and Elizabeth Seguin, a professional singer; was carefully trained by her mother; made her *début* on the operatic stage at Malta as a soprano singer; appeared with success at London 1857; married Captain Carvell of the East India service 1863; became a widow 1865; sang in the U. S. with the Bateman troupe 1865, and again 1866–67; enjoyed great popularity, especially in oratorios; married the violinist Carl Rosa 1867; organized with her husband an English opera-troupe, with which they sang in the principal cities of the U. S. 1869–72; was at the khedive's court in Egypt during the winter of 1872–73, and afterward made another tour in the U. S. (1873). D. in London, England, Jan. 21, 1874.

Revised by B. B. Vallentine.

Rosa, Francisco Martinez, de la: See Martinez de la Rosa, Francisco.

Rosa, Pietro: archæologist; b. in Rome, Italy, about 1815. He was educated as an architect, but as early as 1848 he became almost exclusively interested in archæological researches in Rome and its vicinity. One of his early undertakings was a large-scale map of Latium, with the ancient sites determined, but the constant succession of new discoveries, overturning old theories, has kept this work in hand and unfinished for many years. Meantime he was busied upon the tombs of the Appian Way and their theoretical restoration. In 1861 the French Government charged him with the study of the camp of the Pretorian Guard at Albano, and of the buildings on the Palatine Hill. In 1872 and later he conducted important researches in the Roman Forum, and was director of these at the time of the discovery of the Basilica Julia. His publications are chiefly papers in the archæological journals and monographs of no great extent, but his services as a discoverer and organizer are generally recognized. He was senator of the kingdom of Italy and a member of the Legion of Honor. D. in Rome, Aug. 15, 1891.

Russell Sturgis.

Rosa, Salvatore: painter; b. at Renella, near Naples, July 21, 1615. A relative (Ciceio Fraeanzano) first gave him instruction in art. Eneouraged by Lanfranco, who bought one of his landseapes, he went to Rome in 1635, where he was patronized by the Neapolitan cardinal Braneaeei, Bishop of Viterbo. After painting for the cardinal at Viterbo, he returned to Naples. His pieture of *Prometheus* having made a great sensation in Rome, he established himself there in 1638. D. Mar. 15, 1673. He chose as subjeets wild and romantic aspects of nature, which he always treated appropriately. Examples of his work are to be found in most eolleetions. The National Gallery in London has several fine landscapes by this master. Passeri, *Vite de' Pittori*, is a reliable authority to eonsult for further details, as he was a personal friend of Salvatore Rosa. Many improbable stories have been told of Rosa; these Lady Morgan eolleeted in her romanee *The Life of Salvator Rosa*. He was also an eteher. W. J. Stillman.

Rosa'ceæ [Mod. Lat., named from *Ro'sa*, the typieal genus, from Lat. *ro'sa*, rose]: an important family of polypetalous dieotyledonous trees, shrubs, and herbs, eomprising over 1,000 species, mostly of northern temperate regions. The rose, apple, pear, quinee, cherry, plum, peach, aprieot, almond, blackberry, raspberry, strawberry, ete., belong to this family. In general, it is distinguished by having alternate leaves with stipules, along with regular flowers, generally indefinite or numerous perigynous stamens and definite seeds without albumen. It divides into marked sub-orders, of which the following are the prineipal: (1) *Amygdaleæ*, or the almond family, with a single simple and free pistil, beeoming a stone-fruit, sueh as that of peaeh, plum, and cherry. (2) *Rosaceæ* proper, with dry or berry-like fruits, from numerous or few (seldom single) free pistils, and stipules joined with the petiole. To this belong the small fruits above mentioned and a great variety of useful and ornamental plants, both herbs and shrubs. (3) *Pomeæ*, the apple family, with two or more pistils combined with eaeh other and with a fleshy ealyx-tube, which forms the edible fruit. The fruits of the *Rosaceæ* are all innoeent, exeept that of the eherry-laurel, but the kernels of the stone-fruits contain a poisonous prineiple identical with or analogous to prussie acid, along with a bitter essential oil; and these qualities extend more or less to the bark and foliage. The most aetive artiele of the materia mediea furnished by this family is from the koso-tree of Abyssinia (*Brayera anthelmintica*), the flowers of which are a powerful vermifuge. Astringency generally prevails in the herbage of the family. It yields many useful products, but is most important for its fruits and its ornamental flowers.

Revised by Charles E. Bessey.

Rosamund: a Lombard queen. See Alboin.

Rosan'iline: See Aniline Colors.

Rosa of Lima (secular name, Isabel Flores): saint; b. at Lima, Peru, in 1586. Her parents, who were wealthy Spaniards, lost their property, and she supported them by her labor while living as a reclusc in the habit of the third order of St. Dominic. D. at Lima, Aug. 24, 1617. She was canonized by Pope Clement X. in 1671, and is the only saint of American birth in the Roman calendar.

Rosa'rio, or **Rosario de Santa Fé, El**: a city of the province of Santa Fé, Argentine Republic; on the west side of the delta of the Paraná, 214 miles by the river above Buenos Ayres (see map of South America, ref. 8–D). Until 1852 it was an insignificant village. Urquiza, in his struggle against the supremacy of Buenos Ayres, made it the chief port of the confederated provinees (1854), and sinee then it has grown rapidly. It is the second eity of the republic in size and importanee, and is conneeted with the interior by a network of railways; transatlantic steamers ascend regularly to this point. The city, on flat land 65 feet above the river, is laid out in regular squares, with wide streets; it is substantially built, resembling a town in the eastern part of the U. S. Almost exclusively a commercial place, it is chiefly remarkable for its great elevators and storehouses. It has numerous banks, shops, and hotels. Therc is a large foreign element. The most important exports are wheat and flour; steamers load direetly at the wharves. The climate is temperate and salubrious. Pop. (1895) 94,025. Herbert H. Smith.

Rosary [from Late Lat. *rosa'rium*, string of beads, liter., garland, garland of roses < Lat. *rosa'rius*, pertaining to or made of roses, deriv. of *ro'sa*, rose]: (1) a series of prayers prescribed by the Roman Catholic Chureh. The greater rosary is a synonym for the whole series, and is made up of three lesser rosaries. Each of the three lesser rosaries eontains five deeades or mysteries. Eaeh deeade contains one meditation upon one of the fifteen mysteries of the faith, one Pater Noster, or repetition of the Lord's Prayer, ten Ave Marias, and one Gloria Patri. (2) The ehaplet or string of beads used in the repetition of the rosary. The Pater Nosters are marked by large beads, and the Ave Marias by smaller ones. The beads are of various materials, and are blessed by the pope or by some duly authorized eeelesiastic. The beads serve as counters during the reeitation. They are also in use among Arabs and Hindus, but they are, nevertheless, of eomparatively late oeeurrenee in Europe. They were first used by the Dominicans, though St. Dominic himself seems not to have known them. Probably they were introdueed into Europe by the crusaders. There are various forms of rosaries; that generally used has fifty-five beads—namely, five deeades of Ave Maria beads and five Pater Noster beads. The confraternity of the Rosary was founded at Cologne in 1475.

Rosas, Juan Manuel, de: dictator; b. at Buenos Ayres, Mar. 30, 1793. He first became prominent as a leader of the gaucho eavalry, and in 1827 was made eommander of the rural militia or poliee of Buenos Ayres under Dorrego. After Dorrego's deposition and death (1829) he assumed the leadership of the federalist party, and for some months carried on a civil war with the *unitario* ehief, Lavalle, who was forced to resign. Rosas then beeame governor of Buenos Ayres 1829–32; his sueeessor, Balcaree, was deposed, and Rosas again beeame governor, with extraordinary powers, Mar. 7, 1835. From this time he was praetically dietator of Buenos Ayres, and by intrigue, foree, or foul means he obtained control of most of the other provinees, putting his ereatures in command of them; thus a loose confederation was formed, a number of petty dietators reigning like so many kings in their provinces, but nearly all taeitly aeknowledging the supremaey of Buenos Ayres. Rosas used his power in the most tyrannieal manner, and often with savage though hidden eruelty. His poliey was to keep the country isolated and ignorant. Commeree was plaeed under severe restrietions; few foreigners were permitted to enter the republic; the press was muzzled; and hundreds of persons were assassinated or exiled. Many fled to Montevideo, whieh beeame the focus of opposition to Rosas, and eonsequently the objeet of his espeeial hatred. Hoping to make it subservient to him like the provinees, he aided the exiled president, Oribe, who maintained a eivil war in Uruguay from 1842 to 1851, but did not sueeeed in taking Montevideo. Rosas perseeuted foreign residents, and paid little heed to the repeated remonstrances of Franee and Great Britain. A Freneh fleet bloekaded Buenos Ayres intermittently from 1838 to 1845, and finally Great Britain and France actively interfered to protect Montevideo; their combined fleets bombarded and captured Rosas's intrenehed eamp at Punta de Obligado (Nov. 20, 1845), but nothing further was done. The leaders of the *unitario* party repeatedly ineited rebellion in the interior, and the attempts of Lavalle (1838–41) for a time promised sueeess; but in the end all were beaten, and the eivil wars only increased the miseries of the eountry. In 1851 Brazil interfered to proteet the independence of Uruguay, and was joined by Urquiza, dietator of Entre Rios. Their eombined forees, under Urquiza, raised the siege of Montevideo, invaded Buenos Ayres, and defeated the army of Rosas at Monte Caseros Feb. 3, 1852. The fallen dictator fled to a British vessel, and was taken to England. He purehased an estate near Southampton, where he lived in retirement until his death Mar. 14, 1877. Rosas was the worst because the most powerful of the South Ameriean dictators. His name is execrated throughout Spanish America.

Herbert H. Smith.

Roscelin, ros'lăn' (*Roscellinus*, *Rousselin*, *Rucelinus*): the so-called founder of nominalism; b. in the diocese of Soissons in the middle of the eleventh century, and educated at Rheims; was attached to the Cathedral of Chartres; lived at Compiègne as eanon; while there he greatly startled people by his tritheistic eonception of the Trinity. He could not understand how God could be a person without being an individual, and thus he dissolved the Trinity into three Gods. A synod was convened at Soissons in 1092 to consider the matter, and, as Roscelin had quoted both Lanfrane and Anselm as being in favor of his views, Anselm drew up his *De fide Trinitatis*, which is a complete refuta-

tion of Roscelin, and laid it before the synod. Roscelin was condemned and recanted, but continued, nevertheless, after his return to Compiègne, to propagate his tritheistic doctrines. He afterward settled as a teacher at Tours, and later at Loc-menach, near Vannes, in Brittany, and to this last period of his life belongs his controversy with Abelard. Abelard was a pupil of his, but in his *De Trinitate* (*Introductio in Theologiam*) he found it expedient, evidently with an eye to the decisions of the Synod of Soissons, to emphasize the unity of the Trinity with great strength. Enraged, Roscelin denounced him to Gisbert, Bishop of Paris, for various other heresies, and Abelard answered by a direct and violent attack (Ep. xxi.). After that time (1121) Roscelin disappears from history. The only writing of his extant is a letter supposed to be addressed by him to Abelard. It is probable that he wrote little. His importance in the history of nominalism has led to the close study of such representations of his teachings as are to be found in the writings of his opponents. See the histories of philosophy by Ueberweg and Erdmann. Revised by S. M. Jackson.

Roscher, Wilhelm Georg Friedrich, Ph. D.: political economist; b. in Hanover, Germany, Oct. 21, 1817; educated in Hanover and at the Universities of Göttingen and Berlin; professor at Göttingen University 1844–48; became professor at Leipzig University 1848; was Doctor Honorarius of Law in the Universities of Königsberg, Edinburgh, and Bologna; Doctor Honorarius of Political Economy in the University of Tübingen; member honorarius of the Universities of Kasan and Kiev, and *Ehrenbürger* of Leipzig University. His principal works are *De historicæ doctrinæ apud sophistas majores vestigiis* (Göttingen, 1838); *Leben, Werk und Zeitalter des Thukydides* (1842); *Grundriss zu Vorlesungen über die Staatswirthschaft* (1843); *System der Volkswirthschaft* (4 vols., Stuttgart, 1854–86; vol. i., 20th ed. 1892; vol. ii., 12th ed. 1888; vol. iii., 6th ed. 1892; vol. iv., 3d ed. 1889); *Kolonien, Kolonialpolitik und Auswanderung* (1847; 3d ed. 1885); *Ueber Kornhandel und Theuerungspolitik* (Stuttgart, 1847; 3d ed. 1852); *Zur Gründungsgeschichte des Zollvereins* (Berlin, 1870); *Geschichte der Nationalökonomik in Deutschland* (2 vols., Munich, 1874); *Andichten der Volkswirthe aus dem geschichtlichen Standpunkte* (2 vols., Munich, 1861; 3d ed. 1878); *Umrisse zur Naturlehre des Cäsarismus* (1888); *Umrisse zur Naturlehre der Demokratie* (1890); and *Politik, geschichtliche Naturlehre der Monarchie, Aristokratie und Demokratie* (1892). D. in Leipzig, Saxony, June 4, 1894.

Roscius, Quintus: a celebrated Roman actor, a contemporary of Sulla and Cicero, who in his youth received instruction from him, and subsequently defended him in a civil lawsuit in an oration which is still extant. He was especially great in comedy, and carried his art to the highest degree of perfection which the Roman stage ever witnessed, accumulating an immense fortune. Cicero speaks often of him, and always with enthusiasm for his art and respect for his character. D. 62 B. C. Revised by M. Warren.

Roscoe, Sir Henry Enfield, LL. D., D. C. L.: chemist; grandson of William Roscoe; b. in London, Jan. 7, 1833. He was educated at University College, London, and at Heidelberg; graduated at London University in 1852; appointed Professor of Chemistry at Owens College, Manchester, in 1858, and resigned in 1885. He was elected a fellow of the Royal Society in 1863, and received the royal medal of the society in 1873 for his chemical researches. In 1884 he was knighted for his services as a member of the royal commission on technical instruction; was elected Liberal M. P. for South Manchester in 1885, 1889, and 1892. He was president of the British Association in 1887, and in 1889 received the decoration of the Legion of Honor in recognition of his services at the Paris Exposition of that year. In conjunction with Prof. Bunsen he has published several investigations on the measurement of the chemical action of light, and is the author of numerous papers in scientific journals. His *Lessons in Elementary Chemistry* has been translated into several European and Eastern languages. He is the author of *Lectures on Spectrum Analysis* (1869; 5th ed. 1888), and conjointly with Prof. Schorlemmer of a *Treatise on Chemistry* (8 vols., 1877–90).

Roscoe, William: historian and biographer; b. near Liverpool, England, Mar. 8, 1753; was admitted to the bar 1774; began practice at Liverpool; wrote several pamphlets against the slave-trade; published in 1796 *The Life of Lorenzo de' Medici*, and in 1805 a *History of the Life and Pontificate of Leo X.*; sat in Parliament 1806–07; edited Pope's works (10 vols., 1824), and was author of many political and miscellaneous treatises. He was distinguished for his labors in the cause of philanthropy and his encouragement of younger literary aspirants. D. at Toxteth Park, Liverpool, June 27, 1831. His *Life* (2 vols., 1833) was written by his youngest son, Henry (1799–1836), who was distinguished at the bar, wrote numerous legal works, and was author of the *Lives of Eminent British Lawyers* (1830; often reprinted). Revised by H. A. Beers.

Roscom'mon: an inland county of Ireland, in the province of Connaught, bordering E. on the Shannon. Area, 949 sq. miles (see map of Ireland, ref. 8–F). The surface is level, with the exception of the northern parts, where ranges of low hills are found; the soil is light but fertile, affording excellent pasturage in many places. Agriculture and the rearing of sheep are the principal occupations. Pop. (1891) 114,397. Chief town, Roscommon, which contains remains of a castle and a fine abbey of the thirteenth century, and has an important cattle-market.

Roscommon, Wentworth Dillon, Earl of: poet; nephew of Wentworth, Earl of Strafford; b. in Ireland about 1633; educated at Caen under Bochart; spent a large part of his life in France; obtained several offices about the court of Charles II.; went to Ireland as captain in the Guards; squandered his estate by gaming; returned to England; reformed his habits; married a daughter of the Earl of Burleigh; devoted himself to literature in conjunction with Dryden, and produced some poems, the best being the *Essay on Translated Verse* (1660); a blank-verse paraphrase of Horace's *Ars Poetica* (1684); and a revision of *Dies Iræ*. D. in London, Jan. 17, 1684, and was buried in Westminster Abbey.
Revised by H. A. Beers.

Rose [conjointly from O. Fr. *rose* (< Lat. *ro'sa*) and < O. Eng. *rōse*, from Lat. *ro'sa*, rose; cf. Gr. *ῥόδον*, rose]: a flowering plant of the genus *Rosa* and family *Rosaceæ*, which consists of shrubs, usually prickly, natives of the northern hemisphere from the Arctic zone to Mexico in the New World, and to Abyssinia and the Indian Peninsula in the Old. The genus is characterized by unequally pinnate leaves with serrate leaflets, or rarely simple leaves, which in one species (*R. berberifolia*) are entirely wanting, adnately stipulate petioles, and single or corymbose terminal flowers, with five foliaceous sepals imbricated in æstivation, five petals readily multiplying under cultivation, indefinite stamens, and numerous one-seeded carpels inclosed in the receptacular calyx-cup, which becomes fleshy when ripe. The most widely distributed North American species are the Michigan prairie-rose (*R. setigera*), with high-climbing branches, armed with stout, straight prickles, showy corymbose pink flowers, and globular fruit—a native of the Western and Southern States from Michigan to Louisiana and Georgia; the swamp-rose (*R. carolina*), with stems 4 to 8 feet high, armed with stout hooked prickles, corymbose pink flowers, and bristly, depressed globular fruit—a frequent inhabitant of low swampy ground from Canada to Florida and westward to the Mississippi; the dwarf wild rose (*R. lucida*), with stems 1 or 2 feet high, armed with unequal bristly prickles, mostly deciduous flowers, solitary or in clusters of two or three, and smooth globular fruit—common through Canada and the U. S., E. of the Rocky Mountains.

The sweet-brier (*R. rubiginosa*), a native of Europe, has escaped from cultivation, and become widely naturalized in the Atlantic States. The Cherokee rose (*R. sinica*), a native of China, with high-climbing branches, armed with stout hooked prickles, coriaceous evergreen leaves, and large white flowers, has been naturalized in the Southern States for over 100 years, where it is also extensively cultivated as a hedge-plant. Where sufficient room can be given it, few plants equal the Cherokee rose for winter blooming in Northern conservatories. *R. bracteata*, a native of China and Northern India, with erect branches, armed with stout recurved prickles and large, white, solitary flowers surrounded by conspicuous bracts, has also become naturalized in some of the Gulf States, where it is successfully employed as a hedge-plant, especially in deep rich soils.

From the dried petals of *R. gallica*, an Old World species of doubtful geographical limits, an infusion is made which is employed as an agreeable vehicle for tonic and astringent medicines. From the petals of *R. centifolia*, a native of the Caucasus, and *R. damascena*, whose native country is unknown, rose-water, the principal ingredient in astringent collyria, is distilled. (See Attar of Roses.) In the south of France, Egypt, and other Mediterranean

countries, and in India, roses are also largely cultivated for the manufacture of rose-water. The dog-rose (*R. canina*), widely distributed throughout Europe, Northern Africa, the Canary islands, Persia, and Siberia, is also of some importance to man. The pulp of its fruit, mixed with twice its weight of sugar, constitutes the *confectio rosæ caninæ*, which is employed as an astringent antiseptic preserve; an infusion of its young leaves has been used as a substitute for tea; its seeds are a vermifuge; while the root was formerly considered a specific against hydrophobia.

A classification dividing garden-roses into two sets—the first, of summer or once-blooming, the second, of autumnal or ever-blooming—although open to several objections, is the most convenient for the horticulturist.

To the first section belong the Provence roses or cabbage-roses, double forms of *Rosa centifolia*, favorite garden-plants from the time of the Romans, and of which the pompon-roses are dwarf varieties; also moss-roses, descendants from a sport or accidental bud-variation of the Provence rose, with the glands and bristles of the calyx and peduncle developed into a mossy substance. The original moss-rose was introduced into England about three centuries ago from Holland, but the garden where it originated and the name of its discoverer are lost. Hybrid China roses originated from a cross of the Provence and other summer roses with the Chinese rose and its offspring, the tea-scented, Noisette, and Bourbon roses. China roses are remarkable for vigor of growth, often surpassing both parents in this respect, splendid blooms, and great hardiness. They are particularly adapted for growing on pillars or over arbors, and in similar situations. Scotch roses, descendants of *R. spinosissima*, are of dwarf stature and great hardiness, producing early in the season an abundant crop of red, white, and yellow flowers. Austrian briers, descendants of *Rosa lutea*, in Harrison's Yellow give the best yellow rose for general cultivation. Queen-of-the-prairie and Baltimore belle (a hybrid with evident traces of the blood of one of the tender Noisette group) are the most generally cultivated of the descendants of the prairie-rose.

To the summer roses also belong the sweet-brier (*R. rubiginosa*), of which many forms and varieties are in cultivation; the Bursault rose, a descendant of *R. alpina*, the evergreen rose, of which many varieties, descendants of the European *R. sempervirens*, are in cultivation. The many-flowered rose, *R. multiflora*, is a native of China and Japan, and several double forms derived from it are in cultivation in the Southern States. The Banksian rose, generally cultivated only in its double state, has its origin in the Chinese *R. banksiæ*.

To the second section (ever-blooming roses) belong Chinese roses, descendants of *R. indica* and *R. semperflorens*, now rarely cultivated. Tea-roses, descendants of *R. indica*, and two varieties of this species with sweet-scented flowers, the blush-tea and the yellow-tea, were introduced into England from China early in the nineteenth century. From the intermingling of these two varieties has sprung the whole race of tea-scented roses so extensively cultivated. The musk-roses, double forms of *R. moschata*, a native of the Mediterranean basin, are occasionally cultivated. Noisette roses, generally climbing, with flowers in clusters, were originated by M. Noisette, a French florist of Charleston, S. C., by crossing the China rose with the musk-rose, the offspring being again crossed with the tea-scented roses. Bourbon roses are a race of hybrids introduced into Europe from the Isle of Bourbon, where it was produced by crossing the China rose with some other rose of Eastern origin naturalized in that island. Bourbon roses are valuable for their habit of blooming late in autumn. A French cultivator, M. Laffroy, of Bellevue, near Paris, first, in 1840, produced the hybrid perpetual rose, which has as a basis some hardy once-blooming rose, often the hybrid China, with which has been mingled in sufficient quantities to impart their ever-blooming qualities the blood of the China rose, tea-rose, or Bourbon rose, or a combination of all three.

Roses should be cultivated in situations fully exposed to the sun, in deep strong loam well drained and heavily manured. Indeed, too much rich food can hardly be given them to develop their greatest beauties. The soil in which they grow should be constantly stirred and kept free from other plants, and especially from the roots of neighboring trees, while a careful watch must be kept for the many insects which find a favorite food in their leaves and petals. Next to the selection of soil and situation, pruning is the most important operation in the culture of the rose. Strong-growing roses must be pruned slightly, that they may not be stimulated to excessive growth at the expense of the flowers; weak-growing roses must be pruned severely, to encourage more vigorous growth, or, in the words of Francis Parkman, a master in rose-culture, "Roses should be pruned in inverse proportion to the vigor of their growth." See Francis Parkman's *Book of Roses* (Boston, 1866); Thomas Rivers, *The Rose Amateur's Guide* (London, 1872); S. Reynolds Hole, *A Book about Roses* (11th ed., London, 1891); J. Lachaume, *Le Rosier* (Paris, 1874); and Thomas Afflicks, *Hedging and Hedging Plants in the Southern States* (Houston, 1869).

C. S. Sargent.

Rose (in heraldry): a conventionally drawn flower, having always five petals, and usually also five smaller inner petals and five green points of leaves showing on the outer rim. The rose gules was the badge of the Plantagenets, of the house of Lancaster, and the rose argent of that of York. The Tudor rose is a combination of the two, adopted after the marriage of Henry VII. to Elizabeth of York; this is sometimes a white rose charged upon a red one, and sometimes a single rose quartered red and white. The rose was sometimes surrounded with rays, as of the sun, and termed *rose en soleil*. As a mark of cadency, the rose has been used as the difference of the seventh son.

Revised by Russell Sturgis.

Rose, Ernestine Louise Süsmund Potoski: philanthropist; b. at Peterkoff, Poland, Jan. 13, 1810, of Jewish parents; abandoned early the Jewish creed; visited England in 1829; became a disciple of Robert Dale Owen, and was married to William E. Rose. In 1836 she went to New York and circulated the first petition for the property rights of married women, as there was a bill pending in the Legislature, introduced by Judge Hurtell in 1837. She lectured in all the chief cities; was a delegate from the National Woman Suffrage Association to the woman's industrial congress, held in Berlin, Nov. 9, 1869, and subsequently attended all the woman's rights conventions, and frequently addressed legislative assemblies. She was one of the most logical and eloquent orators on the woman suffrage platform. In her later years she spent most of her time in France and England, speaking on many public occasions on religion and the enfranchisement of women. She died in London in 1892.

Susan B. Anthony.

Rose, rō'ze, Gustav: mineralogist; b. in Berlin, Mar. 18, 1798; took his degree of Ph. D. at Berlin 1820; studied with Berzelius; instructor of mineralogy in the University of Berlin from 1823 till his death; in 1829 visited the Ural Mountains with Humboldt and Ehrenberg. D. in Berlin, July 15, 1873. He published many papers on mineralogy, crystallography, and kindred subjects, mostly in *Gilberts Annalen* and in *Poggendorffs Annalen*; also *Elemente d. Krystallographie* (1829; 3d ed. 1873); *Mineralogisch-geognost. Reise nach d. Ural, d. Altai u. d. Kaspischen Meere* (1837–42); *Das Krystallo-chemische Mineralsystem* (1852).

Rose, Heinrich: chemist; brother of Gustav Rose; b. in Berlin, Aug. 6, 1795. His grandfather, Valentin Rose, Sr., and his father, Valentin Rose, Jr., were distinguished chemists. He studied with Berzelius at Stockholm, and took his degree of Ph. D. at Kiel 1821. D. in Berlin, Jan. 27, 1864. He devoted his attention chiefly to analytical chemistry, and contributed more than any other chemist to advance this branch of science. His *Handbuch der analytischen Chemie* (Berlin, 1829) has run through many editions, and is still the standard authority. He published more than 200 papers on chemical subjects, largely in *Gilberts Annalen* and *Poggendorffs Annalen*. In 1851 he read before the Berlin Academy of Sciences his *Gedächtnissrede auf Berzelius*. He was an instructor in the University of Berlin from 1822 till his death.

Revised by Ira Remsen.

Rose, Hugh Henry: See Strathnairn.

Rose, Hugh James: clergyman and author; b. at Little Horsted, Surrey, England, in 1795; graduated at Cambridge 1817; became curate of Uckfield 1818, vicar of Horsham 1821, select preacher to the University of Cambridge 1825; was Professor of Divinity in the University of Durham 1833–38, chaplain to the Archbishop of Canterbury 1834–38, and principal of King's College, London, from 1836 to his death, in Florence, Italy, Dec. 22, 1838. Author of many sermons and theological treatises; founded *The British Magazine* 1832; became editor of *The Encyclopædia Metropolitana* 1836; was joint editor (with Archdeacon W. R. Lyall)

of *The Theological Library*, and projected *Rose's New General Biographical Dictionary*, a design carried into effect after his death by his brother, Henry John, and other writers. He was one of the founders of the Tractarian movement.

Rose-acacia: an ornamental shrub, the *Robinia hispida*, of the order *Leguminosæ*, growing wild in the mountains of the southern parts of the U. S. It has large, very showy, inodorous flowers of a deep rose-color in drooping loose racemes. It is common in cultivation.

Rose-apples: See EUGENIA.

Rosebery, ARCHIBALD PHILIP PRIMROSE, LL. D., Earl of: statesman; b. in London, 1847; educated at Eton and Oxford; succeeded to his title on the death of his grandfather, the fourth Earl of Rosebery, 1868; seconded an address in reply to a speech from the throne in Parliament 1871; president of the social science congress Glasgow, 1874; elected lord rector of the University of Aberdeen Nov. 16, 1878; lord rector of the University of Edinburgh Nov., 1880; Under-Secretary of State for the Home Department 1881; first commissioner of works 1884; Secretary of State for Foreign Affairs in Mr. Gladstone's government Jan. to June, 1886, and in this position won general approval for the firmness with which he conducted the difficult questions devolving upon him. He was appointed to the same post in 1892, became Prime Minister on Mr. Gladstone's retirement in 1894, but gave place to Lord Salisbury June 29, 1895, and relinquished the leadership of the Liberal party Oct., 1896. C. H. T.

Rose-bug: a very common beetle, *Macrodactylus subspinosus*, of North America, belonging to the family *Scarabæidæ*. It is small and dusky yellow, and is very destructive, not only to the rose, but to other vegetation. In warm weather it will suddenly appear in swarms and then suddenly disappear again, having completed its devastations, against which there seems to be no effectual remedy. In some cases air-slacked lime scattered over the bushes and under them seems to have the desired effect, but in other cases it has proved a complete failure. The same may be said of syringing the bushes with a decoction of whale-oil soap or of ailanthus leaves.

Roseburg: city; capital of Douglas co., Ore.; on the Umpqua river, and the S. Pac. Railroad; 76 miles S. of Eugene City, 197 miles S. of Portland (for location, see map of Oregon, ref. 6–B). It is in an agricultural, stock-raising, fruit-growing, and mining region; is an important market for the fertile Umpqua valley; and contains flour-mills, breweries, wagon-shops, the Oregon State Soldiers' Home, a national bank with capital of $50,000, a private-bank, and a semi-weekly and a weekly newspaper. Pop. (1880) 822; (1890) 1,472; (1900) 1,690.

MANAGER OF "REVIEW."

Rose'crans, WILLIAM STARKE: soldier; b. at Kingston, O., Sept. 6, 1819; graduated at the U. S. Military Academy; promoted brevet second lieutenant of engineers July 1, 1842. With the exception of four years (1843–47), when he was at West Point as Assistant Professor of Engineering and of Natural and Experimental Philosophy, he was engaged in the construction of fortifications until Apr. 1, 1854, when he resigned from the army and established himself in Cincinnati, O., as civil engineer and architect; was president of a coal company in Virginia 1855–57, and engaged in the manufacture of kerosene in Cincinnati 1857–61. As volunteer aide to Gen. McClellan he served in organizing Ohio State troops; was appointed colonel and chief engineer of Ohio June 9, and colonel Twenty-third Ohio Volunteers June 10, 1861. He was commissioned brigadier-general in the regular army, and in the West Virginia campaign commanded a brigade at Rich Mountain, July 11; succeeded to command of the department of the Ohio on July 21, and of the department of West Virginia in Sept., 1861; appointed major-general of volunteers Mar., 1862; in May he commanded a division of the Army of the Mississippi at the siege of Corinth: succeeding to command of that army in June, he fought the battles of Iuka (Sept. 19) and Corinth (Oct. 3–4); was transferred to the command of the Army of the Cumberland Oct. 27. His exertions did much to win the battle of MURFREESBORO (*q. v.*), fought Dec. 31, 1862–Jan. 3, 1863, after temporary reverse on the first day. Advancing on Tullahoma June 24, he occupied Bridgeport and Stevenson July 24; crossed the Cumberland Mountains, and Sept. 19–20 fought the battle of CHICKAMAUGA (*q. v.*), where, defeated and falling back on Chattanooga, he was relieved Oct. 30, 1863 (see CHATTANOOGA, SIEGE AND BATTLE OF): was placed in command of the department of the Missouri Jan., 1864; repelled the invasion of Missouri by Price; was mustered out of the volunteer service in 1866; again resigned from the army 1867; was for a short time (1868–69) U. S. minister to Mexico, after which he became a resident of San Rafael, Cal., and was in Mexico 1871–73, engaged in an unsuccessful effort to negotiate the construction of a vast system of narrow-gauge railways. He was member of Congress from California 1881–85, and register of the Treasury 1885–93. On Mar. 2, 1889, he was restored to the rank of brigadier-general and retired. D. near Redondo, Cal., Mar. 11, 1898.

Rose-gall: See GALL INSECTS.

Ros'egger, PETRI KETTENFEIER: poet and novelist; b. at Alpl, a small village in the Styrian Alps, July 31, 1843; passed his youth in great poverty and was apprenticed to a tailor at the age of seventeen. Through the aid of a number of patrons, whose attention he attracted by his exceptional poetic talent, he was enabled to make up for his defective education and devote himself entirely to literature. In 1869 he published his first book, *Zither und Hackbrett*, a collection of poems in the Styrian dialect, which met with success. Since then he has produced a great number of stories, sketches, and novels, most of which describe the peasant life of his native country with great originality and power of characterization. The best known of his stories are *Aus dem Walde* (1874); *Geschichten aus den Alpen* (1873); *Der Gottsucher* (1883); *Jacob der Letzte* (1888); *Hoch vom Dachstein* (1892); *Peter Mayr* (1894). JULIUS GOEBEL.

Rosellini, ros-el-lee'nĕe, IPPOLITO: Orientalist; b. at Pisa, Italy, Aug. 13, 1800. After graduating at Pisa in 1821, he studied Oriental languages at Bologna, and in 1824 was made Professor of Oriental Philology in the University of Pisa. Having been commissioned by the Grand Duke of Tuscany to examine the antiquities of Egypt, he visited that country and spent fifteen months (1827–28) with Champollion, who was under appointment by the French Government, in careful exploration. After the death of Champollion, Rosellini became to some extent his literary executor. The remainder of his life, after his return from Egypt, was spent in editing and publishing his monumental volumes, *I Monumenti dell' Egitto e della Nubia* (9 vols. octavo, and 3 vols. folio, containing 394 plates, Pisa, 1832–44). Ungarelli's *Elementa linguæ Ægyptiacæ vulgo Copticæ* (Pisa, 1837) contained the material delivered by Rosellini, who in turn depended upon Champollion's *Grammaire Copte*. D. at Pisa, June 4, 1843. Biographies of him were written soon after his death by Bardelli (1843), Dei (1843), and Cavedoni (1845). CHARLES R. GILLETT.

Roselly de Lorgues, rō'ze'lee'de-lōrg', ANTOINE FRANÇOIS FÉLIX: religious writer; b. at Grasse, Alpes-Maritimes, France, Aug. 11, 1805; studied law, but soon left the bar and devoted himself to religious writing and to researches in philosophy; became a member of the Legion of Honor in 1837, and officer in 1855. His best-known works are those in defense of the Roman Catholic Church, especially *Le Christ devant le siècle* (1835; 16th ed. 1847), translated into several languages, and *La Croix dans les deux mondes* (1844; 3d ed. 1852). He also wrote several works with the purpose of obtaining the beatification of Columbus, among them *Christophe Colomb* (1856: 3d ed. 1886) and *Histoire posthume de Christophe Colomb* (1885).

Rose-mallow: See HIBISCUS.

Rosemary [by analogy of *rose* and *Mary* < M. Eng. *rosmarine*, viâ O. Fr. from Lat. *rosmari'nus*, liter., sea-dew; *ros*, dew + *mari'nus*, of the sea, marine, deriv. of *ma're*, sea]: a labiate evergreen shrub, *Rosmarinus officinalis*, of Europe and Asia, having fragrant aromatic leaves which yield a pungent volatile oil, valued as a stimulant medicine and sometimes used as an ingredient in perfumery, in hair-dressings, and in liniments. Oil of rosemary is a principal ingredient of the perfume called Hungary water or queen of Hungary water. The shrub, which reaches a height of from 4 to 8 feet, has linear leaves which are covered beneath with a short whitish-gray down and emit a penetrating camphor-like odor; the flower is pale bluish. It grows in sunny places, on rocks, old walls, etc., in the countries around the Mediterranean, and is generally cultivated as an ornamental and aromatic shrub in the west of Europe. The rosemary may sometimes be smelled for many leagues off the Spanish coast. It affords excellent bee-pasture. Revised by L. H. BAILEY.

Rosen, rō′zen, Friedrich August, Ph. D.: Orientalist; b. at Hanover, Germany, Sept. 2, 1805; educated at Göttingen, Leipzig, and Berlin; published in 1826 his *Corporis Radicum Sanscritarum Prolusio*, expanded in the following year into *Radices Sanscritæ* (Berlin, 1827); was from 1829 Professor of Oriental Languages in the University of London (now University College). Becoming honorary foreign secretary to the Royal Asiatic Society and secretary to the Oriental Translation Committee, he became intimate with H. T. Colebrooke, by whose advice he published the Arabic text (with English translation and notes) of Mohammed ben Musa's *Algebra* (1831); prepared for publication Ibn Khallikan's great *Biographical Dictionary*, and undertook a work (never completed) on *Indian Jurisprudence*; edited Sir Graves Houghton's *Dictionary, Bengali, Sanscrit, and English* (1833–34), and 2 vols. of Colebrooke's *Miscellaneous Essays* (1837); he planned an edition of the *Vedas*, and in 1830 published his *Rig-Vedæ Specimen*, and began in 1836 to print the Sanskrit text with a Latin translation and explanatory notes. He had not completed the first volume when he suddenly died in London, Sept. 12, 1837. The Oriental Translation Committee issued the work under the title *Rig-Veda-Sanhita, Liber Primus, Sanscrite et Latine* (1838).

Rosendale Cement: See Cement.

Ro'senkranz, Johann Karl Friedrich: philosopher; b. at Magdeburg, Prussia, Apr. 23, 1805; at the age of nineteen took up his residence in Berlin, devoting himself to philosophy. He completed his university course at Halle, receiving the degree of doctor of philosophy in 1828. In 1833 he entered upon the duties of Professor of Philosophy at Königsberg, occupying the chair formerly filled by Herbart and Kant till his death in 1879. He was the best representative of the "center" of the school of Hegel, and did much valuable work in rearranging and reclassifying the several parts of the system. His chief works are a *History of German Poetry in the Middle Ages* (1830); a *Handbook of the General History of Poetry* (Halle, 1833); *Encyctopædia of Theological Sciences* (Halle, 1831); *Critique of Schleiermacher's Glaubenslehre* (Königsberg, 1836); *Psychology, or Science of Subjective Mind* (Königsberg, 1837); *Critical Explanations of Hegel's System* (1840); *History of Kant's Philosophy* (Leipzig, 1840); *Life of Hegel* (Berlin, 1844); *Modifications of Logic* (Leipzig, 1846); *Goethe and his Works* (Königsberg, 1847); *Pedagogics as a System* (Königsberg, 1848; Eng. trans. New York, 1886); *System of Science* (Königsberg, 1850); *Æsthetics of the Ugly* (Königsberg, 1853); *Science of the Logical Idea* (Königsberg, 1859); *On Vera's Translation of Hegel's Philosophy of Nature* (Berlin, 1868); *Hegel as the National Philosopher of Germany* (Leipzig, 1870; nearly all of this work has appeared in English); *From Magdeburg to Königsberg: Autobiography* (Leipzig, 1873); *New Studies*—vol. i., *The History of Culture*; vol. ii., *The History of Literature* (1875). D. June 17, 1879. William T. Harris.

Ros'enmüller, Ernst Friederich Karl: Orientalist; b. at Hessberg, near Hildburghausen, Germany, Dec. 10, 1768; studied theology at the University of Leipzig 1813, where he became Extraordinary Professor of Arabic 1796 and Ordinary Professor of Oriental Languages in 1795. D. at Leipzig, Sept. 17, 1835. His principal works are *Scholia in Vetus Testamentum* (16 parts, Leipzig, 1788–1817): *Scholia in Vetus Testamentum in compendium redacta* (5 parts, 1828–35); *Handbuch der biblischen Alterthumskunde* (4 parts, 1823–31). Revised by S. M. Jackson.

Rosenmüller, Johann Georg: preacher and writer; b. at Ummerstadt in Hildburghausenschen, Dec. 18, 1736; studied at Altdorf till 1760; pastor in Hessberg 1768; diakonus in Königsberg in Franken 1772; pastor and professor in Erlangen 1773; professor and superintendent in Giessen 1783; professor and pastor in Leipzig 1785; prelate of the Hochstift Meissen 1802. D. Mar. 14, 1815. Among his works are *Hist. interpret. lib. Sacr. in eccles. Christiana* (1795–1814); *Scholia in N. T.* (1777); *Emendationes et supplementa* to the foregoing (1789–90); *Morgen und Abendandachten* (7th ed. 1820); and *Ausertes. Beicht und Kommunionsbuch* (12th ed. Nuremberg, 1827). See Dolz, *Rosenmüllers Leben und Wirken* (Leipzig, 1816). R Gottheil.

Rose-noble, or **Gold Penny**: an ancient English gold coin, first current in the reign of Edward III., and last coined under Henry V. It bore a rose on one side, and was worth 1 noble—6*s.* 8*d.* sterling.

Rosenthal, Albert: See the Appendix.

Rosenthal, rō′zen-tăăl, Isidor, M. D.: physiologist; b. in Labischin, near Bromberg, Prussia, July 16, 1836; studied medicine at the University of Berlin; in 1867 elected Extraordinary and in 1872 Ordinary Professor of Physiology at the University of Erlangen. He was editor of the *Centratbtatt für die medicinischen Wissenschaften* (1869–80), and co-editor of the *Biologisches Centralbtatt* in 1881. Among his works are *Allgemeine Physiotogie der Muskeln und Nerven* (Leipzig, 1877); *Vorlesungen über die öffentliche und private Gesundheitspflege* (Erlangen, 1887).

Rosenthal, Max: See the Appendix.

Rosenthal, Moriz: See the Appendix.

Rosenthal, Moriz, M. D.: neurologist; b. in Grosswardein, Hungary, in 1833; graduated M. D. at the University of Vienna in 1858; in 1875 appointed a Professor of Nervous Diseases, and assigned to a division in the general hospital in Vienna. He is universally known as an able neurologist and careful investigator. Among his works are *Handbuch der Diagnostik und Therapie der Nervenkrankheiten* (Erlangen, 1870); *Klinik der Nervenkrankheiten* (Stuttgart, 1875).

Rosenthal, Toby Edward: See the Appendix.

Rose of Jericho, or **Rose of the Virgin**: a cruciferous herb. the *Anastatica hierochuntica* (resurrection-flower of Jericho), of the Levant and of Arabia. It is fabled that the rose of Jericho first bloomed at the Nativity, and that it remains in flower from Christmas until Easter. Others say that it sprang up wherever the Virgin alighted during the journey to Egypt. See Jericho, Rose of.

Rose of Sharon: the popular name of the *Hibiscus syriacus*. See Hibiscus.

Roseola, rō-zee′ō-la [Mod. Lat., dimin. of Lat. *ro'sa*, rose. Named from the color induced in the skin]: any one of various forms of disease attended with an erythematous rash. Very often mild cases of measles and scarlet fever were so designated, and the term has more recently been used as a designation of German measles. It is not properly applied excepting to the rash itself, and this may occur in a variety of conditions including gastric disturbances, mild fever from any cause, and various infectious fevers. W. P.

Rose-quartz: a variety of Quartz (*q. v.*).

Roses, War of the: the name given to the civil war, lasting thirty years (1455–85), between the princes of the rival houses of York and Lancaster, each claiming the throne of England by right of descent from Edward III. See the articles England (*History*), Edward IV., Henry VI., Henry VII., and Richard III.

Roset'ta [=Arab. *Reshîd*, or *Rashîd*]: an Egyptian town; 40 miles N. E. of Alexandria, near the mouth of the westerly branch of the Nile, and near Fort St. Julien, where the famous Rosetta Stone (*q. v.*) was found (see map of Africa, ref. 2–F). The place was founded in 870 A. D., near the site of the ancient Bolbotinum. Its history is obscure, and the name does not appear in the literature of the Coptic period. (See Amélineau, *Géographie de l'Égypte*, Paris, 1893, p. 404.) Before the opening of the canal that connects Alexandria with the Nile it had some importance as a port for trade, but this has almost entirely disappeared. Its native population is about 13,000, with very little foreign admixture. Charles R. Gillett.

Rosetta Stone: a large slab of black basalt, now in the British Museum, which was found in 1799 by a French engineer in the trenches of Fort St. Julien near Rosetta (*q. v.*) in Egypt. It measures 3 ft. 9 in. in height, 2 ft. 4½ in. in width, and 11 inches in thickness in its present broken condition, but originally it was probably about 12 inches higher, and had a rounded top. It contains parts of fourteen lines of hieroglyphic text, in the upper register, nearly the whole of the original thirty-two lines of demotic or enchorial writing, and fifty-four lines (twenty-eight of them complete) in uncial Greek letters. The mutilations at the top have destroyed about fourteen lines of hieroglyphic text, and the piece lost from the lower right-hand corner has deprived us of the endings of twenty-six lines of the Greek. Judging by internal evidence it has been concluded that the original text was the Greek, and that the native writing contains only versions. (For an account of the Egyptian graphic systems, see Egyptian Language and Literature and Hieroglyphics.) The stone itself speaks of the three styles of caligraphy as "writing of divine words" (hieroglyphic), "writing of letters" (demotic), and "writing of the Greeks."

The stone contains a copy of a decree promulgated by the Egyptian priesthood assembled at Memphis in 195 B. C., in honor of Ptolemy V. Epiphanes (205–182 B. C.) on account of certain benefits that he had conferred upon Egypt in his eighth year, by remitting certain taxes and reducing others, by conferring privileges upon the priests and soldiers, by dedicating certain revenues to the temples, and by averting serious damage from the land by damming and regulating the waters of an unusually high Nile. According to the decree it was directed that its text be engraved in three sorts of characters upon hard stone, and set up in all Egyptian temples of the first, second, and third order, to commemorate these beneficent deeds of "Ptolemy, the saviour of Egypt." It was also directed that statues of the king should be placed in all the temples, and that a shrine containing his image in wood should be carried with those of other deified kings of Egypt in solemn processions. The first five days of the month of Thoth were set apart for the celebration of special services in his honor.

The inscriptions on this stone were similar to those on the Tablet of Tanis, also known as the Stela of Canopus, discovered at Tanis by Lepsius in 1866. The latter was set up in 238 B. C., the ninth year of Ptolemy III., Euergetes I. (246–221 B. C.) to commemorate his good deeds, and particularly his restoration of the images of the gods, which had been carried off to Mesopotamia. These texts served to confirm the results of the decipherment based upon the Rosetta Stone. In the original work of decipherment great assistance was rendered to Champollion in 1822 by inscriptions on an obelisk then recently brought from Philæ to London, which contained the names of Ptolemy Euergetes and Cleopatra, to whose identification he was led by the Greek inscriptions on the base of the obelisk. The name of Ptolemy was already known, and the decipherment of the name of Cleopatra added several alphabetic signs to those that had been previously determined on the basis of the Rosetta Stone. For an account of the decipherment, see article EGYPTOLOGY. See also Budge, *The Mummy* (Cambridge, 1893), pp. 144 ff.; Ebers, *Cicerone durch Ægypten*, ii., pp. 24 ff. Budge, pp. 109–110, gives an extensive bibliography of works bearing upon the decipherment and interpretation of the Rosetta Stone. CHARLES R. GILLETT.

Roset'ti, or **Roseti**, CONSTANTIN: poet and politician; b. in Bucharest, Roumania, June 14, 1816; in the army from 1833 to 1836; wrote translations from Byron and others, and in 1843 published a volume of original poems under the title *Ceasurĭ de mulţumire* (Hours of Contentment). He was concerned in the political disturbances of 1848, being a secretary of the provisional government. When the uprising was put down his journal, *Pruncul român* (The Roumanian Child), was suppressed, and he went to Paris, where he was active as a political writer. After the Crimean war he returned to Roumania and founded the journal *Românul* (The Roumanian), and as an ardent liberal was influential in politics. He became a member of the chamber of deputies, and held other public positions. He urged the proclamation of independence, and the alliance with Russia against Turkey in 1877. From 1878 to 1880 he was Minister of the Interior, and was a senator at the time of his death, Apr. 20, 1885. A new edition of his poems, translations, and political writings appeared in 1885 at Bucharest. E. S. SHELDON.

Rosewood: (1) the beautiful and fragrant wood of several leguminous Brazilian trees of the genera *Machærium* and *Triptolemæa*, highly valued as a veneer for furniture, pianos, etc.; (2) the almost equally beautiful wood of an East Indian leguminous tree, *Dalbergia latifolia*; (3) Canary island rosewood, the fragrant woody root of the convolvulaceous *Rhodorrhiza scoparia* and *R. florida*. The last is a delightful incense, and its powder is mixed with snuff. From it is obtained the oil of rhodium, much vaunted as a charm for horses and highly prized by trappers. (4) Burmese and African rosewoods are the timber of leguminous trees of the genus *Pterocarpus*.

Revised by L. H. BAILEY.

Rosicrucians [Lat. *ro'sa*, rose + *crux*, *crucis*, cross]: a secret society reported to have been founded in the fourteenth century. The first mention of the society appeared in the *Fama Fraternitatis des löblichen Ordens des Rosenkreuzes*, anonymously published at Cassel in 1614, and in the *Confession oder Bekenntniss der Societät und Brüderschaft R. C.*, published the following year. In these the most wonderful stories were told of the Rosicrucians, who were said to be possessed of the deepest wisdom, and most potently at work for the weal of mankind. Concerning the founder of the society, Christian Rosenkreutz—his residence among the Arab and Egyptian magicians, his life in Spain and Germany as head of the new order, his death and burial—the most stirring revelations were made in a third book, *Chymische Hochzeit Christian Rosenkreutz'*, which appeared at Strassburg in 1616. Some theologians considered the society a means of salvation, others the organ of a foul scheme. Some physicians thought that it would give the fulfillment of the golden prophecies of Theophrastus Paracelsus concerning an elixir of life; others, that it was only an impudent opposition to Galen. The alchemists particularly were anxious to join it, sure that it had found the philosopher's stone and could make gold, but the whereabouts of the brotherhood remained unknown. For several years the secret society of the Rosicrucians was the all-absorbing topic of the day. Some think that the books were written by Johann Valentin Andreä, simply as a satire. Of the real existence of such a society there never was found the slightest trace. Soon there arose a multitude of Rosicrucian societies, and at the end of the eighteenth century Cagliostro pretended to be a Rosicrucian. See Semler, *Impartial Collections for the History of the Rosicrucians* (Leipzig, 1768); and Waite, *The Real History of the Rosicrucians* (London, 1887).

Rosin, or **Col'ophony** [*rosin* is appar. dial. form of *resin* (see RESINS); *colophony* is from Lat. *colopho'nia* (sc. *resi'na*, rosin) = Gr. κολοφωνία (sc. ῥητίνη, rosin), Colophonian rosin, rosin, liter., fem. of Κολοφώνιος, pertaining to Colophon (Gr. Κολοφών)]: the residue which is obtained by distilling off the water and volatile oil from the crude turpentine from pine-trees. The yield is from 70 to 90 per cent. of the whole. (See TURPENTINE.) It is largely manufactured, together with oil of turpentine, at Wilmington, Newbern, and Beaufort, N. C. When entirely freed from water it is translucent. The color depends upon the purity of the original turpentine and the care taken to distill at a low temperature. It is chiefly the anhydride of abietic acid.

Colophony is pale yellow and transparent (virgin rosin), or brownish yellow and translucent, according to the care taken in its preparation. It may be obtained nearly colorless by distillation with steam or some inert gas, as hydrogen, carbon dioxide, or nitrogen, under a pressure of ten atmospheres at a temperature not higher than 600° F. It has a peculiar luster, called resinous, is brittle when cold, and breaks with a conchoidal fracture; sp. gr. 1·07 to 1·08. It is insoluble in water, soluble in alcohol, ether, wood-spirit, and in fixed and volatile oils; partially soluble in petroleum. Nitric acid dissolves it, forming chiefly isophthalic acid, together with trimellitic acid and a resinous acid. It dissolves in caustic alkalies and alkaline carbonates. Colophony softens at 160° F. and melts at 275° F. At higher temperatures it gives off volatile oils, acquiring a dark color.

Colophony is extensively used in making varnishes and cements, in the calking of ships, in the preparation of plasters and ointments, and as a reducing agent in the soldering of metals. Large quantities are consumed in the manufacture of yellow soap. A well-known use of it is for covering the bows of violins to prevent the bow from slipping over the strings without producing vibration. Before the introduction of petroleum, rosin-oil was used to some extent in lamps. The rosin-spirit is sometimes used as a substitute for oil of turpentine. The viscid oil is used in paints, for the manufacture of printer's ink, in soap-making, in cheap lubricators, etc. Revised by IRA REMSEN.

Rosin Bible: See BIBLE.

Rös'kilde: town; in the island of Sealand, Denmark; on a hill on a branch of the Isefjord. In the early Middle Ages it was a great city, the royal residence, with 100,000 inhabitants, and 27 churches and monasteries, but conflagrations, the plague, and the growth of Copenhagen destroyed its prosperity. It has a magnificent cathedral, built 1047–84, which contains many splendid monuments; the Danish kings are buried here. Pop. (1890) 6,972.

Roslyn: village; Queens co., Long Island, N. Y.; now a part of the Borough of Queens, New York city; at the south end of Hempstead harbor, on the Long Island Railroad; 23 miles E. N. E. of Brooklyn. It was named by William Cullen Bryant, who had a residence here and presented the village with a public hall. It has an English classical school, a savings-bank, a weekly newspaper, flour, paper, and planing mills, and canning-factories. Many New York business men have summer residences here. Pop. (1880) 1,101; (1890) 1,251; (1893) 1,409. EDITOR OF "NEWS."

Roslyn: town; Kittitass co., Wash.; on the Northern Pac. Railroad; 32 miles N. W. of Ellensburg, the county-seat (for location, see map of Washington, ref. 4–E). It is in an agricultural and coal-mining region; has a local output of about 2,500 tons of coal per day, shipped chiefly to Eastern Washington; and has a weekly newspaper. The town is reached by a branch railway from Clealum, 4 miles distant. Pop. (1890) 1,484; (1900) 2,786.

Rosmar'idæ: now usually called ODOBÆNIDÆ (*q. v.*).

Rosmini, ros-mee'nĕe, ANTONIO: ecclesiastic and philosopher; b. at Roveredo, Tyrol, Mar. 25, 1797; at an early age devoted himself to philosophical studies, and in his youth wrote a number of miscellaneous works. In 1827 he formed a friendship with Manzoni, and in 1830 went to Rome to obtain the sanction of the pope to his Instituto dei Preti della Carità, an order founded by himself; in the same year published his principal work, *Nuovo Saggio sull' Origine delle Idee*; in 1834 returned to Roveredo as archdeacon, and there gave himself entirely to philosophy, producing works upon ontology, theosophy, theodicy, pedagogy, supranatural anthropology, ethics, methodology, and many other subjects, which in all form thirty volumes. The *Cinque Piaghe della Chiesa* and *Il Progello di Cosliluzione* are applications of his philosophical doctrines to politics. English translations of his *Psychology* and *Pedagogy* have appeared, and a work expounding his doctrines at length has been published in London by T. Davidson; this work contains also (p. lii.–lxxxviii.) a full biography. He carried on long polemical controversies with Gioberti and Mamiani. D. at Stresa, July 1, 1855. Revised by W. T. HARRIS.

Rosny, rō'nĕe', LÉON, de: Orientalist; b. at Loss, department of Nord, France, Aug. 5, 1837; studied in Paris; was attached as interpreter to the Japanese embassy which visited Europe in 1863, and became Professor of Japanese in Paris in 1868. He published *Diclionnaire japonais-français-anglais* (1858); *Les Écrilures figuralives el hiéroglyphiques des Différents Peuples, anciens el modernes* (1860); *Dictionnaire des Signes idéographiques de la Chine* (1864–67); *Éludes asialiques de Géographie et d'Hisloire* (1864); *Aperçu de la Langue coréenne* (1867).

Rosol'ic Acid, Coralline, Pseudo-Coralline, or **Aurine** [*rosolic* is from *rose* + carb*olic*; *aurine* is from Lat. *au'rum*, gold]: names formerly applied to red coloring-matters which were supposed to be identical, but have been shown to be distinct. *Rosolic acid* was obtained by Runge in 1834 by treating coal-tar naphtha with milk of lime. It is now prepared by treating a cold dilute solution of rosaniline in hydrochloric acid with sodium nitrite, and subsequently boiling the product to convert the diazo-compound formed into rosolic acid. Rosolic acid, previously boiled with water, appears as a dark-greenish, amorphous substance, with the greenish metallic luster of cantharides. Its powder is red, and assumes a bright gold-like luster when rubbed or pressed with a hard body. Thin films are orange-red by transmitted and metallic by reflected light. When precipitated from alcohol by water, it is a bright-red powder. At 170° F. it cakes together, and in boiling water it melts. It is not volatile; dissolves readily in alcohol, ether, wood-naphtha, phenol, creosote, concentrated acetic, hydrochloric, and sulphuric acids. From all of these solvents, which are miscible with water, it is precipitated unchanged when that is added. It is not decolorized by sulphurous acid. Its acid properties are very feeble; it is even weaker than carbonic acid. It forms dark-red compounds, soluble in alcohol and in water, and a magnificent red with ammonia, caustic alkalies, and caustic alkaline earths; carbonic acid decomposes them, and the prolonged action of air and light destroys the rosolic acid completely. The formula of rosolic acid is $C_{20}H_{16}O_3$. It is the tri-para-oxytolyl-diphenyl-carbinol-anhydride. Rosolic acid has been suggested as an indicator in Pettenkofer's process for determining carbonic acid, and in nitrogen determinations with standard acid. It was sold in a crystalline form at one time under the name of *aniline scarlet*.

Coralline was first prepared by Persoz in 1859, by heating 3 parts of phenol, 2 of oxalic acid, and 2 of sulphuric acid for several hours. The mass effervesces, and becomes thick and deep red. The process is terminated when a drop of the mixture is found to dissolve with a deep red in dilute ammonia. The mixture is then poured into hot water. A resinous mass, with the luster of cantharides, separates. Persoz's process was not published till after Kolbe and Schmitt in 1861 announced their discovery of a similar process. They use 3 parts of phenol, 2 of oxalic acid, and 4 of sulphuric acid, and heat to 285°–300° F. four to six hours, in a vessel furnished with a cohobator. The product is treated as in Persoz's process. Coralline (known as crude or yellow coralline) is a mixture of pseudo-rosolic acid, $C_{20}H_{16}O_4$ (70 per cent.), aurin or para-rosolic acid, $C_{19}H_{14}O_3$, oxidized aurine, $C_{19}H_{16}O_6$, and methyl-aurine, $C_{20}H_{16}O_3$. Coralline gives fine red shades in dyeing, which are easily modified by the use of proper reagents. The liability to change renders it somewhat difficult to fix. The calcic carbonate lake of coralline is largely used by paper-stainers.

Red coralline, pæonine, or *pœonine* (J. Persoz, 1859), is obtained by heating 9 parts of crude coralline with 22 parts of concentrated ammonia to 270° F. for three hours in a strong iron vessel. A thick solution with a golden-crimson reflection is obtained, from which acids precipitate the new dye as a deep-red powder, the composition of which is not determined. It is probably an amide or imide of coralline. It is almost insoluble in water, soluble in alcohol (red), and in alkalies (red, turning brown in the air). Pæonine is much used for dyeing wool, although it has the disadvantage of being changed to yellow by acids. This can be prevented by the use of magnesia, dissolving the dye in alcohol. It produces a rich Turkey red, the intensity of which is retained for years, at a cost of two-thirds that of cochineal, and possesses the advantage of not turning blue on washing in water containing bicarbonate of lime. Cotton must be mordanted with tin and sumac or galls. The color obtained is between that of cochineal and magenta. It resists washing, but is affected by soap and by exposure to sunlight.

Azuline was formerly prepared by heating aurine with aniline. It is not now used.

Aurine, or *para-rosolic acid*, $C_{19}H_{14}O_3$, is formed (1) by the action of nitrous acid on para-rosaniline; (2) together with pseudo-rosolic acid, oxidized aurine, and methyl-aurine by the action of oxalic acid and sulphuric acid on phenol, the product being known as crude or yellow coralline, described above.

Aurine is insoluble in water, soluble in hot alcohol and acetic acid. It crystallizes in dark rose-red crystals with a sky-blue reflection. Hydrochloric acid precipitates it from hot alkaline solutions in hair-like needles, which do not melt to a resinous mass, as rosolic acid does.

Pseudo-coralline, or *corallin phlhalin*, $C_{20}H_{16}O_4$, is the chief constituent of oxide coralline. It dyes orange-yellow shades on mordanted wool.

Poisonous Properlies of Woolens dyed with Coralline, etc.—Much has been written on this subject, but it appears that the irritation of the skin, etc., which results from wearing red and scarlet flannel dyed with these colors is due not to the coralline, but to the picric acid, phenol, etc., which are often associated with them. Washing removes these substances. See Guyot, *Comptes Rendus* (Aug. 6, 1869).

Revised by IRA REMSEN.

Ross: county of Scotland. See ROSS AND CROMARTY.

Ross, ALEXANDER: poet; b. in the parish of Kincardine-O'Neil, Aberdeenshire, Scotland, Apr. 13, 1699; graduated at Marischal College, Aberdeen, about 1716; engaged in teaching, and was parish schoolmaster at Lochlee, Forfarshire (or Angus), from 1732 until his death at that place May 20, 1784. He wrote verses from his childhood, but was sixty-nine years of age when he first appeared as an author, through the advice of Dr. Beattie, by the publication of *Helenore, or the Forlunate Shepherdess, a Pastoral Tale in lhe Scotlish Dialecl, to which are added a few Songs by lhe Author* (Aberdeen, 1768), a poem which in the north of Scotland has rivaled in popularity the writings of Burns and Allan Ramsay. Ross left in MS. eight volumes of miscellanies, of which an account is given in the *Life* prefixed to the best edition of *Helenore* (1866), edited by John Longmuir, LL. D. See also A. Campbell's *Introduction to lhe History of Poelry in Scotland* (1799). Revised by H. A. BEERS.

Ross, ALEXANDER MILTON: See the Appendix.

Ross, ARTHUR WELLINGTON: lawyer; b. at East Williams, Middlesex, Ontario, Canada, Mar. 25, 1846; graduated at Toronto University. He was head master of Cornwall schools 1868–69; inspector of public schools for the county of Glengarry 1871–74; removed to Manitoba in 1877, and was admitted to the bar in 1878. He soon became the largest real-estate owner in the province; has been vice-president of the Manitoba and Northwest Railway Company, and was chosen to represent Manitoba and the Northwest in

the Howland syndicate to build the Canadian Pacific Railway. He was a member of the Manitoba Legislature 1878–82, and in the latter year was elected to the Canadian Parliament, where he remained until 1896. NEIL MACDONALD.

Ross, GEORGE WILLIAM, LL. D.: educator; b. in Middlesex, Ontario, Canada, Sept. 18, 1841; educated at Normal School, and became a teacher. In 1871 he was appointed county inspector of schools in East Lambton; subsequently became inspector of county model schools, and was appointed Minister of Education for Ontario Nov. 23, 1883. He was a member of the Dominion Parliament 1872–83, and since then has held a seat in the Ontario Legislature. For many years he has been a leader in temperance and prohibition movements; was an honorary commissioner at the Colonial and Indian Exhibition, London, 1885, and has been editor of the Strathroy *Age* and of the Seaforth *Expositor*. NEIL MACDONALD.

Ross, Sir JAMES CLARK: navigator; b. in London, Apr. 15, 1800; nephew of Sir John Ross; entered the navy in 1812, and accompanied his uncle on his first voyage in search of a northwest passage, and was also with Capt. Parry (1819–27) in the latter's expeditions having the same object in view, being on one occasion wrecked in the Fury; in 1827 was appointed commander, and in 1829 again sailed with his uncle as second in command, and was absent four years. On June 1, 1831, he discovered the position of the north magnetic pole. Promoted to be post-captain on his return, he was engaged in a magnetic survey of Great Britain and Ireland 1835–38; in Apr., 1839, was appointed to the command of the Erebus, and in September of that year, in company with the Terror, sailed for the Antarctic seas, reaching lat. 78° 10′ S., the highest southern latitude ever reached. A volcano was discovered in lat. 77° 32′ S., nearly 13,000 feet in height, which was named Mt. Erebus. It is in Victoria Land, discovered and named by him, and the most extensive Antaretic land yet seen. In 1844 the honor of knighthood was conferred upon him, and in 1847 he published *A Narrative of a Voyage in the Antarctic Regions*. He was a fellow of the Royal Society, and of many continental scientific bodies. D. at Aston Abbots House, near Aylesbury, Apr. 3, 1862. Revised by C. C. ADAMS.

Ross, Sir JOHN, K. C. B.: explorer; b. in the parish of Inch, Wigtonshire, Scotland, June 24, 1777; entered the navy in 1786; in Jan., 1818, received his commission as commander of the Isabella, and Apr. 25, in company with the Alexander, Lieut. Parry, sailed from London to ascertain the existence or non-existence of a northwest passage, returning in Nov., 1818; in May, 1829, again sailed in the steamer Victory, equipped by Sir Felix Booth, sheriff of London, but in Sept., 1830, became ice-bound in the Gulf of Boothia, making but little subsequent advance, and May 29, 1832, the Victory was abandoned. In Aug., 1833, the party was rescued by the Isabella, formerly commanded by Capt. Ross, but at that time engaged in the whaling business. He arrived in London Sept. 19, 1833, was knighted the following year, and admitted to the companionship of the Bath. From 1839 to 1845 he was consul at Stockholm: in 1850 departed, in command of the Felix, 90 tons, in search of Sir John Franklin, returning the following year; in July, 1851, attained the rank of rear-admiral. D. in London, Aug. 30, 1856. (See POLAR RESEARCH.) He published (1819) *A Voyage of Discovery, made under the Orders of the Admiralty for the purpose of exploring Baffin's Bay*, and in 1835 a *Narrative of a Second Voyage, including the Reports of Commander James Clark Ross, and the Discovery of the Northern Magnetic Pole*; also published a treatise on steam-navigation and numerous other papers. Revised by C. C. ADAMS.

Ross, Sir JOHN, K. C. B.: general; b. at Stonehouse, Cumberland, England, Mar. 18, 1829; entered the army as second lieutenant in the Rifle Brigade in 1846; served with that regiment during the Crimean war, where he won distinction and received the brevet rank of major and Turkish medal and order of the Medjidie. During the Indian mutiny he was present at the action at Cawnpur and the capture of Lucknow; subsequently commanded the Camel Corps at the capture of Calpee and in the ensuing campaign in Central India, and for his services received the rank of lieutenant-colonel, the companionship of the Bath, and a medal. He commanded the Bengal troops during the operations in the Malay Peninsula 1875–76, and was assigned to the command of a large force of Indian troops sent to the Mediterranean in 1878, when war with Russia was threatened. He afterward commanded the second division of the Cabul army during the war with Afghanistan 1878–79, and received the thanks of Parliament and was knighted for his services. He was appointed to the command of the troops in Canada in 1888, and stationed in Halifax. NEIL MACDONALD.

Ross, JOHN JONES, M. D.: Canadian senator; b. at Ste. Anne de la Pérade, Aug. 16, 1833. He is president of the Provincial College of Physicians and Surgeons; was a member of the agricultural council of Quebec 1862–90; and elected vice-president of the North Shore Railway Company 1875. He was Speaker of the Legislative Council of Quebec 1873–74 and 1876–81; commissioner of agriculture and public works 1881–82, and held this office together with that of Premier of the province 1884–87. He was a member of the Canadian Assembly 1861–67, of Parliament 1867–74, was called to the Senate in 1887, and was its Speaker 1891–96.

Ross, LUDWIG: archæologist; b. at Altekoppel, Holstein, Germany, July 22, 1806. Endowed with a traveling scholarship by the Danish Government, he went to Athens in 1832 for the scientific exploration of Greek antiquities. When about to return home, he was appointed in 1833 by the Greek Government as superintendent of antiquities of the Peloponnesus, and subsequently of the entire kingdom. In 1845 he became Professor of Archæology at the University of Halle. Ross was one of the great pioneers in the field of Hellenic archæology, topography, and epigraphy. He traveled all over Greece, excavating, copying inscriptions, and fixing the topography of classical localities with such accuracy, scientific method, and descriptive talent that his works have retained their value. Among his many publications the following are the most important: *Wanderungen in Griechenland* (1851); *Reisen auf den Griechischen Inseln des ägeischen Meeres* (4 vols., 1840–52); *Die Demen von Attika* (1846); *Das Theseion und der Tempel des Ares zu Athen* (1852); *Archäologische Aufsätze* (1855–61), the second volume of which also contains a biographical sketch by Otto Jahn. D. at Halle, Aug. 6, 1859. ALFRED GUDEMAN.

Ross, WILLIAM: member of privy council of Canada; b. at Boularderie island, Cape Breton, in 1825; represented Victoria in Nova Scotia Assembly from 1858 till 1867, and in the Canadian Parliament till 1874; collector of customs at Halifax 1874–88. He was sworn of the privy council Nov. 7, 1873, and was Minister of Militia and Defense from that date till Nov. 5, 1874. N. M.

Ross, Sir WILLIAM CHARLES, R. A.: painter; b. in London, England, June 3, 1794; son of a miniature-painter and teacher of drawing, from whom he received artistic training; gained a prize from the Society of Arts at the age of thirteen; in 1817 became an assistant to Andrew Robertson, an eminent miniature-painter; was appointed miniature-painter to Queen Victoria 1837; was knighted 1842; was patronized by all the court circle, and occasionally executed historical and imaginative pieces, having obtained a premium of £100 in the great cartoon competition for his *Angel Raphael discoursing with Adam* (1842). D. in London, Jan. 20, 1860.

Ross and Cromarty: a northern county of Scotland, washed on the E. by the German Ocean and on the W. by the Atlantic, and bounded N. and S. by Sutherlandshire and Inverness-shire respectively. It comprises the districts of Easter and Wester Ross, the Black Isle, the island of Lewis, and the ten detached districts which formerly made up the county of Cromarty. Area, 3,078 sq. miles. Pop. (1901) 76,149. The surface is wild and mountainous, but the soil affords good pastures, on which large herds of sheep and cattle are fed; agriculture and fishing are carried on. The royal burgh of Dingwall, 166 miles N. W. of Edinburgh, is the county-town. Pop. (1891) 2,300.

Rossa'no (anc. *Roscianum*): town; province of Cosenza, Italy; on a hill near the Gulf of Taranto, which it overlooks (see map of Italy, ref. 8–H). There are quarries of marble and alabaster in the neighborhood. Fish are abundant, and silk and cotton are raised in the vicinity, as well as grain, olives, grapes, etc. The town, still walled and defended by a castle, was once a very strong fortress. Rossano is the seat of an archbishop. Pop. of commune about 18,000. Revised by M. W. HARRINGTON.

Rosse, WILLIAM PARSONS, third Earl of: astronomer: b. at York, England, June 17, 1800; studied first at Trinity College, Dublin, and then at Magdalen College, Oxford, where he graduated in 1822; sat in the House of Commons as Lord Oxmantown, representing King's County from 1821

to 1831; succeeded to the peerage in 1841, and was elected a representative peer of Ireland in 1845 and chancellor of the University of Dublin in 1862. He studied astronomy and optics, and concentrated his attention on the improvement of the telescope. For several years he was engaged in experiments referring to the construction of fluid lenses, the results of which researches are communicated in the *Philosophical Transactions* (1840); but although he failed in this particular object, he succeeded at last, after a long series of experiments, in constructing a speculum of a reflecting telescope in which the spherical aberration and the absorption of light were reduced to a minimum, at the same time that his process of construction did away with that cracking and warping of the surface of the speculum while cooling after the casting which so often had proved fatal under the old method of operation. In 1842 a telescope was successfully constructed on his plan, 6 feet in diameter, and mounted at his residence near Parsonstown. Since his death, Oct. 31, 1867, his work with the great telescope has been continued by his son, the fourth earl. Revised by S. Newcomb.

Rosseau, Rodolphe: See the Appendix.

Rossel'li, Cosimo: painter; b. at Florence, Italy, 1439. He began as a mason, and Neri de' Bicci instructed him in art. He remained with Bicci till the age of seventeen. At an early age his work was recognized and admired; among the earliest examples are the frescoes at Sant' Ambrogio, still existing. About 1480 Sixtus IV. invited Cosimo Rosselli, together with other great masters, to come to Rome and decorate the Sixtine chapel. Cosimo, feeling his work inferior to that of his competitors, Ghirlandajo, Luca Signorelli, and Perugino, loaded his figures with ultramarine and gold, so that the pope was satisfied with their decorative effect. These frescoes still exist. He became a mannerist in his later days, and his work lost the excellent qualities it had when he followed in the footsteps of Masaccio. Rosselli died in Florence, Jan. 7, 1507. Fra Bartolommeo and Piero di Cosimo were his pupils. W. J. Stillman.

Rosselli'ni, Bernardo: sculptor and architect; b. in Florence, Italy, 1409. The mausoleum of Beata Villana, in Santa Maria Novella, and the monument of Leonardo Bruni (called Aretino) in Santa Croce, which is very remarkable both in design and in perfection of execution, are by him. Pope Nicholas V. made great use of Rossellini in his capacity of architect, though some of his designs were not carried out on account of their vastness. In Rome he restored the Churches of Santa Maria in Trastevere, Santa Prassede, San Teodoro, San Pietro in Vincola, San Giovanni Laterano, Santa Maria Maggiore, San Stefano, and San Lorenzo. He was also employed at Spoleto, Gualdo, Assisi, Civita Vecchia, Narni, Orvieto, Viterbo, and at Pistoia, where the monument to Filippo Lazzari in the Church of San Domenico may be regarded as one of his principal works. D. in 1464. W. J. Stillman.

Rosser, Leonidas, D. D.: minister and author; b. at Petersburg, Va., July 31, 1815; graduated at the Wesleyan University in 1838; joined the New York Conference in 1838; was transferred to the Virginia Conference of the Methodist Episcopal Church South in 1839; served in the pastorate until 1852; was presiding elder 1852–59; was editor of the Richmond *Christian Advocate* 1858–59; pastor in Richmond 1860; general missionary 1861–64; again presiding elder for a time, and afterward an evangelist both North and South. Author of *Baptism* (Richmond, 1843); *Experimental Religion* (1854); *Class Meetings* (1855); *Recognition in Heaven* (1856); *Reply to Howell's Evils of Infant Baptism* (1856); *Open Communion* (1858); and *Initial Life* (1885). D. Jan. 24, 1892. Revised by A. Osborn.

Rosser, Thomas Lafayette: See the Appendix.

Rosset'ti, Christina Georgina: poet; sister of Dante G. Rossetti; b. in London, England, Dec. 5, 1830; published *The Prince's Progress* (1866); *Commonplace, and other Short Stories in Prose* (1870); *Sing-Song, a Nursery Rhymebook* (1872); *Speaking Likenesses, Annus Domini* (1874); *Seek and Find* (1879); *A Pageant, and other Poems* (1881); and *Letter and Spirit* (1883). D. Dec. 30, 1894.

Rossetti, Dante Gabriel: painter and poet; b. in London, England, May 12, 1828. He was the son of Gabriele Rossetti, the author and patriot, and was named Gabriel Charles Dante, and he signed at least one early work "Gabriel Rossetti, Jr." He studied painting while a boy at Cary's school of art and at the schools of the Royal Academy, and showed very early a great and peculiar poetical gift both in verse and in design. His *Blessed Damosel* was published when he was nineteen, and the picture *The Girlhood of Mary, Virgin*, was exhibited when he was twenty. It was in the same year (1848) that was formed the Pre-Raphaelite Brotherhood (see Prerapiiaelites) of which Rossetti was to be the most distinguished member. In 1851 he wrote the remarkable poem *Sister Helen*, and made the strange design *How They Met Themselves*, showing a pair of lovers who meet their ghostly wraiths or doubles. In 1856 he was at work on the powerful designs which partly illustrated the Tennyson poems of 1859. In 1857–58 he painted in distemper one of several large pictures of the *Legend of King Arthur* on the walls of the Union Debating Society at Oxford. This picture has perished, apparently because the artist did not understand the medium. He wrote many poems before the year 1862, and these were announced for publication under the title of *Dante at Verona, and other Poems*; but his wife died in the last-named year, and Rossetti's manuscripts were buried with her. Six years later they were exhumed, and in 1870 there was published the volume entitled *Poems*. In 1872 his health began to give way, and the use of chloral to induce sleep weakened him still more. His second volume of original verse, *Ballads and Sonnets*, was published in 1881. In his later years he lived in a house with a large garden on the Thames at Chelsea, and spent some time at Kelmscott Manor in Oxfordshire. In Dec., 1881, he went to Birchington, Kent, for his health, and died there Apr. 9, 1882. His most important publication besides the poems was the volume of *Early Italian Poets* (1861), reissued as *Dante and his Circle*.

Russell Sturgis.

Rossetti, William Michael; poet and art critic; brother of Dante G. Rossetti; b. in London, Sept. 25, 1829. He was educated at King's College School, London, and has held positions in the Excise Office since 1845. Author of *Dante's Comedy—The Hell, translated into Literal Blank Verse, with Introduction and Notes* (1865); *A Life of Percy Bysshe Shelley, with a Revised Edition of his Poetical Works* (2 vols., 1869); *Life of John Keats* (1887); *Poems and Ballads, a Criticism* (upon A. C. Swinburne, 1866), and editor of the poems of Coleridge, Milton, Campbell, Blake, and Walt Whitman. Revised by H. A. Beers.

Rossi, Ernesto: actor; b. at Leghorn, Italy, in 1829; began to study law at Pisa, but joined in 1846 one of the better Italian troops of actors; played at Milan 1847, at Turin 1852, at Paris, with Madame Ristori, 1855, subsequently at Vienna, especially in the comedies of Goldoni; returned to Paris in 1866; appeared in the *Cid* at the Théâtre Français on the anniversary of the birthday of Corneille; performed several of the principal characters of Shakspeare—Hamlet, Othello, etc.—in Lisbon in 1869. He aroused extraordinary admiration by his performances in 1874, in Breslau, Berlin, Dresden, and Prague. He also achieved great success in South America. In 1881 he visited the U. S. There was a diversity of opinion as to his conception of Shakspearean characters, and the verdict on the whole was unfavorable. He wrote a treatise on Hamlet, and several plays. D. June 4, 1896. Revised by B. B. Vallentine.

Rossi, Francesco, de', called *De' Salviati*, from his patron Cardinal Salviati: painter; b. in Florence in 1510. He studied under Andrea del Sarto. In 1540 when living at Venice he painted a portrait of Pietro Aretino, which the poet gave to Francis I. Salviati visited France in 1554, during Henry II.'s reign, but returned in 1555. He painted in Rome, and completed the altarpiece in the Chigi chapel in Santa Maria del Popolo, which Del Piombo had left unfinished. D. in Rome, Nov. 11, 1563. W. J. S.

Rossi, Giovanni Battista, de': epigraphist and archæologist; b. in Rome, Italy, Feb. 23, 1822; under Father Marchi he devoted himself to the study of archæology and of the Christian inscriptions of the first centuries of the Church, and was complimented by being made a member of the Berlin Academy of Sciences and also foreign member of the French Institute. The discoveries made by him in the catacombs are of special importance, particularly those in the cemetery of St. Calixtus. His most valuable works are *Inscriptiones Christianæ Urbis Romæ septimo sæculo antiquiores* (vol. i., 1861; vol. ii., 1888); *Roma Sotterranea Cristiana* (3 vols., 1864–77): he was one of the chief editors of the *Inscriptiones urbis Romæ* (vol. vi. of the *Corpus Inscriptorum Latinorum*). To these must be added numerous treatises contributed to archæological and epigraphical journals. D. in Rome, Sept. 20, 1894. Revised by A. Gudeman.

Rossini, ros-see'nĕe, Gioacchino Antonio: composer; b. at Pesaro, Italy, Feb. 29, 1792. In 1807 he entered the musical school of Bologna, studying counterpoint under the Abbate Mattei, and in 1810 he produced his first opera, *La Cambiale di Matrimonio*, at Venice. Other operas, since forgotten, followed, and in 1813 his *Tancredi* excited an immense enthusiasm, first in Venice, and soon on every stage on which Italian opera was given. In 1815 he went to Naples as director of the opera, and composed among other operas *Elizabetta* (1815), *Otello* (1816), *La Gazza Ladra* (1817), *Mosè in Egitto* (1818), *La Donna del Lago* (1819), and *Zelmira* (1820): but his most celebrated production of this period is *Il Barbiere di Seviglia* (originally called *Almaviva*), first performed in Rome in 1816, and generally considered the masterpiece of the whole genre of opera buffa—irresistibly gay, and as characteristic as graceful and brilliant. *Semiramide* (1823), composed at Bologna for the Fenice theater, Venice, was not appreciated on the occasion of its first representation. Rossini went to London in 1823, and next year to Paris, where he was made successively director of the Italian opera, inspector-general of song in France, and first composer to the Grand Opera. In bringing out his old compositions on the Paris stage he felt compelled to make considerable alterations: the melodies required a greater simplicity and more character, the chorus a deeper connection with the whole organism and a fuller significance, the instrumentation greater variety and elaborateness. He made a penetrating study of his task before he ventured to represent any new composition, but when at last, in 1828, he made the attempt with *Count Ory*, and in 1829 with *William Tell*, his success was astonishing. A few days after the performance of the last work he left Paris and retired to his villa near Bologna, where he lived till 1847, declining all offers, even the most tempting, made in order to induce him to compose a new opera. In 1847 he removed to Florence, in 1856 to Paris, where he died Nov. 13, 1868. In the last forty years of his life he published only a *Stabat Mater*, and a *Messe solennelle*, which was performed at his burial. See Edwards's *Life of Rossini* (1869), and the biography by Azevedo (1865).

Rossiter, Thomas Prichard: figure and portrait painter; b. at New Haven, Conn., Sept. 29, 1818. He was a pupil of Nathaniel Jocelyn in New Haven, and studied in Paris, London, and other places in Europe 1840–46; National Academician 1849; gold medal, Paris Exposition, 1855. Many of his portraits are excellent. He devoted the later years of his life to painting the *Life of Christ* in a series of pictures. *Rebekah at the Well* is in the Corcoran Gallery, Washington. D. at Cold Spring, N. Y., May 17, 1871. W. A. C.

Rost, rost, Reinhold, LL. D., C. I. E.: Orientalist; b. at Eisenberg, Germany, Feb. 2, 1822; studied in the gymnasium at Altenburg; graduated in 1846 at Jena; went to England 1847; from 1851 instructor in Oriental languages in St. Augustine's College, Canterbury; became secretary to the Royal Asiatic Society 1863, and librarian to the India Office 1869. He prepared a descriptive catalogue of the palm-leaf MSS. in the Imperial Library of St. Petersburg 1852; edited Dr. H. H. Wilson's *Essays on the Religion of the Hindus and on Sanskrit Literature*. Editor of the Trübner series of *Simplified Grammars* 1882–88, and of the *Oriental Record*. D. at Canterbury, Feb. 7, 1896.

Ros'tock: town of Northern Germany; in Mecklenburg-Schwerin; on the Warnow, 9 miles from its mouth in the Baltic (see map of German Empire, ref. 2–F). It has a university founded in 1419, with a library of 140,000 volumes; many other good educational institutions; manufactures of linen, leather, and tobacco, and an active trade. Vessels which draw more than 12 feet must load and unload at Warnemünde, its port at the mouth of the Warnow. Pop. (1895) 49,912.

Rostof': town of European Russia, in the government of Yaroslaf (see map of Russia, ref. 6–E). It has 33 churches and large manufactures of linen and candles, and holds an annual fair from Feb. 21 to Mar. 11, in which transactions to the amount of about 2,000,000 rubles are carried out. Pop. 17,439.

Rostof: town of European Russia, government of Ekaterinoslaf; on the Don, at the beginning of its delta; founded in 1749 as a fortress, and rapidly growing into one of the commercial centers of Southern Russia (see map of Russia, ref. 10–E). Ropes, linen, leather, soap, and tobacco are extensively manufactured. Pop. (1897) 119,889.

Rostoptchin', Fedor Wasilievich, Count: general; b. in the government of Orel, Russia, Mar. 23, 1763; was educated at the court as a page of Catherine II.; became Minister of Foreign Affairs under Paul I., and was governor-general of Moscow in 1812, when Napoleon approached. He was long believed throughout Western Europe to have set fire to the city before leaving it to the French, but in his *La Verité sur l'Incendie de Moscou* (Paris, 1823) he denies this. It is certain, however, that he set fire to his own palace and made preparations for the burning of the magazines. D. in Moscow, Feb. 12, 1826. See Schnitzler, *Rostoptchine et Koutousof, ou la Russie en 1812* (Paris, 1863). F. M. Colby.

Rostra [Lat., liter., beaks. So called because decorated with the beaks of the galleys of Antium, taken in the first naval victory of the republic, 338 B. C.]: the platform for public speaking at Rome; originally situated between the Comitia and the Forum. It was used also as a place for setting up statues of distinguished men, and on its sides were displayed some of the most important public documents, such as the laws of the Twelve Tables, international treaties, etc. At Cæsar's initiative the old rostra was torn down, and a new one constructed (probably not earlier than 42 B. C.) at the west end of the Forum, before the temple of Concord. This was about 10 feet high, 80 feet long, and 33 feet deep, its great size being accounted for by the necessity of providing a place for statues, as above indicated. The rostra was restored with great magnificence in the second century A. D. (by Trajan or Hadrian). G. L. Hendrickson.

Roswitha: See Hrotsvitha.

Rot (in vegetable pathology): any one of many diseases of plants, all due to the attacks of fungi or other low vegetable organisms.

The *bitter-rot* of apples causes upon the surface of the mature fruit brownish or blackish spots, which at length become studded with minute black raised points. On cutting through a diseased spot it is seen to extend far into the tissues of the apple. The fungus causing this disease

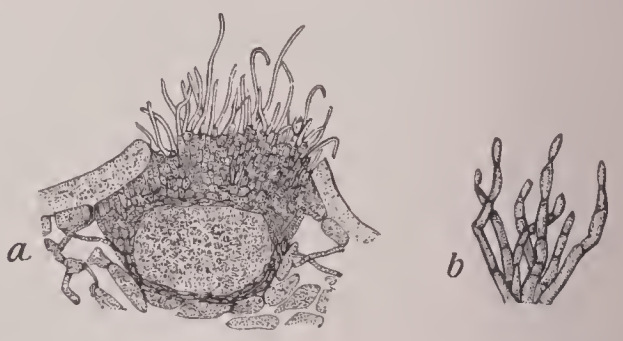

Fig. 1.—*a*, section through black point of bitter rot; *b*, spore-bearing threads (highly magnified).

is *Glœosporium fructigenum*, one of the so-called imperfect fungi of the family *Melanconiaceæ*. Its threads grow parasitically through the tissues of the apple, killing the

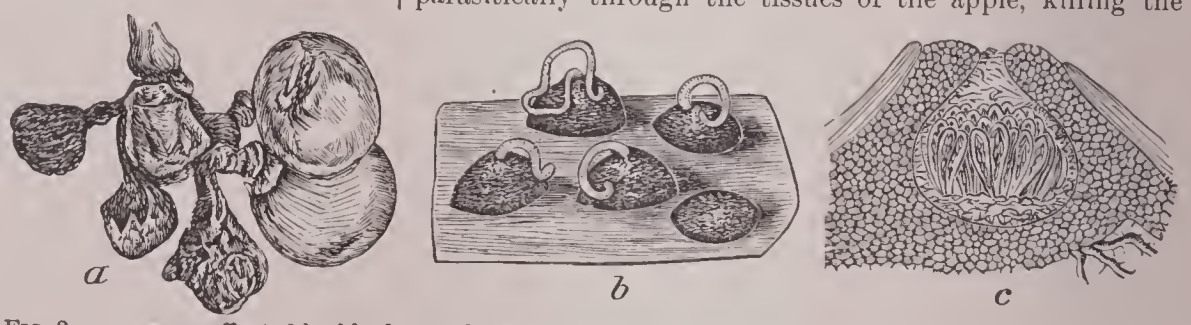

Fig. 2.—*a*, grapes affected by black-rot; *b*, escape of the conidia; *c*, section showing ascospores (*b* and *c* magnified).

cells, and finally come to the surface and produce the minute black points mentioned above, in which spores are produced (Fig. 1). Spraying the fruit in August with a 1-per-cent. solution of ammoniacal copper carbonate is a preventive. Another rot of the apple is called *black-rot* from the black color of the decayed portion, in which are found little points or pustules containing spores. The fungus (*Macrosporium malorum*) is closely related to the preceding.

Black-rot of grapes attacks the fruit, leaves, and shoots,

causing brown and finally black spots of dead tissue, resulting eventually in the shriveling of the berries into hard black masses. The disease is caused by a black fungus (*Læstadia bidwellii*) of the family *Sphæriaceæ* (Fig. 2, *a*). In its earlier stage (*Phoma* stage) it produces stalked spores, which are emitted from the black pustules in gelatinous strings (Fig. 2, *b*). Later in its perithecia it produces ascospores, which are always eight in each ascus (Fig. 2, *c*).

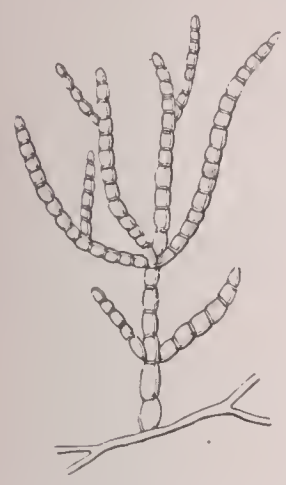

Fig. 3.—Conidia-bearing threads of plum-rot (highly magnified).

The *brown-rot* of grapes is caused by one of the downy mildews (*Plasmopara viticola*; see Mildews). The grapes turn brown and hard, and finally shrivel up. Brown spots appear upon the leaves also. Both kinds of rot on grapes may be prevented by freely spraying the vines five or six times during the season with a 1-per-cent. solution of ammoniacal copper carbonate. The *bitter-rot* of the grape which gives to the fruit a bitter taste is due to a minute species of the "imperfect fungi." Closely related to this is the *white-rot*. No remedy is known for either, but Bordeaux mixture is recommended. *Bird's-eye rot* of grapes is known also as *anthracnose* and *grape-scab*. See Scab.

Fig. 4.—*Armillaria mellea* of the root-rot of the grape (reduced).

One form of *potato-rot* or *blight* is caused by a downy mildew (*Phytophthora infestans*) whose parasitic threads penetrate the tissues of the leaves, stems, and tubers, and quickly destroy them. (See Mildews.) Spraying with some of the fungicides is said to be a remedy. Another form of potato-rot is produced by bacteria, which infest the tissues of the tubers, as well as of the parts above ground, causing their speedy death and decay. This bacterial disease of the potato appears to be more prevalent in the U. S. than that caused by the downy mildew. The bacterial disease appears to be checked by a rotation of crops.

Plum-rot is a common disease of the nearly ripe fruits of plum and peach trees. It is caused by a so-called imperfect fungus (*Monilia fructigena*) of the order *Hyphomyceteæ* and family *Mucedinaceæ*. Only the conidial stage (Fig. 3) is known. The threads grow through the tissues of the affected fruit, and appear here and there in tufts of bead-like rows of spores (conidia). The latter readily germinate in water or upon the injured surface of the fruit. The speedy removal of all diseased fruit and the early application of poisonous sprays will serve to check the disease.

Tomato-rot, in which the fruit decays when nearly ripe, is due to the minute *Macrosporium tomato*, one of the "imperfect fungi." Growing the plants so as to admit light and air decreases this disease, and spraying with Bordeaux mixture has been recommended.

Root-rot is an affection of several cultivated plants, and appears to be due, in some cases at least, to the growth of some of the larger fungi. In the grape the mycelium of one of the toadstools (*Armillaria mellea*) penetrates and destroys the tissues of the roots, finally producing the characteristic fruiting, as shown in Fig. 4. The same fungus causes the decay of the roots and trunks of timber-trees, and it or a related species often attacks the roots of apple-trees.

Dry-rot of timber is a destruction of the tissues of the wood, resulting from the growth of the mycelium of one of the pore-fungi, *Merulius lacrymans* (Fig. 5). It attacks timber which is kept damp, as the supports in mines, cellars, etc., the foundation-timbers of buildings, and, in wooden ships, the interior timbers below the water-line. Thorough painting or saturation with poisonous solutions reduces the

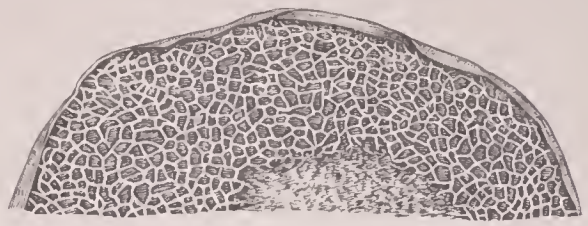

Fig. 5.—Portion of the fungus of dry-rot, in the fruiting state (slightly reduced).

danger of dry-rot. Especial care should be taken to avoid the use of timber in which dry-rot has made any beginning whatever. *Wet-rot* is a disease of timber-trees caused apparently by one or more species of the larger fungi, in some cases possibly the same as the preceding, and sometimes referred to *Trametes* and *Polyporus*.

Literature.—F. L. Scribner, *Fungous Diseases of the Grape and Other Plants* (1890); H. M. Ward, *Timber and some of its Diseases* (1889); also various papers by F. L. Scribner and B. T. Galloway in the U. S. Agricultural Reports (1887 to 1892). Charles E. Bessey.

Rotary Presses: See Printing-presses.

Rotation: See Motion.

Rotation, in agriculture: See Agricultural Chemistry.

Rotato'ria: another name for Rotifera (*q. v.*).

Rotch, rōch, Abbott Lawrence, M. A., F. R. M. S.: meteorologist; b. in Boston, Mass., Jan. 6, 1861; studied at the Boston Institute of Technology. In 1885 he founded the Blue Hill meteorological observatory on Blue Hill, Mass., the highest point on the Atlantic coast of the U. S. south of Maine. From 1886 till 1892 he was associate editor of *The American Meteorological Journal*, and in 1891 he was appointed by the international meteorological committee a member of its commission on the classification and nomenclature of clouds. In 1889 he represented the U. S. at the Paris Exposition, and was made Chevalier of the Legion of Honor. He is author of many meteorological papers in the scientific journals, and of regular annual reports of the work of the Blue Hill observatory (since 1887 published in the *Annals of the Astronomical Observatory of Harvard College*).
Mark W. Harrington.

Roth, rōt, Rudolf, von: Orientalist; b. in Stuttgart, Germany, Apr. 3, 1821; studied at Berlin, Paris, and London; in 1856 became Professor of Oriental Languages and chief librarian at Tübingen University. With Böhtlingk (*q. v.*) he prepared a great Sanskrit dictionary. Among his other works are *Vedic Literature and History* (1846); *Nirukta* (1852); and *Atharva-Veda* (1856), written in conjunction with W. D. Whitney. D. at Tübingen, June 23, 1895.

Rothe, rō'te, Richard: theologian; b. at Posen, Prussia, Jan. 28, 1799; studied at Heidelberg and Berlin, and was appointed preacher to the Prussian embassy at Rome in 1823; professor at Wittenberg in 1828, at Heidelberg in 1837, at Bonn in 1849, and again at Heidelberg in 1854, where he died Aug. 20, 1867. His principal work is *Theologische Ethik* (3 vols., Wittenberg. 1845–48), edited, with his posthumous notes, by Holtzman (5 vols., 1869–71). But he also occupied a most prominent place in the historical and dogmatic divisions of his science—*Die Anfänge der christlichen Kirche* (Wittenberg, 1837) and *Zur Dogmatik* (Gotha, 1863; 2d ed. 1869). An English translation of his *Sermons for the Christian Year* appeared in Edinburgh 1877, and of his *Still Hour* (London and New York, 1886). After his death appeared his *Dogmatik* (Heidelberg, 1870); *Vorlesungen über Kirchengeschichte* (2 vols., 1875–76); *Geschichte der Predigt* (Bremen, 1881); *Gesammelte Vorträge und Abhandlungen aus seinen letzten Lebensjahren* (Elberfeld, 1886). He was a noble, broad-minded, speculative theologian, imbued with the inspiring idea that no line of demarkation should be drawn between sacred and secular, for religion and morals are absolutely identical. See his *Life*, by F. Nippold (2 vols., Wittenberg, 1873–75).
Revised by S. M. Jackson.

Roth'ermel, Peter Frederick: painter; b. in Luzerne co., Pa., July 18, 1817, of German extraction; was educated in Philadelphia for the profession of land-surveyor; opened a studio as a portrait-painter, but soon adopted historical painting as his branch of art; visited Europe in 1836–37, and painted in Italy. With the exception of his *Columbus*

before Queen Isabella, The Martyrs of the Colosseum, Cromwell breaking up Service in an English Church, his best-known pictures are suggested by American themes—*De Soto discovering the Mississippi, Patrick Henry before the Virginia House of Burgesses, The Battle of Gettysburg.* Rothermel belongs to the class of sensational artists, but his talent for composition and color gives him a high rank among these. D. near Pottstown, Pa., Aug. 15, 1895.

Rothesay, roth'sā: a royal burgh and favorite watering-place of Scotland; capital of the county of Bute; pleasantly situated at the head of a spacious and sheltered bay on the northeastern coast of the island of Bute. Though the first cotton-mill established in Scotland was located here, the place has now no industries worth mentioning. Considerable fishing, however, is carried on. Near the center of the town are the ruins of Rothesay Castle, founded in 1098. Pop. of burgh (1891) 9,034.

Rothesay, David Stewart, Duke of: See Stewart.

Rothrock, Joseph Trimble, B. S., M. D.: botanist; b. at McVeytown, Pa., Apr. 9, 1839; educated at Harvard College and the University of Pennsylvania. He has been Professor of Botany in the Pennsylvania Agricultural College and the University of Pennsylvania, and was the botanist of the U. S. geographical surveys W. of the 100th meridian, made by Lieut. Wheeler in 1873–74–75. Among his scientific publications are the following: *Morphology of the Androecium in Fumariaceæ* (1863); *Revision of the North American Gaurineæ* (1864); *Flora of Alaska* (1867); *Botany of the Wheeler Expedition* (1878). He has also written many papers on forestry. Charles E. Bessey.

Rothschild. Germ. pron. rōt'shĕĕlt, Meyer Anselm: financier and founder of a family celebrated for its great wealth; b. at Frankfort-on-the-Main, 1743; was intended for the Jewish priesthood, but was placed in a counting-house at Hanover, whence he returned to Frankfort and started in business for himself on a small scale as a banker and broker. Devoting himself closely to his new business, he obtained a reputation for ability and integrity, and was intrusted with the money affairs of the landgrave, afterward Elector of Hesse, who during Napoleon's possession of Germany confided to Rothschild the keeping of his immense private fortune without interest. D. in Sept., 1812, leaving a large fortune to his five sons, Anselm, Solomon, Nathan, Charles, and James, who established themselves respectively in the cities of Frankfort, Vienna, London, Naples, and Paris. All of these were created in 1822 barons of the Austrian empire.—The third son, Nathan, b. Sept. 16, 1777, who established a branch of the house in England, employed with great judgment the immense sums confided to his father, and raised the firm to the position of one of the leading banking-houses of the world. D. at Frankfort, July 18, 1836.—Lionel Nathan, b. Nov. 22, 1808, eldest son of Nathan, was repeatedly elected to the British Parliament, but declining to take the prescribed oath, "on the true faith of a Christian," was not admitted until the act for removing the disabilities of the Jews was passed in 1858, when he took his seat, being the first Jew admitted to Parliament. D. June 3, 1879.—His son Nathan was raised to the peerage as Baron Rothschild in 1885. See Reeves, *The Rothschilds* (London, 1887). F. M. Colby.

A rotifer.

Rotif'era [Mod. Lat.; Lat. *ro'ta*, wheel + *ferre*, to bear]: a group of microscopic animals which are of interest not only on account of their motions and powers of withstanding desiccation, but from the fact that they represent as adults a structure which occurs only in the embryos of other worms. The scientific name, as well as the popular term of wheel-animalcules, is due to the fact that around the anterior end of the body is a more or less modified circle of cilia, the motions of which convey the impression of a wheel in rapid rotation. Just behind the wheel is the mouth, which communicates with a complicated apparatus of jaws (mastax) in the throat. There is a large stomach, and the vent is on the dorsal surface of the body. The nervous system consists of a ganglion above the throat, from which nerves run to all parts of the body. Eyes are not infrequently present, as well as organs apparently tactile in character. Two tubes with funnel-shaped openings into the body-cavity serve as excretory organs. Organs of circulation and respiration are lacking. The sexes are separate, and the males are usually smaller than the females, and are further characterized by the lack of intestine and vent. Most of the rotifers live in fresh water, and are noticeable because they are able to withstand prolonged drying, and upon the return of moisture again begin their active life. See Hudson and Gosse, *Rotifera* (London, 1886), and papers by Plate, Salensky, Leydig, Jennings (*Report* Michigan Fish Commis., 1893), etc. J. S. Kingsley.

Rot'teck, Karl Wenzeslaus Rodecker, von: historian; b. at Freiburg, Baden, July 18, 1775; studied law, afterward history; was appointed Professor of History at the university of his native city; took part with much energy, though with moderation, in the opposition against the political reaction which set in after 1815; was elected to the upper chamber of Baden in 1819, to the lower chamber in 1831, and was one of the foremost men of the liberal opposition. This brought upon him the hostility of the Government, and in 1832 he was deprived of his professorship. D. at Freiburg, Nov. 26, 1840. By his *Allgemeine Geschichte* (9 vols., 1813–27) and the minor compendium of it, *Allgemeine Weltgeschichte* (4 vols., 1830–34), he exercised a great and beneficial influence on the German middle classes. Both books were often reprinted, and have been translated into several European languages. F. M. Colby.

Rottenstone: a fine earth or softened aluminous stone, much employed in polishing glass and metals. True rottenstone comes from Wales and Bakewell, Derbyshire. The name is also extended so as to include tripoli and the infusorial earths. See Infusorial Earth.

Rotterdam: the second commercial town in Holland; on the right bank of the Maas, about 14 miles from the North Sea and 36 miles S. W. of Amsterdam (see map of Holland and Belgium, ref. 6–E). It occupies a site in the form of a nearly equilateral triangle, the base of which is the Maas and the vertex the Delft Gate. The city is intersected by numerous canals (*grachten* or *havens*), and is traversed by the Rotte, a small stream, at the junction of which with the Maas there is a large dike or dam; whence the name Rotterdam. The numerous vessels lying in the canals and harbors, which are deep enough to accommodate those of heavy tonnage and admit of their discharging their cargoes in the very heart of the city, always present a busy and picturesque scene. Along the river, which opposite the town is 30 to 40 feet deep, is a fine quay 1¼ miles long, called the *Boompjes* (Little Trees), from a line of elms planted in 1615, now grown to a large size. Here is the birthplace of Erasmus (*q. v.*), to whom a bronze statue is erected. Rotterdam is the entrepôt of a large cattle-trade with England, and the point of departure of numerous lines of steamships, and, besides being the seat of an extensive commerce with the East Indian possessions of Holland and with Europe and America, has important manufactures. The railway route between Belgium and Holland, connecting the cities of Brussels, Antwerp, Rotterdam, The Hague, and Amsterdam, crosses the Holland Deep (*Hollandsche Diep*) by the great bridge at Moerdijk. Pop. (1899) 319,866.
Revised by M. W. Harrington.

Rotti: a volcanic island of the Malay Archipelago; S. W. of Timor; in lat. 10° 40′ S. and lon. 123° E.; is 36 miles long, 11 miles broad, hilly, and produces rice, millet, and maize, ebony and other valuable woods, sheep, buffaloes, horses, swine, and fowls, edible birds' nests, and wax. Pop. 64,000. M. W. H.

Roubaix, roo'bā': a large manufacturing town of France, department of Nord; 6 miles N. E. of Lille (see map of France, ref. 1–F). It has extensive manufactures of woolen and cotton fabrics, furniture cloth, carpets, and twists, large dye-works and tanneries, and carries on a very active trade. Pop. (1896) 124,661.

Roubiliac, roo'bĕĕ'li-ăăk', Louis François: sculptor; b. at Lyons, France, about 1695; became a distinguished sculptor; settled in England probably during the reign of George I., and executed many important works of art, among which were the celebrated monuments of Mrs. Nightingale, that of John, Duke of Argyle, and the statue of Handel, all in Westminster Abbey, the statue of Shakspeare in the British Museum, and of Sir Isaac Newton at Cambridge. D. in London, Jan. 11, 1762.

Rouble, or **Ruble** [from Russ. *rubli*, ruble]: the principal Russian money of account. The rouble is equal to 100

kopecks. The nominal rouble of gold is worth 77·2 cents of U. S. money, while the current paper rouble has two different values, viz., the official value in gold as determined by the government for each year and the exchange value. These are usually about 50 cents.

Roudaire, roo′dâr′, François Elie: soldier; b. at Guéret, in the department of Creuse, France, Aug. 6, 1836; entered the Academy of St.-Cyr in 1854 and was made a lieutenant in 1858, a captain in 1861, and chief of squadron in 1878. In 1873 he was charged with the geodetic surveys necessary for the determination of the meridian of Biskra, and, having observed that the level of Sahara lay considerably lower than that of the Mediterranean, he conceived the idea of transforming the desert into an inland sea by piercing the dunes which separate it from the Mediterranean. In 1874 he began a new series of explorations at the expense of the Government, and after his return, in 1876, he laid before the Government a scheme which was very warmly supported by Waddington. D. at Guéret, Jan. 13, 1885. He published *Une Mer intérieure en Algérie* (1874) and *Rapport sur la Mission des Chotts en Algérie* (1876).

Rouen, roo′ăn′ (anc. *Roto′magi*): city of France, the ancient capital of Normandy, at present the capital of the department of Seine-Inférieure; on the right bank of the Seine, 67 miles N. W. of Paris, and connected with its suburb, St.-Sever, on the opposite bank, by three bridges (see map of France, ref. 3–E). The quays along the river and the boulevards occupying the site of the former ramparts are new and elegant; the central part of the city is old and more interesting than beautiful. Of the many remarkable public buildings the most noticeable are the cathedral, a Gothic structure of great beauty, 434 feet long, 103 broad, 89 high at the nave, with a tower and spire over the crossing of the nave and the transept rising 470 feet, and two elegant towers flanking the front, built by Philip Augustus (1200–20), and containing, besides a number of other interesting monuments, the tomb of Richard Cœur de Lion; the Church of St. Ouen, built in the fourteenth century, and considered one of the finest specimens of Gothic architecture; the Palais de Justice, of the fifteenth century, etc. In the Place de la Pucelle stands a statue of the Maid of Orleans, who was burned here in 1431. Monuments have also been raised in honor of Corneille and Boieldieu, who were born here. The city has a public library of 110,000 volumes, a very valuable collection of pictures, an excellent botanical garden, a theological seminary, an academy of science and art, and numerous other educational and benevolent institutions; and it is one of the most important manufacturing centers of France. The principal manufactured articles are cotton and cotton velvet, mixed silk and woolen fabrics, flannels, blankets, and hosiery, chemicals, paper, etc. Its commerce is very extensive; the river forms an excellent harbor, and vessels of 400 to 500 tons can enter it. Pop. (1896) 113,219.

Revised by M. W. Harrington.

Rouen Ware: See Pottery and Porcelain.

Rouge, roozh [= Fr., liter. red]: a powder used for adding an artificial bloom to the complexion. Rouge is finely powdered talc colored with safflower by an elaborate process. It is harmless to the skin. Much of the so-called rouge is colored with carmine and other pigments. These are considered injurious.

Rouge: French name of the Songkoi (*q. v.*).

Rougé, roo′zhā′, Olivier Charles Camille Emmanuel, Vicomte de: Orientalist; b. in Paris, Apr. 11, 1811. After studying law, he devoted himself to Oriental studies, particularly to Hebrew, Arabic, and Coptic. Finally he confined himself more exclusively to the study of Egyptology. Having obtained celebrity in this line through his *Examen critique de l'ouvrage de M. le Chevalier de Bunsen*, and through his contributions to the *Revue archéologique*, in 1849 he was made keeper of Egyptian antiquities in the Louvre. In 1851 he published a *Mémoire sur l'inscription du tombeau d'Ahmès*, which Lepsius declared to be the only work then published which could lay claim to be a philological analysis of a hieroglyphic text. In fact he was the first to attempt the translation of long Egyptian texts such as his *L'histoire des deux frères* (1852, from the papyrus d'Orbiney), and he was the founder of the French school of scientific investigation. He was chosen member of the French Institute in 1853, and Professor of Egyptology in the Collège de France in 1860. In 1855 he published a *Notice sommaire des monuments égyptiennes du Louvre*, and in 1856–59 an *Étude sur une stèle égyptienne de la Bibliothèque Impériale*. He made an Egyptian tour in 1863, whose results were published by his son in *Inscriptions hiéroglyphiques copiées en Égypte pendant sa mission scientifique* (Paris, 1877–79, 4 vols.). His most important historical work was his *Recherches sur les monuments qu'on peut attribuer aux six premières dynasties de Manéthon* (Paris, 1866), and his great service to grammatical investigation was rendered in his *Chrestomathie égyptienne . . . précédée d'un abrégé grammatical* (4 vols., Paris, 1867–76), in which he remodeled the whole subject. Among his works upon Egyptian religion and mythology were the following: *Explication d'une inscription égyptienne, prouvant que les anciens Égyptiens ont connu la génération du fils du Dieu* (Paris, 1851); *Études sur le Rituel Funéraire des anciens Égyptiens* (Paris, 1860); *Conférence sur la religion des anciens Égyptiens et sur le monothéisme primitifs* (Paris, 1869). He held to a monotheistic conception of the supreme solar deity of Egypt, explaining polytheism by the doctrine of emanation. He also held that the grouping of local deities in triads was an attempt to signify the passage of conception from the supersensuous to the sensuous, and from the invisible to the visible. In these views he has been followed in the main by Pierret and Brugsch. He is also credited with the discovery of the Egyptian doctrine of immortality. In his *Mémoire sur l'origine égyptienne de l'alphabet phénicien* (published after his death, from an imperfect draft, in 1874) he endeavored to trace our modern alphabet through the Greek and Phœnician back to an Egyptian prototype. He died Dec. 31, 1872, at Bois Dauphin, in the department of Sarthe.

Charles R. Gillett.

Rouge-et-Noir, roozh′ā-nwăr′ [Fr., red and black], also called **Trente-et-Un** [thirty-one], or **Trente-et-Quarante** [thirty and forty]: a game of chance played with six packs of cards on a table, each end of which is divided alike into spaces known as *rouge*, *noir*, *couleur*, and *inverse*. The players make even bets with the bank by placing the sums risked on these spaces. The *taitteur* (dealer or banker) deals first for *noir*, and places the cards in a row until the number of pips amounts to more than thirty, the face cards counting 10 each. He then deals for *rouge* in the same manner, and that row whose value is nearest to 31 wins. If the first card dealt is of the color whose row wins, *couleur* wins; if it be of the color of the losing row, *inverse* wins. If the value of the two rows is equal, it is a *refait*, a new dealing commences, and the players neither win nor lose unless the value of each row is 31; in that case the players lose half the stakes. Were it not for this provision as regards the *refait* of 31 (which occurs once in about sixty-four times), the chances of the players and the bank would be equal. In 1789 this game and roulette were invented in Paris, and superseded faro and biribi, but both were forbidden by law in 1838. In 1873 they were also forbidden in Germany, but they are still much played and very popular at Monaco.

Rouget, roo′zhā′, Georges: painter; b. in Paris in 1781; studied painting in the Academy of Art and in the studio of David, in the execution of whose pictures he often assisted; began to exhibit in 1812; achieved great success both by his portraits and historical pictures. D. Apr. 9, 1869. The best known of his works are the *Marriage of Napoleon and Marie Louise* (1838, at Versailles); the *Death of Napoleon* (1846); and the portraits of Napoleon, Marshal Soult, Louis XVIII., and Charles X.

Rouget de Lisle, -de-leel′, Claude Joseph: author of words and music of the French national song, the Marseillaise (*q. v.*); b. at Lons-le-Saulnier, May 10, 1760; entered the army, and was an officer of engineers at Strassburg when he composed the *Marseillaise* in the night of Apr. 25, 1792; served afterward in La Vendée, retired to civil life, and was given a pension by Louis Philippe in 1830. D. June 27, 1836. He wrote other poems, stories, libretti for operas, etc., but nothing of merit. A. G. C.

Rouher, roo′ā′, Eugène: minister of Napoleon III.; b. at Riom, France, Nov. 30, 1814; was admitted to the bar in 1838, elected to the Constituent Assembly in 1848, and to the Legislative Assembly in 1849, in which latter year he was made Minister of Justice by Louis Napoleon. In July, 1851, he resigned, but was reappointed Dec. 2, 1851, the day of the *coup d'état*. Upon the confiscation of the Orleans property (Jan. 22, 1852) he again resigned, but a few days later was made vice-president of the council of state; in Feb., 1855, was appointed Minister of Agriculture, Commerce,

and Public Works, among the important acts of his administration being the negotiation, with Cobden, of the commercial treaty of 1860, when the grand cross of the Legion of Honor was bestowed upon him. He was raised to the rank of senator in 1856, and in 1863 succeeded M. Billault as Minister of State, which position he resigned on the occasion of the celebrated letter of the emperor's of Jan. 19, 1867, announcing a more liberal policy, but was immediately reinstated, and the additional portfolio of Minister of Finance was confided to his charge. Following the election of May, 1869, the ministry resigned July 13, and Rouher was nominated president of the senate a week later. During the Franco-German war he was prominent, but on the downfall of the empire fled to England. Returning to France, he was arrested and held for a brief time. He became a member of the Assembly, where he took the lead of the Bonapartist party. D. in Paris, Feb. 3, 1884. F. M. Colby.

Roulers, rōō'lā' : town of Belgium, province of West Flanders; on an affluent of the Lys, 13 miles by rail N. W. of Courtrai (see map of Holland and Belgium, ref. 10–B). It has large manufactures of linen and lace, and trade in flax, which is largely grown in the vicinity. Pop. (1891) 20,339.

Roulette, rōō'let' [= Fr., dimin. of O. Fr. *roule*, wheel < Lat. *ro'tula*, dimin. of *ro'ta*, wheel]: a game of chance played on a table in whose center is a cavity, the sides of which are firm and divided at equal distances into thirty-eight compartments painted half black, half red, and designated by the first thirty-six numbers, besides a zero and a double zero. The bottom of the cavity is movable by the aid of a handle in the form of a cross. When the banker puts the bottom in motion he throws down in the cavity a small ivory ball, and when the movement stops the ball drops into one of the painted compartments. Each end of the table is divided into spaces on which the players place the stakes they wish to risk. Each number has one, and a player betting on the winning number receives thirty-six times his stake. There are devices also by which a player may bet on two numbers, with odds of 1 to 17; three numbers, with odds of 1 to 11; or twelve numbers, with odds of 1 to 2. Finally, there are six spaces, with even odds, on which the player bets respectively that the winning number will be (1) odd, (2) even, (3) one in a red compartment, (4) in a black one, (5) less than 19, and (6) more than 18. The advantage of the bank in the first bets described is evidently as 38 to 36. For the last six methods zero counts as odd, red, and less than 19, and double zero as even, black, and more than 18; but if a player wins on either of these compartments he loses half his stake instead of receiving it double. See Rouge-et-Noir.

Roum: See Roumelia.

Rouma'nia [from Lat. *Roma'nus*, Roman]: a kingdom of Europe, comprising the former principalities of Moldavia and Wallachia, together with the Dobrudja, a territory E. of the Danube, ceded by the Ottoman empire at the Congress of Berlin (1878). It is situated between 43° 38′ and 48° 20′ N. lat. and 22° 20′ and 30° 15′ E. lon. (see map of Turkey); bounded N. by Austria-Hungary and Russia, E. by the Pruth, which separates it from Russia, and by the Black Sea, S. by Bulgaria and the Danube, W. by the Danube, which separates it from Bulgaria and Servia, and by Austria-Hungary. Area, 48,307 sq. miles.

Roumania is a crescent-shaped territory, rising gradually from the Danube and Pruth to the inland frontier, the crest of the Carpathian Mountains, the loftiest of whose peaks, the Ciacleul or Pion, attains a height of 8,920 feet. It is drained entirely by affluents of the Danube. The principal rivers are the Aluta or Olto, 220 miles long, which rises in Transylvania, cuts through the Carpathians, and empties at Islar; the Sereth, 215 miles long, which rises in Bucovina and flows by Roman to Galatz; the Dumbovitza, on which Bucharest, the capital, is situated; and the Pruth, 247 miles long. The Danube is navigable from the Austrian-Hungarian frontier to the Black Sea for vessels of several hundred tons, and hence is a great commercial artery. The other rivers, save the Pruth, are not available for transport trade. Both salt and fresh water lakes abound in the interior, and the coast is skirted by brackish lagoons. In the Danube are over 300 islands belonging to Roumania.

The territory naturally divides into three regions: the mountainous, where are the forests and mines; the hilly, devoted to vineyards and pasturage; and the lowland or rich alluvial tracts, occupied by grain-fields, along the lower Danube and the Pruth. Sixty-eight per cent. of the total area is productive, 29 per cent. being under cultivation, 22 per cent. for pasturage, and 17 per cent. forest. The residue is waste. The upland plain between mountains and lowland is of Quaternary formation; the foot-hills of the Carpathians are of Tertiary formation, containing Pliocene and Miocene deposits, while the mountain summits represent the Secondary, Primary, and Metamorphic or Azoic rocks. All the birds and mammals of similar climate, large and small, abound in the forests, and the rivers and lakes teem with every variety of fish found in Europe. The forests consist mainly of pine, oak, fir, beech, box, birch, poplar, and plane. The apple, pear, plum, and cherry are extensively cultivated, as also all the cereals and garden vegetables known to Europe. The vines are excellent. The climate varies according to situation and elevation; extremes of temperature, 98° F. and −19°. There are three distinct seasons: winter passes almost without transition into summer, just as autumn, the agreeable season lasting through November, suddenly becomes winter, when all the rivers and even the Danube are frozen over. The soil is exceedingly fertile, not exhausted by over-cultivation, and would be most productive but for the scorching and long-continued droughts of summer. The chief agricultural products are maize (average yield, 32,000,000 bush.), wheat (average yield, 30,000,000 bush.), rye, barley, oats, millet, flax, hemp, and tobacco. Various marbles are found in the valley of the Aluta; millstones, alabaster, and gypsum abound; fuller's earth and hydraulic lime are common; carbonate and sulphate of sodium, sulphate of aluminium, and magnesia and native sulphur occur in certain localities. Gold, iron, copper and lead ores, as well as cobalt and arsenic, exist. Salt-works and petroleum-wells especially yield valuable returns. Live stock is a main source of wealth. In 1897 there were 670,909 horses, 1,079,312 swine, 2,138,315 cattle, and 6,847,825 sheep and goats.

The decimal system for money, weights, and measures was introduced in 1876. The unit of value is the leŭ (plu. leĭ), or franc. Gold is scarce, and silver the common medium of exchange. In the financial year 1898–99 the state received 221,935,617 leĭ and expended 206,042,202. The chief budget estimates of the revenue for 1901–02 were: direct and indirect taxes, 106,280,000 leĭ; state monopolies, 55,930,000 leĭ; agriculture, 23,363,000 leĭ. The chief expenses were: interest on public debt, 91,270,238 leĭ; war department, 41,560,609 leĭ; financial department, 31,195,666 leĭ; education and worship, 23,451,251 leĭ; public works, 5,020,824 leĭ. The public debt on Apr. 1, 1900, was 1,451,497,307 leĭ, an enormous amount for so poor a country. In 1899 the imports, chiefly from Germany, Austria-Hungary, and Great Britain, amounted to 333,267,938 leĭ: the exports, chiefly to Great Britain, Belgium, Germany, and Austria-Hungary, 149,119,657. Grain forms nearly five-sixths of the entire exports: other exports were fruits and vegetables, animal and animal products, woven fabrics, lumber. Nearly half the imports were woven goods, amounting to 130,987,296 leĭ; other imports were metals and objects in metal, fruits and vegetables, and combustible materials. Foreign commerce is almost exclusively in the hands of foreigners. In 1899 26,246 vessels of 5,701,177 tons entered, and 25,876 of 5,200,487 tons cleared. In 1899 the merchant navy included 382 vessels of 69,072 tons, of which 55 of 12,785 tons were steamers. Railways, posts, and telegraphs all belong to the state. In 1900 there were 1,932 miles of completed railways, and 72 in construction. Postal communication was formerly conducted by Russian and Austrian commercial agencies, but in 1869 a regular postal service was organized. In 1892 15,645,630 letters, 4,787,565 postal-cards, and 7,960,771 newspapers and parcels passed through the mails; 1,091,819 domestic telegrams and 446,775 foreign telegrams were sent. Receipts for posts and telegraphs, 6,149,043 leĭ; expenses, 6,022,011 leĭ. Number of post-offices, 352; of telegraph stations, 411. Length of telegraph lines, 3,503 miles, generally with two wires.

The government is an hereditary constitutional monarchy. The constitution, one of the most liberal in Europe, guarantees to every Roumanian equality under the law, and liberty of conscience, with freedom of the press and right of assembly. Legislation is vested in a senate of 120 members and a house of 183 deputies. The person of the king is inviolable, but his seven ministers, of the Interior, Finance, Foreign Affairs, War, Worship and Public Instruction, Commerce and Public Works, and Justice, are responsible to the legislative bodies. The kingdom is administratively divided into the four provinces of Little and Great Wallachia with 17 districts, Moldavia with 13 districts, and

Dobrudja with 2 districts. These are further divided into 227 departments, subdivided into 2,979 communes comprising over 30,000 villages and hamlets. Military service for seven years in active service or *congé*, and two years in the reserve is obligatory on every able-bodied male citizen on reaching the age of 21; from 30 to 36 he belongs to the militia, and from 36 to 46 to the Landsturm; the latter takes the field only in national emergency. There are 4 army-corps, comprising 33 regiments of infantry, 4 regiments of hussards, 12 regiments of artillery, 2 regiments of heavy artillery, and 2 regiments of engineers, with an effective force in time of peace of 2,960 officers, 354 employees, 46,000 men, 600 cannon, and 10,000 horses. In war 250,000 men can be put under arms. The fleet in 1893 consisted of 33 vessels, of which 19 were steamships of various kinds, carrying 65 cannon, and of 3,175 tons tonnage. In 1892 there were 98 officers and engineers, 25 mechanicians, and 1,480 sailors. Three torpedo-boats were added in 1894.

The following figures from the fiscal census of 1889 are not absolutely exact: Population, 5,038,342 (Roumanians, 4,265,642; Israelites, 400,000; gypsies, 200,000; Slavs, 85,000; Germans, 39,000; Hungarians, 29,000; Armenians, 8,000; Greeks, 5,500; French, 2,000; English, 1,000; Italians, 500; other nationalities, 2,700). As to religious connection, about 4,300,000 belong to the national or Greek Orthodox Church; 400,000 are Israelites, 114,200 Roman Catholics, 13,800 Protestants, and less than 2,000 Mussulmans. The population in 1899 was, according to provisional returns of the census, 5,912,520. Population of principal cities in 1889: Bucharest, the capital, 194,633, now probably 230,000; Jassy, 72,859, now perhaps 85,000; Galatz, 59,143; Braïla, 46,715; Ploështi, 34,474; Botosani, 31,024; Craïova, 30,081; Berlad, 20,008; Piatra, 20,000; Buzeü, 17,307; Tulcea, 17,257; Focsani, 17,039; Turnu-Severin, 14,669; Bacaü, 12,675; Husi, 12,660; Giurgevo, 12,559; Alexandria, 12,308; Pitesci, 12,126. Though increasing attention is paid to education, it is still in a backward state and not generally diffused. In 1891 there were 3,566 primary schools with 220,683 pupils, 52 high schools with 10,227 pupils, and 8 normal schools with 770 pupils. The two admirable universities of Bucharest and Jassy, with faculties in law, philosophy, science, and medicine, have 100 professors and 900 students. The wealthier Roumanians are educated abroad, especially in France. The Roumanian Church is absolutely independent, though acknowledging the spiritual superiority of the Patriarch of Constantinople. The country is divided into 8 dioceses; the Archbishop of Bucharest is Primate of Roumania, and next in rank is the Metropolitan of Jassy, who is called Archbishop of Moldavia. The monasteries, numerous during the Ottoman domination, when they served as refuges from oppression, are rapidly decreasing. The Mussulmans and Israelites, while not possessing political rights, enjoy full religious privileges.

The kingdom of Roumania does not include more than half of the Roumanians or of the territory they inhabit. Independent Roumania, Austro-Hungarian Roumania (the Banat, part of Hungary, Transylvania, and Bukovina), and Russian Roumania (Bessarabia) territorially correspond with ancient Dacia, which was subjugated by Trajan (107) and, when almost depopulated, colonized from Rome. It became a most prosperous province (*Dacia Felix*), but was overrun by the Goths (270), and a partial emigration ensued. It endured every possible vicissitude of invasion and dismemberment, till in the thirteenth century the two principalities of Wallachia (1241) and Moldavia (1293) emerged from the general confusion. They long and fiercely resisted the Ottomans, but were forced to become vassal provinces. From 1511 to 1849 their hospodars, or governors, were chosen by the sultan. These rulers were usually Phanariote Greeks, but in 1822 natives began to be appointed. Constant interference of Russia in their behalf and remoteness from Constantinople assured Moldavia and Wallachia privileges which they could not otherwise have enjoyed. During the Crimean war they were occupied by Austrian troops. In 1858 a European convention for their reorganization was signed at Paris. In 1859 both Moldavia and Wallachia elected Prince Cuza hospodar, and declared themselves united in 1861. The despotic Cuza was compelled to abdicate in 1866, and Prince Charles of Hohenzollern called to the throne. A constitution was speedily promulgated. The Roumanians distinguished themselves in the Russo-Turkish war (1877–78), and largely contributed to the capture of PLEVNA (*q. v.*). Their independence was recognized by the Congress of Berlin (1878), and the country proclaimed itself a kingdom Mar. 26, 1881. King Charles having no children, his nephew, Prince Ferdinand, was decreed heir presumptive Mar. 18, 1889. Since achieving independence, Roumania has made constant, solid progress. Her people are frugal, temperate, industrious, and patriotic. Their aspiration to unite all the Roumanians under one scepter is itself a source of danger, and they occupy a geographical situation of great difficulty.

See Quinet, *Les Roumains* (Paris, 1857); White, *Report on the Kingdom of Roumania* in *Reports of H. M.'s Diplomatic and Consular Officers*, part vi. (1883); Ubicini, *Les Provinces Roumaines* (Paris, 1856); Vaillant, *La Romanie* (1845); Mrs. Walker, *Untravelled Paths in Roumania* (London, 1888); Xenopol, *Istoria Romînilor* (Yassy, 1888–93); Samuelson, *Roumania Past and Present* (London, 1882); Laveleye, *La Péninsule des Balkans* (Paris, 1886; English translation, London, 1887). E. A. GROSVENOR.

Roumanian Language: the national language of Roumania. It is not limited exactly by the political boundaries; in the south and southeast the language limit is almost identical with the Danube, the Dobrudja being not linguistically Roumanian except along that river; in the east it occupies most of Bessarabia in Russia, in the north much of Bukovina, and it covers most of Northern and Western Transylvania and the adjacent parts of Hungary, as well as a small region in the northeastern part of Servia S. of the Danube. In this territory dialect differences are slight, but there are numerous communities in European Turkey and Northern Greece, especially in Macedonia, Thessaly, and Albania, with dialects generally grouped together under the name Macedo-Roumanian, and in Istria are some small remains of a dialect called Istro-Roumanian. Since the ancient Dacia, which corresponds roughly to the present territory where Roumanian is spoken N. of the Danube, did not become a Roman province until 107 A. D., and the Roman occupation ended under Aurelian (270–275), it is probable that the present language of Roumania is the descendant of the vulgar Latin of the regions S. of the Danube, brought in by later immigrations in the Middle Ages, and combined with some remains of the vulgar Latin of such older inhabitants of Dacia as had become thoroughly Romanized at the time of the abandonment of the province, and had succeeded in preserving their form of Latin, perhaps taking refuge in part in the mountains of Transylvania. It is probable that the eastern part of Roumania, the modern Moldavia, was never really Romanized. The closest relations of Roumanian are with Italian. The number of those whose mother tongue it is probably considerably exceeds 9,000,000, about 3,000,000 of these being under Austria-Hungarian rule.

The recognized sounds of Roumanian, not including dialects, are the seven vowels *i*, *e* (close and open *e* and *o* are not distinguished), *a*, *o*, *u*, and two peculiar vowels, one *î* (also written *â*, and sometimes *é* or even *û*), pronounced like Polish *y* (somewhat like *i* in *pit*), the other *ă* (also in some words written *ĕ*), pronounced somewhat like English *u* in *cut* or *curt*; and the twenty consonants *p*, *b*, *f*, *v*, *w* (not always counted, written *o*, *u*), *m*, *t*, *d*, *l*, *r* (trilled with the tip of the tongue), *n*, *s*, *z* (written *z*, *s*, and sometimes *ḑ*), two other sibilants, one like English *sh* in *shine* (written *ş*), the other like English *z* in *azure* (written *j*), *y* (written commonly *i*, but sometimes not expressed at all in writing), *k* (written commonly *c* or, before *e* or *i*, *ch*, with a slight difference in sound), *g* (as in English *go* or *give*, written *g* or, before *e* or *i*, *gh*), the sound of German *ch* in *ach* (written *h*), and that of English *ng* in *sing*, *song* (written *n*, and occurring only before *k* or *g* sounds). Besides these are to be noted the common consonant groups *ts* (written *ţ*), the sounds of English *ch* in *chin* (written *c* before *e* or *i*, *ce* or *ci* in other cases), and English *j* in *jest* (written *g* before *e* or *i*, *ge* or *gi* in other cases). The two vowels *i* and *u* are also written often with the sign ˘ (*ĭ*, *ŭ*) to indicate that they are not fully sounded, but are very short, and in some cases indeed they are entirely silent. Instead of the group *şt* is often written *sc* for etymological reasons. The language was formerly written with the Cyrillic alphabet borrowed from Slavic use, and this alphabet was long retained, gradually giving way in the nineteenth century to the Latin alphabet, which did not entirely replace it till after 1860. Roumanian spelling has suffered from an excessive influence of Latin etymology, which led to the use of silent letters (especially *u*) and several inconsistencies, and it is still not well settled, though the phonetic principle has gained ground and seems likely to prevail.

Exposed as the language has been to very different conditions from those under which the other Romance languages have developed, it is not strange that it shows some peculiar features. It has preserved some Latin words lost in the others, and has lost some which they have preserved. Its vocabulary has been much affected by foreign languages, which have also furnished it some suffixes, and have even perhaps somewhat affected its structure. Very many words are of Slavic origin, and it has also words from mediæval or modern Greek, from Turkish, Hungarian, and Albanian, while the origin of a number is unknown. A remarkable feature of the language is its post-positive article: (*un*) *socru* (a) father-in-law, *socrul*, the father-in-law; *loc*, place, *locul*, the place; *casă*, house, *casa* (from *casă* + *a*), the house. A similar use appears in Albanian and in Bulgarian. In some matters of phonology and inflexion, particularly its genitive and dative case (one form for both uses) in articles, feminine nouns, and adjectives, Roumanian is nearer to the Latin than is any other language of the family. (See Romance Languages.) There are so-called neuter nouns, which are masculine in the singular and feminine in the plural; this peculiarity is due to old Latin neuter nouns. The simple parts of verbs, or those formed without auxiliaries, are the present, imperfect, preterite, and pluperfect indicative, the present subjunctive and imperative, the present infinitive, the gerund, and the past participle; this last can also be used with prepositions so as to correspond in sense to the Latin supines. The auxiliaries used for other verb forms are not always the same as those common in other Romance languages.

Apart from a few scattered words found, for example, in Slavic documents, the earliest specimens of the language preserved to us date from near the end of the fifteenth century. The first grammar was that of Klein, *Elementa linguæ dacoromanæ sive valachicæ* (Vienna, 1780). Among modern works should be mentioned particularly Gröber's *Grundriss der romanischen Philologie* (i., 1888), where full references may be found; here are added some other works, in part more recent, as Tiktin, *Gramatica română* (i., 1892; ii., 1894), and *Manual de ortografia română* (1889); *Indreptariŭ pentru ortografia română* (contains orthographical rules for schools in Bukovina, Vienna, 1893); G. Weigand, *Die Sprache der Olympo-Walachen* (1888), *Vlacho-Meglen* (1892), and *Die Aromunen*, ii., 1894 (planned for 5 vols.). A short grammar in English is Torceanu, *A Simplified Grammar of the Roumanian Language* (1883). Dictionaries: Ion Costinescu, *Vocabolaru româno-francesŭ* (1870); L. Şăinéanu, *Dicţionar româno-german* (1889); F. Damé, *Nouveau dictionnaire roumain-français* (i., A–E, 1893; ii., F–L, 1894); Hasdeu, *Etymologicum magnum Romaniæ* (in the letter B in 1895). The dictionary of the Roumanian Academy (see Laurianu) is not to be recommended, and Cihac's *Dictionnaire d'étymologie daco-romane* (i. 1870; ii. 1879) contains many errors. Gaster's *Chrestomatie română* (2 vols., 1883) has texts with a glossary, and an introduction on the literature and the grammar. Some periodicals published in Roumania also deserve mention, as *Columna lui Traian*, *Convorbiri literare*, *Revista pentru istorie, archeologie şi filologie*, etc. See also Roumanian Literature and the references under Romance Languages.

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Roumanian Literature: the literature of the people speaking the Roumanian or Wallachian language. It begins, so far as documents are preserved, about the end of the fifteenth century or the beginning of the sixteenth, with translations from the Bible, followed by other religious writings, such as catechisms, prayers, legends, etc., by legal documents, public and private, and by chronicles, of which there are many in the seventeenth and eighteenth centuries. The oldest texts published thus far are a psalter (*Psaltirea Scheiană*, i., 1889), which the editor Bianu dates in 1482 or 1485, and the Voronetz manuscript (*Codicele Voroneţean*, edited by Sbiera, 1885), which contains a part of the Acts and of some of the Epistles, and belongs probably to about the same time. Hasdeu's *Limba română vorbită între 1550–1600*, i., 1878, ii., 1879 (commonly referred to as *Cuvente den betruni* or *Cuvinte din bĕtrânĕ*), contains texts of the second half of the sixteenth century, with linguistic and literary discussions. The Roumanian Academy has published (1881), among other texts, the psalter printed in 1577 by Coresi in Transylvania (Coresi was probably of Greek descent); this was, it seems, printed from the same translation as that used in the psalter mentioned above. All these early texts have rather linguistic than literary interest; but it is to be noticed that some of the religious productions were results of the Reformation, showing themselves in Transylvania through the Saxons. Of chronicles may be mentioned those of Ureche (see E. Picot's edition, *Chronique de Moldavie*, 1878–83) and Miron Costin (lived about 1628–92; two volumes of an edition by V. A. Urechiă were published, 1886–88). M. Cogălniceanu has published *Cronicele Românieĭ* (1852; 2d ed. 3 vols., 1872–74).

It was not until the nineteenth century that Roumanian literature began to develop in sympathy with the literatures of the great nations of Europe. A powerful stimulus to the growth of a truly national literature has been the national spirit, developing after the French Revolution and after the changed political aspect, as Wallachia and Moldavia attained practical independence of Turkey and later became united, and finally the independent kingdom of Roumania was established. The new era began in the eighteenth century under the leadership of Roumanians in Transylvania, where they were aided by Catholic schools, from which some went to Rome to study. Klein's *Grammar* (see Roumanian Language) was followed by some other grammatical writings. Klein wrote also many theological and historical works. Naturally the connection with the Romans and their language was emphasized during this period of awakening, as indeed it has been since. Other noteworthy writers are Petru Maior (about 1753–1821), whose historical work marks the beginning of a more critical period, and who was one of the authors of the lexicon published at Buda in 1825; Şincai (about 1754–1826), whose most important work is his *Cronica Romînilor*, a history of all the Roumanians from the year 86 to 1741; Ienache Văcărescu (about 1740–99), ban of Wallachia, remarkable for his grammatical work on the language, and author, among other things, of some verses. George Lazăr (1779–1823) came into Wallachia in 1816, and was allowed after a time to open a Roumanian school in Bucharest (previously the schools had been Greek); he may be considered the founder of the national schools in Wallachia. Veniamin Costache (1768–1846) and George Asachi (1788–1871) were similarly active even earlier in Moldavia; the many works of the latter (lyric verse, dramatic and historical writings) belong largely to the next period. Costache Conache (1777–1849) was distinguished for his learning, and was active in public affairs. His poems were not published until 1856 (2d ed. 1888). Budai Deleanu (1770–1830), among other things, wrote the heroi-comic *Ţiganiada saŭ tabăra Ţiganilor* (The Camp of the Gypsies).

The next period, beginning about 1830, is that in which the influence of Western Europe shows strongly, combined with a national feeling, which, however, still rests too much on pride of assumed Roman ancestry. The strongest influence is that of French, but an Italian influence shows itself in Eliade (see Héliade), who, like Asachi in Moldavia, founded journals in Wallachia, and stirred up the youth of the country to an interest in education and literary pursuits. Since about 1860 comes the most modern period, in which the excessive admiration for French models is somewhat tempered by a wider knowledge of modern European culture, and which may be considered as introduced by T. Maiorescu's critical writings. (See Maiorescu.) In this time are to be noticed the organization of the society Junimea (Youth) and the establishment of literary and critical periodicals, such as the *Convorbiri literare* (Literary Conversations; since 1867). Both Maiorescu and Eminescu (1850–89), the latter one of the foremost poets of modern Roumania, made themselves acquainted with German literature. Many journals and periodicals have been started in Roumania, from those of Eliade and Asachi on, for political, literary, or scientific purposes, which have had various degrees of merit and success; some of them are mentioned under Roumanian Language. (See also Hasdeu.) In these much of the work of modern writers first appears. Not least important are the popular songs, tales, etc., collected by Alecsandri, Ispirescu (1830–87), and others. Many of these have been translated into German, notably by the Queen of Roumania. See Carmen Sylva.

Only Alecsandri (or Alexandri; see Alecsandri) among Roumanian writers has made his name well known outside of Roumania for purely literary work; but several others are of some note in the country itself. (See Alecsandrescu, Bolintineanu, C. and I. Negruzzi, C. Rosetti.) Verse has been written, among others, by G. Sion (b. 1822; has also written comedies), Şerbanescu (b. about 1839), and Vlăhuţă

(b. 1859; has also written stories). There are dramatic productions by Alecsandri, Slavici (b. 1848; has also written tales), Caragiale (comedies published in 1889, stories in 1892), and others. C. Dobrogeanu, commonly called I. Gherca (b. 1855), is the author of *Studii critice* (Critical Studies). Historical writings have been published by Bariţiu (b. 1812), E. Hurmuzachi (1812–74), M. Cogălniceanu (1817–91), Xenopol (b. 1843), Tocilescu (b. 1850), Hasdeu, and several others. The history of the language or the literature, or both, has been treated by several writers; some names are mentioned below. Elena Ghica, later Princess Koltzoff Massalsky, though of Roumanian birth, wrote mostly in French, not in Roumanian. See DORA D'ISTRIA.

REFERENCES.—W. Rudow, *Geschichte des rumänischen Schrifttums* (1892, with a supplement in 1894; the best general work thus far covering the whole subject, but excessively condensed and very ill written); A. Densuşianu, *Istoria limbei şi literaturei române* (1885); V. A. Urechiă, *Schiţe de istoria literaturei române* (i., 1885); Philippide, *Introducere în istoria limbei şi literaturei romîne* (1888); M. Gaster, *Literatura populară română* (1883); I. Bianu, *Despre cultura şi literatura românéscă în secolul al XIX-lea* (1891); L. Şăinénu, *Istoria filologieĭ române* (1892).

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Roume'lia, Rou'meli, or **Roum**: the name formerly applied by the Ottomans to their European provinces in distinction from those in Asia, which were called Anatolia or Anadoli. Roumelia was divided into 197 judicial districts, under the judicial supremacy of the cazi-asker of Roumelia, an officer who, with the cazi-asker of Anadoli, then ranked next to the grand vizir. The Ottoman sultan is still called by the Tartars Sultan of Roum, by which, however, they often mean Asia Minor. In a restricted sense Roumelia is supposed to comprise ancient Thracia and parts of Illyricum, Epirus, and Macedonia. The province of Eastern Roumelia, created by the Congress of Berlin (1878), and comprising territory S. of the Balkans, mainly inhabited by Bulgarians, united itself to the principality of Bulgaria (Oct., 1885), but this union *de facto* has not been officially recognized by the Ottoman empire or the European governments. E. A. G.

Round, WILLIAM M. F.: See the Appendix.

Roundheads: the Puritans or supporters of Parliament during the civil war in England, so styled probably from having the hair cut close, while the Cavaliers or adherents of the king wore theirs long. See ENGLAND (*History*).

Round Table: See ARTHUR and ROMANCES.

Round Towers: remarkable stone towers found chiefly in Ireland, but also in Scotland, Switzerland, Corsica, and other countries. It has been customary to assign these structures to the pagan and even the prehistoric period; another opinion is that they were attached to churches and other ecclesiastical buildings of a very remote period.

Roundworms: See NEMATHELMINTHES.

Roup: See POULTRY (*Management*).

Rouphia, or **Ruphia**: See ALPHEUS.

Rouquette, rōō'ket', ADRIEN EMMANUEL: poet; b. in New Orleans, La., Feb. 13, 1813; educated at the College of Nantes, France, where he studied law; was afterward ordained a Roman Catholic priest, and was for many years professor in the Roman Catholic Seminary at New Orleans, and subsequently chaplain to that institution, being known as the Abbé Rouquette. He wrote with equal elegance in French and English. His chief works were *Les Savanes*, *Poesies américaines* (Paris and New Orleans, 1841), a book highly praised by Sainte-Beuve; *Wild Flowers*, *Sacred Poetry* (New Orleans, 1848); *La Thébaïde en Amérique* (1852); *L'Antoniade, ou la Solitude avec Dieu* (1860); and *Poëmes patriotiques* (1860). D. in New Orleans, July 15, 1887.—His brother, FRANÇOIS DOMINIQUE, b. in New Orleans, Jan. 2, 1810, was also educated at Nantes; studied law in Philadelphia: published in Paris two volumes of poems, *Les Meschacébéennes* (Paris, 1839) and *Fleurs d'Amérique* (New Orleans, 1857); has resided much in France, and has written a work in French and English on the Choctaw Indians.

Revised by H. A. BEERS.

Rouses (rows'iz) **Point**: village; Clinton co., N. Y.; on Lake Champlain, at the mouth of Richelieu river, and on the Canada Atlantic, the Cent. Vt., the Del. and Hudson, and the Gr. Trunk railways; 21 miles N. by E. of Plattsburg, 24 miles N. W. of St. Albans, Vt. (for location, see map of New York, ref. 1–J). The lake is here crossed by a railway bridge nearly a mile long, which cost $300,000, and is protected by Fort Montgomery, situated on the frontier at its outlet. The village has a large lake commerce with Canada, and receives the greater part of the customs receipts of the Champlain district, which in the year 1900 had total exports of $5,211,770 and imports of $15,309,725. There are railway repair-shops, manufactories of lumber and smoking-pipes, and a large printing-establishment. Pop. (1880) 1,485; (1890) 1,856; (1900) 1,675.

Rousseau, rōō'sō', JEAN BAPTISTE: poet; b. in Paris, France, Apr. 6, 1670; the son of a shoemaker; received a liberal education, and won from his contemporaries the title of "prince of lyric poets" by his odes, epistles, allegories, cantatas, and epigrams. These are written with talent and even brilliancy, but lack poetic spirit, and are no longer read. He was suspected, probably justly, of the authorship of verses against persons of consideration, tried to free himself and fasten the authorship upon the geometrician Saurin by bribed witnesses, and was condemned in 1712 to perpetual banishment. D. at Brussels, Mar. 17, 1741. Editions: *Œuvres complètes* (5 vols., Paris, 1820); *Œuvres lyriques*, ed. by Manuel (Paris, 1852). A. G. CANFIELD.

Rousseau, JEAN JACQUES: philosopher; b. at Geneva, Switzerland, June 28, 1712; second son of a watchmaker. His family was originally from Paris, and had moved to Geneva in the sixteenth century. His mother died at his birth, and he was left to the care of two aunts and his father, who let him grow up at random and stuff his mind with Plutarch and unwholesome novels, which the two read together. In 1722 his father fled from the city in consequence of some trouble, leaving him to the care of an uncle, who put him for board and instruction into the family of a clergyman, with whom he remained two years. Then he was sent (1723) to a notary, who could make nothing of him, and to an engraver, who beat him, and with whom he developed the boyish vices of lying and stealing. Finally (1728) he ran away, and for several days tasted the delights of a roving, irresponsible life, the charm of which he could never quite forget. A Roman Catholic priest picked him up and sent him to Madame de Warens, at Annecy, a zealous convert from Calvinism to Roman Catholicism, gay, volatile, flighty, and of easy morals, who was to have a great influence over the formative years of his life. She sent him to a hospice in Turin, where he made no opposition to his conversion. Turned adrift, he lingered about Turin, tried being a valet, but was discharged for theft, found regularity of life and industry irksome, and wandered back on foot to Madame de Warens, who became from 1729 to 1738 the real center of his life. After each new failure, as his study for the priesthood and his attempt to teach music, and after each fit of restless wandering to Lyons, Lausanne, Neuchâtel, or Paris, he returned to her, and was long an inmate of her house. By 1738 his relations with her began to cool, and he broke away and went to Paris in 1741 with a comedy, *Narcisse*, and a new system of musical notation. Neither found favor, and in 1743 he went to Venice as secretary of the French ambassador, but soon quarreled with him and returned to Paris, where he was forced to copy music for a livelihood. But he began to make literary acquaintances and to get literary employment; he also formed a union with Theresa Levasseur, an ignorant kitchen-girl, which lasted till his death, and was regularized by a marriage ceremony in 1768. The five children of this union were sent to the foundling asylum, in strange contradiction to the educational theories of their father. In 1750 he achieved his first literary notoriety by the essay which won the prize offered by the Academy of Dijon, in which he brought great ingenuity and eloquence to support the paradox that the progress of the arts and sciences has done more to corrupt than to purify morals. Still greater was the impression produced by his *Discours sur l'inégalité parmi les hommes* (1754). In these essays appeared that notion of the perfection of the natural man that became so fascinating and so fruitful, and that involved so thorough a criticism of existing institutions. His literary reputation was still further increased by the success of his opera, *Le Devin de village* (1752); he became at once the object of attention, praise, and flattery. But his nature was not social; he was refractory to the conventionalities, arts, and graces of polite intercourse, sensitive, proud, suspicious, and despised money. The roving spirit and the native delight in fields, woods, and sky were unconquered in him; he loved to roam the field and botanize better than

to be imprisoned in a drawing-room, and in the spring of 1756 he removed to a little cottage on the skirts of the forest of Montmorency, put at his disposal by Madame d'Épinay. He soon quarreled with her and took a house at Montmorency. Thence he issued the novel, *La Nouvelle Héloïse* (1761), which, by the eloquence and authority lent to the voice of passion and the glow and fervor of a new and wonderful style, created intense enthusiasm and was read with feverish eagerness; the *Lettre sur les spectacles* (1758), condemning the theater for its moral influence; the *Contrat social* (1762), which contains the fullest statement of his political ideas, maintains radically the sovereignty of the people, and supplied the positive ideas of the Revolution; *Émile* (1762), which unfolds his fruitful views on education. This last work offended the authorities; the Sorbonne condemned it; the Parlement had it burned, and ordered Rousseau's arrest. He was warned and fled to Geneva, Neuchâtel, and finally to England (1765), where Hume gave him a refuge at Wootton. But his irritability, sensitiveness, and suspicion were sharpened by his experiences to an unhealthful degree; he fancied himself the object of a conspiracy, and fled back to France. He spent a year under a false name with the Prince of Conti and then fled from imagined pursuit to different parts of France. In 1770 he returned to Paris and resumed the copying of music for his support, still haunted by the idea of persecution. In 1777 he accepted a house on a friend's estate a few miles from Paris, and died there July 2, 1778, under circumstances that to some have suggested suicide. In 1794 his body was transported amid great popular enthusiasm to the Pantheon. The main work of the latter years of his life was his *Confessions*, one of the most remarkable works of the kind ever written, surprisingly free from reticence, and unsparing in the revelation of himself, but not always exact. It is hard to overestimate the influence of Rousseau upon his country and Europe. At the center of his ideas was his sincere belief in the goodness of nature and whatever is in accord with her. The primitive natural instincts and affections were sacred: the primitive natural state of society furnished criteria for the criticism and renewal of institutions. The sentimentalists date from him, and the view that to show that an act is natural is to prove that it is right. The standard editions of his *Œuvres* are by Musset-Pathay (23 vols., Paris, 1823–26), and by Auguis (25 vols., Paris, 1822). One must add L. Borscha, *Correspondance inédite de J. J. Rousseau* (Paris, 1858); Streckeisen-Moultou, *Œuvres et Correspondance inédites de J. J. Rousseau* (2 vols., Paris, 1861–65); H. de Rothschild, *Lettres inédites de J. J. Rousseau* (Paris, 1892). See H. Beaudoin, *La vie et les œuvres de J. J. Rousseau* (2 vols., Paris, 1871); Saint-Marc Girardin, *J. J. Rousseau, sa vie et ses œuvres* (2 vols., Paris, 1875); A. Chuquet, *J. J. Rousseau* (Paris, 1893); J. Morley, *J. J. Rousseau* (2 vols., London, 1873).

A. G. Canfield.

Rousseau, Lovell Harrison: soldier; b. in Lincoln co., Ky., Aug. 4, 1818: received little early education, but subsequently studied law at Louisville and at Bloomfield, Ind.; admitted to the bar in 1841; member of the Indiana Legislature 1844–45, and of the State Senate 1847. In the war with Mexico, as captain in the Second Indiana Volunteers, he served with gallantry at Buena Vista; returned to Louisville in 1849; became a successful criminal lawyer, and in 1860 was a member of the State Senate, where he boldly opposed the secession of Kentucky. On the outbreak of the civil war he raised the Third Kentucky Infantry, of which he became colonel Sept., 1861; appointed brigadier-general U. S. volunteers Oct. 1, 1861; was distinguished at the battle of Shiloh Apr. 7, 1862; in command of division and conspicuous for gallantry at Perryville, Ky., Oct. 8, 1862, for which he was made major-general of volunteers; participated in the battle of Murfreesboro, Dec. 31, 1862; commanded the district of Tennessee from Nov., 1863, till the close of the war. He resigned Nov. 30, 1865; member of Congress 1865, and in Mar., 1867, was appointed a brigadier-general in the regular army and brevetted major-general. Assigned to command the department of Louisiana July 28, 1868, he died in New Orleans, Jan. 7, 1869. Revised by James Mercur.

Rousseau, Philippe: still-life and animal painter; b. in Paris, France, Feb. 22, 1816; pupil of Bertin and Baron Gros; third-class medal, Salon, 1845, first-class 1848; second-class, Paris Exposition, 1855; first-class, Paris Exposition, 1878; officer Legion of Honor, 1870. D. at Acquigny, Dec. 4, 1887. His pictures of still life are notable for excellent technical qualities and strong sober color schemes. *Importunate* (1850) and *The Rat Retired from the World* (1885) are in the Luxembourg Gallery, Paris; and there are works in the museums at Chartres, Valenciennes, and Nantes. W. A. C.

Rousseau, Pierre Étienne Théodore: landscape-painter; b. in Paris, France, Apr. 15, 1812; first-class medal, Salon, 1849, Paris Exposition, 1855; medal of honor, Paris Exposition, 1867; Legion of Honor, 1852. D. at Barbizon, Dec. 22, 1867. He was the friend and fellow worker of Millet and Diaz, and worked with them at Barbizon on the borders of the Forest of Fontainebleau, finding in the forest and the surrounding country the subjects for his pictures. He was one of the greatest of the modern French painters of landscape, and his works are characterized by profound sentiment, extraordinary technical qualities, and great truth to nature. He represented detail in a marvelous fashion without sacrificing breadth or harmony of color. One of his finest works is *The Hoar Frost*, in the collection of W. T. Walters, Baltimore. The *Woods of Fontainebleau* (1885), a magnificent picture of sunset effect, and a number of other landscapes are in the Louvre. *Morning on the Oise*, a masterpiece of color-harmony and unity of effect, is in the collection of Henry Graves, Orange, N. J. W. A. C.

Rousset, rōō'sā', Camille Félix Michel: historian; b. in Paris, France, Feb. 15, 1821; became in 1843 Professor of History at Grenoble, in 1845 at the Lycée Bonaparte, and was from 1864 to 1876 historiographer to the ministry of War. Among his works are *Histoire de Louvois* (4 vols., 1861–63); *Les Volontaires de 1791–94* (1870); *Histoire de la Guerre de Crimée* (2 vols., 1877); and *Les Commencements d'une conquête: L'Algérie de 1830 à 1840* (2 vols., 1887). He became an academician in 1871. D. Oct. 19, 1892. A. G. C.

Routh, rowth, Martin Joseph, D. D.: educator and editor; b. at South Elmham, Suffolk, England, Sept. 18, 1755; graduated at Oxford 1774; became college librarian 1781, and in 1791 president of Magdalen College, which post he retained till his death at Oxford, Dec. 22, 1854. He is best known by his collection of writings of Christian Fathers under the title *Reliquiæ Sacræ, sive Auctorum fere jam perditorum*, etc. (5 vols., 1814–18; new ed., 5 vols., 1846–48).

Routhier, Adolfe Basile: See the Appendix.

Rove-beetles: beetles belonging to the family *Staphylinidæ*, in which the wing-covers are very short, leaving a large part of the abdomen uncovered. The beetle when irritated turns this abdomen about in such a way as to convey the impression that it is armed with a sting. The rove-beetles are small, frequently minute; they live under stones, in moss, on composite flowers, etc.

Roveredo, rō-vā-rā'dō: town of Austria; in the Tyrol; picturesquely situated on the Leno, near its junction with the Adige; 14 miles by rail S. of Trent (see map of Austria-Hungary, ref. 7–A). Napoleon Bonaparte here defeated the Austrians in 1796. It is the center of Tyrolean silk-manufacture and has a large transit trade. Pop. (1890) 9,030.

Rovigno, rō-veen'yō: town of Austria; in Istria, on a rocky promontory in the Adriatic; 40 miles S. by W. of Trieste (see map of Austria-Hungary, ref. 8–C). It has two harbors, ship-building yards, ropewalks, manufactures of sailcloth, tunny-fisheries, and an active trade in wine and oil. Pop. (1890) 9,662.

Rovigo, rō-vee'gō: town of Italy; province of Rovigo; lying between the Po and the Adige on the Adigetta, an emissary of the Adige; 38 miles S. W. of Venice (see map of Italy, ref. 3–D). It has an octagon-shaped church (1594), a cathedral (1696), a picture-gallery, and a town-hall with a library of 80,000 volumes. Mediæval Rovigo belonged sometimes to Venice, sometimes to the house of Este. Pop. 7,272.

Rovigo, Duke of: See Savary.

Roving: See Cotton Manufactures.

Rowan, rō'an, Stephen Clegg: sailor; b. near Dublin, Ireland, Dec. 25, 1808; entered the U. S. navy as a midshipman Feb. 15, 1826; was distinguished for ability and courage on the west coast of Mexico during the war with that country, and during the civil war in the rivers of Virginia, the sounds of North Carolina, and at Charleston, S. C.; for his long, honorable, and gallant service received a vote of thanks from Congress; was made vice-admiral Aug. 15, 1870; became superintendent Naval Observatory, and was chairman of lighthouse board; retired Feb. 26, 1889. D. at Washington, D. C., Mar. 31, 1890. Revised by C. Belknap.

Rowan-tree: See Mountain-ash.

Rowe, Nicholas, dramatist; b. at Little Barford, England, June 30, 1674; was educated at Westminster School; studied law; became a successful courtier and politician, but is best known as a dramatic author and as translator of Lucan's *Pharsalia* (1718). He published an edition of Shakspeare (1709), preceded by the first biography of that poet; became Under-Secretary of State under Queen Anne (1708–11), and was made poet-laureate by George I. D. Dec. 6, 1718, and was buried in Westminster Abbey. Among his plays the most successful were the tragedies *Tamerlane* (1702), *The Fair Penitent* (1703), *Jane Shore* (1714), *Lady Jane Grey* (1715). Revised by H. A. Beers.

Rowing [O. Eng. *rōwan*, row, akin to M. H. Germ. *rüejen*; cf. Lat. *rēmus*, oar]: the art or practice of propelling a boat or vessel by means of oars. As a pastime rowing was introduced into England by the Saxons, and to Alfred the Great was due the introduction of the long galleys of the Mediterranean. On the accession of the Normans, boat-tilting, a passage-at-arms on the water, became popular, and the success of the contestants depended much on skillful handling of the oars.

Accounts of early rowing-matches are rare, and the first authentic account of boat-racing of comparatively modern times is dated 1715, when the Coat and Badge race was established by the comedian Thomas Doggett, in honor of the anniversary of the accession of the house of Hanover, in the person of George I., to the throne. A red coat having a silver badge on the arm, bearing an imprint of the white horse of Hanover, was given as a prize. The conditions of the race were that it was to be rowed annually, on Aug. 1, on the Thames, by six young watermen who had served an apprenticeship in their calling of not more than six months. The first regatta held in England was in 1775. The next records are in 1798 or 1799 when annual pair-oared races were instituted, the prize being a new wherry, presented by the proprietor of the Vauxhall Gardens.

Until about 1800 all the racing in England was done by professional watermen, when the pleasure of engaging in the sport began to be recognized by gentlemen, and as a result there were soon in and about London several amateur clubs. The schools took up the sport, and in 1816 there was a race between the Fly, a heavy six-oared boat of the Westminster School and a six of the Temple School. The race was rowed from Johnson's dock to Westminster bridge, was won by the Fly, and was the first interscholastic race. In 1817 Eton College rowed a four-oared race against the watermen and won, but until 1828 all her crews were coached and stroked by professional watermen. In 1818 Eton challenged Westminster, but the authorities interfered, and it was 1829 before the two crews met. Oxford rowed in 1815. Cambridge had no eight-oared boat until 1826. The first race between the two took place June 10, 1829, on the Thames; the course was from Hambledon lock to Henley bridge, and Oxford won in 14 min. 30 sec., by 60 yards. Cambridge and Oxford next met in 1836 and rowed from Westminster bridge to Putney bridge, nearly 5½ miles. Cambridge won. Their next race was in 1839, and from then until 1856 Cambridge won seven and Oxford five of the twelve races rowed.

Since 1856 the race has been held annually. The course is from Putney bridge to Mortlake church, or the reverse, depending upon the nature of the tide at the time of the race, since it is always rowed with the tide, a distance of 4⅝ miles. Of these races, from the first in 1829 up to 1901, Oxford has won thirty-four and Cambridge twenty-four, with one dead heat in 1877.

In 1839 the first Henley Regatta was held, it being due to the efforts of the inhabitants of Henley, who subscribed 100 guineas for the purchase of the Grand Challenge Cup, which was to be rowed for annually by amateur crews in eight-oared boats, over the Henley course, which is 1 mile and 550 yards in length. At the same time it was arranged to have a race for the Town Challenge Cup by four-oared amateur crews.

Although boat-racing in the U. S. is known to have existed since about the beginning of the nineteenth century, yet no races of importance occurred before 1811, when oarsmen of New York challenged the best of Long Island to a race in four-oared barges with coxswains. The course was from Harsimus, N. J., to the flagstaff on the Battery. New York won easily. This race excited so much interest that the winning boat was exhibited for many years in a public museum.

Distinctively amateur rowing was not recognized until 1834, when the Castle Garden Boat Club Association was formed. From this time until 1873, when the National Association of Amateur Oarsmen was founded, the amateur's rating was purely local, being judged by each regatta committee, and it was not an uncommon occurrence for an oarsman to compete as an amateur on one river and as a professional on another. To put an end to this unsatisfactory state of affairs was the main object in the convention of boat clubs held in New York on Aug. 28 and 29, 1892, which culminated in the National Association of Amateur Oarsmen of America.

The most important rowing events of the year among amateurs is the regatta of the National Association, and its rulings in respect to amateurs and all other affairs of general rowing interest are accepted by the other associations of America. According to the National Association an amateur is "one who does not enter in an open competition; or for either a stake, public or admission money or entrance fee; or compete with or against a professional for any prize; who has never taught, pursued, or assisted in the pursuit of athletics as a means of livelihood; whose membership of any rowing or athletic club was not brought about, or does not now continue, because of any mutual agreement or understanding, expressed or implied, whereby his becoming or continuing a member of such club would be of any pecuniary benefit to him whatever, direct or indirect, and who has never been employed in any occupation involving the use of oar or paddle"; and who shall otherwise conform to the rules and regulations of the National Association of Amateur Oarsmen.

In 1876 an international regatta was held on the Schuylkill in which three crews from Great Britain were entered, representing the London Rowing Club, Dublin University, and Trinity College, Cambridge. The two latter crews were defeated in the trial heats, while the London men were beaten in the finals by the crew of the Beaverwycke Boat Club, of Albany, N. Y., by the small margin of only 3 feet. On Aug. 17, 1869, Harvard and Oxford met in a four-oared race with coxswains over the Putney course, which Oxford won in 22:17.

In 1878 the Columbia College eight won the Visitors' Cup at the Henley Regatta from Dublin University, University College of Oxford, and Hertford College, Oxford. In 1881 the Cornell University four and Shoewaessemette crew of Michigan visited England, but lost in all the races they entered. In 1882 the champion four-oared Hillsdale crew won a number of minor races, although not allowed to compete in the Henley Regatta, and they were beaten by the Thames Boat Club only by reason of their bow-oar breaking his seat while they were leading by a good length.

It was not until 1843 and 1844 that boat clubs were formed or boats owned at either Yale or Harvard. The first intercollegiate race was held at Center Harbor, on Lake Winnipiseogee, Aug. 3, 1852. Harvard was represented by the Oneida, while Yale was present with two boats, the Shawmut and Undine, all three being eight-oared lapstreaks, rowed on the gunwale, and carrying coxswains. The Oneida won. In 1855 Yale again challenged Harvard, and this race was rowed on the Connecticut river, July 22, Yale having entered two six-oars with coxswains and Harvard a four-oar without and an eight-oar with coxswain. The Harvard boat Iris, eight oars, won in 22 min. A handicap of 11 sec. per oar was allowed the other boats. In 1853 Harvard suggested a convention of colleges with boat clubs, which met at New Haven, May 26, with Harvard, Yale, Brown, and Trinity represented by delegates. Arrangements were set on foot for a regatta under rulings adopted by the convention. On July 26 of the following year the first intercollegiate regatta was held on Lake Quinsigamond with Harvard, Yale, and Brown represented. Harvard entered two boats and Yale and Brown one each. Harvard won in 19:11½, the distance being 1½ miles to stake and back to place of starting. In 1860 the intercollegiate race was again contested by Harvard, Yale, and Brown, and finished in order named, 18:53 being the winner's time. In 1871 the Rowing Association of American Colleges was formed by Harvard, Brown, Massachusetts Agricultural, and the various other colleges with aquatic facilities. Yale refused to enter, and the races were contested only by the three colleges named above. Massachusetts Agricultural won easily from Harvard in 16:46½ over a straight-away 3-mile course. The next year Yale and Cornell entered the association, which then represented eleven colleges. The race was at Springfield, Mass., was entered by only six crews, and was won by Amherst.

The regatta of 1873 was held over the course at Saratoga, and eleven crews entered. Yale won. Columbia won the regatta of 1874 in 16:42½. In the following year the regatta was again held at Saratoga, and participated in by thirteen representative crews. Cornell won in 16:53, Harvard third, Yale fifth. In 1876 the Yale-Harvard races were again established for eight-oared shells with coxswains over a 4-mile straight-away course at Springfield on the Connecticut. Yale won by 21 sec. in 22:02. That year Yale was not present at the American College Regatta, but Harvard sent entries for all three events—University and Freshmen crews, also a single scull—each of which secured second place in their respective races, Cornell winning the three honors. Since 1876 the Yale-Harvard race has been an annual occurrence. Of the twenty-three races rowed, including that of 1901, Yale has won fifteen and Harvard eight. The best time has been made by Yale in 1888, being 20:10, which stands as the record for eight-oared shells over a 4-mile straight-away course. All but the first two of these latter races have been rowed at New London, Conn., with varying tide and wind. In 1883 an annual race between Cornell and the University of Pennsylvania was initiated.

Rowing at Cornell dates from 1869 with the formation of the Undine Boat Club. In 1870 the Cornell navy was organized, and has existed as such ever since. In 1873 Cornell sent her first crew to compete with other colleges in the regatta of the American Colleges Rowing Association, and was annually represented in this contest thereafter until the association came to an end. In the first two contests her crews finished fifth, but led in the latter two. In the last year of the regatta not only did the 'Varsity win, but also the Freshmen crew and her single sculler, Francis. Following these events, both Harvard and Yale withdrew from the association, and have declined races with other colleges since.

From 1895 neither Cornell's 'Varsity nor Freshmen crews met defeat in a series of nineteen races, the summary of intercollegiate races from 1873 to 1894, both 'Varsity and Freshmen included, being thirty-two victories and seven defeats.

BEST ROWING RECORDS OF AMERICAN OARSMEN.

			Min.	Sec.
1883.	Eight-oared shell, 1 mile,	Columbia College	5	4¾
1889.	" " " 1½ miles,	Cornell 'Varsity	6	40
1891.	" " " 2 "	Columbia College, freshmen.	9	43½
1891.	" " " 3 "	Cornell 'Varsity	14	27½
1888.	" " " 4 "	Yale 'Varsity	20	10
1872.	Six- " " 3 "	Amherst College	16	32⅘
1883.	Four- " " 1 "	Argonaut Rowing Association	4	51
1887.	" " " 2 "	Owashtanong Boat Club	12	27
1875.	" " " 3 "	Argonaut Rowing Association	15	37½
1871.	" " " 4 "	Ward brothers	24	40
1860.	" " " 5 "	John, James, and Barney Biglin and Dennis Leary	30	44½
1871.	" " " 6 "	E. Ross, S. Hutton, G. Price, and R. Fulton	39	20⅗
1876.	Double sculls, 1 "	J. Smith, J. C. Hayes	5	55½
1876.	" " 2 "	F. E. Yates, C. E. Courtney	12	16
1885.	" " 3 "	P. H. Conley, C. E. Courtney	17	57½
1876.	Pair-oared shell, 3 "	J. Faulkner and P. Regan	20	28
1872.	" " " 5 "	John and Barney Biglin	32	1
1891.	Single sculls, ¼ "	Edwin Hedley	0	57
1872.	" " 1 "	Ellis Ward	5	1
1868.	" " 2 "	J. Tyler	11	20
1890.	" " 3 "	H. J. Gaudaur	19	31
1883.	" " 4 "	E. Hanlan	27	57½
1879.	" " 5 "	E. Hanlan	33	56¼

Since the introduction of rowing as a pastime in Great Britain there has been a vast change in all the departments of the sport—in the training for a race, selection of a crew, style of rowing, and, greatest of all, in the boats. Formerly the boats were built with a proportion of breadth to length of 1 to 6, but the present usage is 1 to 30 and even 1 to 40. Their finest racing boats were about 6 ft. 2 in. beam, 35 feet in length, weighed 700 lb., and were rowed by oarsmen of 200 lb. weight, with two spare men to act as ballast and assist at the oars. A shell 24 inches beam. 66 feet long, and weighing 250 lb., can be rowed by eight men with coxswain, having total weight of 1,350 lb., at a rate of 12 miles an hour. This great reduction in width, with a corresponding increase of length and also speed, is due almost entirely to the outriggers and consequent improvement in design and materials of construction.

To Harry Clasper, probably, more than any other oarsman, credit is due for the adoption of the outrigging and many other improvements in race-boat building. In 1828 Anthony Brown had fastened various pieces of wood, now known as false outriggers, to the side of the Diamond, of Ouseburn, preparatory to its race with the Fly, of Scotswood-on-Tyne, and in 1830 Frank Emmett had contrived a more perfect plan of iron outriggers for his boat, the Eagle, yet it was not until 1844 that Clasper's four-oared outrigged boat fully overcame the prejudice of the time, and racing boats began to be modeled with regard to the new innovation. Yet Clasper's first outriggers were but 8 inches long. To Clasper also are we indebted for improving the spoon oar.

James Mackay, who appeared in 1857 at the Portland City Regatta in a shell of his own construction, was probably the first builder of shells with outriggers in the U. S. He received an order from Harvard for a six-oared shell, which he completed in December of that year. It was 40 feet long, 26 inches amidships, built of white pine, with iron outriggers and spoon oars, and was the first six-oared shell launched in the U. S.

Another improvement which added materially to the speed of racing boats was the sliding seat, from which has been evolved the roller seat. The distance through which the seat moves varies according to the style of the stroke rowed. The sliding seat is claimed to have been first used by J. C. Babcock, of the Nassau Boat Club, in a sculling boat in 1857, but it was not until 1870 that its merits were fully appreciated. The change to roller seats was made by Charles E. Courtney in 1878, and first used by him in 1879 in a race at Toronto, Canada.

Charles E. Courtney is authority for the following general directions as to one style of stroke: The beginning of the

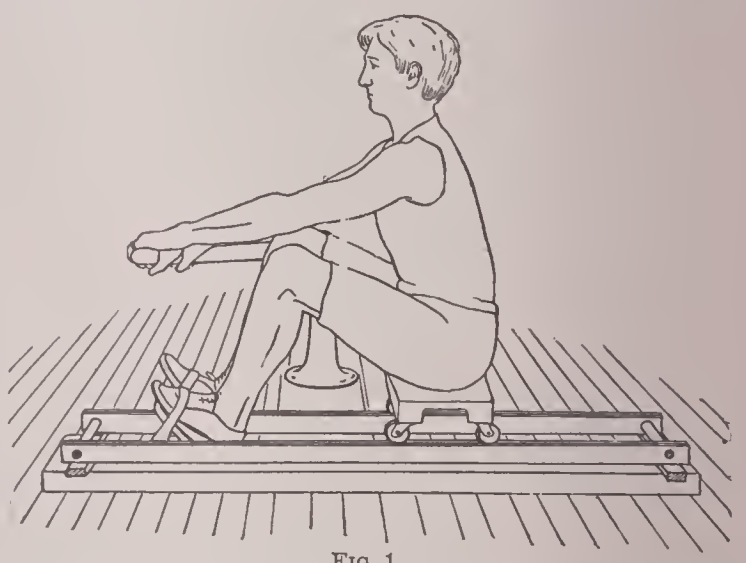

FIG. 1.

stroke, known as the forward reach, is illustrated in position 1. In this the seat is pulled forward with the feet until it is from within 9 to 12 inches from the bottom of the foot-

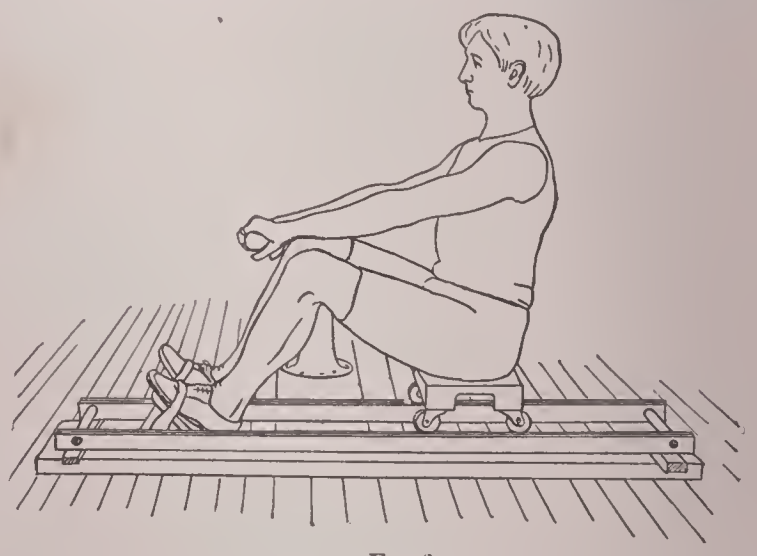

FIG. 2.

brace, the distance varying with individuals. The seat is held in position 1 while the oar catches the water, being so dipped as to just fairly cover the oar-blade, and until swinging the body at the hips the shoulders are in position 2. The shoulders go back no farther, and the stroke is finished by the legs and arms, as in position 3. The arms are kept straight until just before the legs are fully straightened, when the elbows are bent and the hands brought sharply in to the body, and are then dropped almost into the lap to bring the oar cleanly out of the water. Then the wrist is turned to

feather. On the recover, the hands are shot forward and the seat started quickly forward and slowed down as it reaches its limit, when the oarsman will again be in position 1.

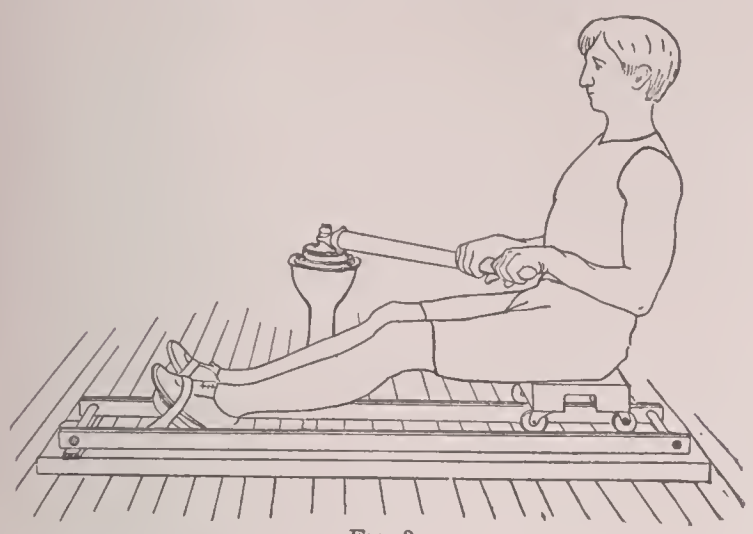

FIG. 3.

See *Boat-Racing*, by E. D. Brickwood (London, 1876); Woodgate's *Oars and Sculls* (London and New York, 1874); Macmichael's *Oxford and Cambridge Boat-Races* (London, 1870); and *Boating* in Badminton Library (London). For racing records, see *New York Clipper Annuals* 1884 and 1894, and Janssen's *American Amateur Athletic and Aquatic History* (New York). EDWARD HITCHCOCK, Jr.

Rowland, HENRY AUGUSTUS: See the Appendix.

Roxa'na (in Gr. Ῥωξάνη): the beautiful daughter of the Bactrian prince Oxyartes. She became the wife of Alexander the Great in 327 B. C., and shortly after the death of Alexander in 323 B. C. bore him a son, Alexander IV. Her fortunes varied with those of the successors of Alexander. She and her son were murdered by Cassander in 311 B. C.

Roxburgh: county of Scotland. It comprises the districts of Teviotdale and Liddesdale, and is bounded on the S. by the English counties of Northumberland and Cumberland. Area, 665 sq. miles. Its southern and western parts are hilly, covered with the Cheviots and Lauriston Hills; in the northern and eastern parts the surface is generally level, and the fertile and productive soil is cultivated with the utmost care. Large herds of sheep are kept on the pastures of the hills; manufactures of woolens are carried on; coal, lime, marl, and freestone are found. Pop. (1901) 48,793. The county town is Jedburgh (pop. 3,397), 49 miles S. E. of Edinburgh. The county returns one member to Parliament.

Royal, JOSEPH, D. C. L.: Canadian official; b. at Repentigny, P. Q., May 7, 1837; educated at the Jesuits' College, Montreal, and admitted to the bar in 1864. He edited the Montreal *Minerve* 1857–59; established *L'Ordre* 1859, *La Revue Canadienne* 1864, *Le Nouveau Monde* (Montreal) 1867, *Le Métis* (Manitoba) in 1871: has been vice-chancellor of Manitoba University since 1877; and was appointed a commissioner for the consolidation of the statutes of Manitoba in 1877. He was Speaker of the first Legislative Assembly of Manitoba 1871–72; Provincial Secretary 1872–74; Provincial Secretary and Minister of Public Works 1874–76; Attorney-General 1876–78; and Minister of Public Works for a short time in 1878. He was the first superintendent of education appointed for Manitoba 1871; commanded a troop of cavalry during Fenian raid in 1871; was appointed a member of the executive council of the Northwest Territories in 1873; and discharged the administrative duties of Attorney-General 1874–78. He was a member of the Legislature of Manitoba 1870–79; and of the Dominion Parliament from 1879 until July 4, 1888, when he was appointed Lieutenant-Governor of the Northwest Territories. He is the author of the School Law (1871); contributed largely to a readjustment of the financial arrangements of Manitoba with the Dominion in 1875; author of *Vie Politique de Sir Louis H. Lafontaine* (1864), and of many important contributions to French-Canadian literature.

NEIL MACDONALD.

Royal Academy: See ACADEMY.

Royal Geographical Society: an institution founded by royal charter in London in 1830 for the promotion and encouragement of geographical research. It annually awards several medals to successful workers in the cause of geography, and distributes prizes among training-colleges for proficiency in geographical knowledge. The society's *Journal* reports the progress of explorations and discoveries. On May 1, 1900, the society had 4,026 fellows, each entitled to append the letters F. R. G. S. to his name.

Royall, ISAAC: soldier; b. in Massachusetts about 1720; was a wealthy resident of Medford, which he long represented in the general court; was for twenty-two years a member of the executive council; took part in the French war; was appointed brigadier-general 1761, and was the first resident of New England who bore that title; adhered to the crown in the preliminaries of the Revolutionary contest, for which reason he left the country Apr. 16, 1775; was proscribed and his estate confiscated 1778. He died in England, Oct., 1781, taking a noble revenge upon his persecutors by leaving 2,000 acres of land in Worcester County as the endowment of a law-professorship in Harvard College, now known by his name. There were other bequests equally liberal and patriotic. The town of Royalston, Worcester County, of which he had been one of the original proprietors (1752), commemorates his name.

Royal Society: See ACADEMY.

Royce, JOSIAH, Ph. D.: educator and author; b. in Grass Valley, Cal., Nov. 20, 1855; educated at the University of California, and at Göttingen, Leipzig, and Johns Hopkins Universities; became instructor in English in the University of California in 1878, instructor in philosophy in Harvard College in 1882, assistant professor there in 1885, and full Professor in the History of Philosophy in 1892. His writings comprise *The Religious Aspect of Philosophy* (Boston, 1885); *California* (American Commonwealth Series, Boston, 1886); *The Feud of Oakfield Creek* (novel; Boston, 1887); *The Spirit of Modern Philosophy* (Boston, 1892); with many articles and lectures. J. MARK BALDWIN.

Royer-Collard, rwäă'i-ā'kō'laar', PIERRE PAUL: statesman; b. at Sompuis, Marne, France, June 21, 1763. He studied law, and at first took an active part in the Revolution, but, being moderate and royalist, fled from Paris after the fall of the king Aug. 10, 1792, and lived concealed at Sompuis during the Reign of Terror. He represented Marne in the Council of Five Hundred in 1797, but was removed from the Assembly in the same year as a royalist, after the Revolution of Sept. 4. At the creation of the empire he retired to Sompuis and devoted himself to the study of philosophy, being much influenced by the Scottish philosophers, from whose standpoint he successfully opposed the sensualism of Condillac. He wrote little, but wielded a great influence through his lectures as Professor of Philosophy at the University of Paris from 1811 to 1814; Jouffroy, Cousin, Guizot, etc., became his disciples. Under the ultra-royalist tendencies of the Restoration he founded in 1820 the party of the Doctrinaires and became the powerful champion of constitutional monarchy, contributing much to produce the Revolution of 1830. Afterward he gradually withdrew from public life. D. near St.-Aignan, Sept. 4, 1845. His *Life* has been written by Barante (1861) and Lacombe (1863). A. G. CANFIELD.

Royersford: borough; Montgomery co., Pa.; on the Schuylkill river, and the Phila. and Reading Railroad; opposite Spring City, 15 miles W. N. W. of Norristown (for location, see map of Pennsylvania, ref. 6–I). It contains a high school, two national banks with combined capital of $200,000, a private bank, and a weekly newspaper, and has manufactories of stoves, machinery, glass, building and fire brick, sashes, and meters. Pop. (1890) 1,815; (1900) 2,607.

Royle, JOHN FORBES, M. D., F. R. S.: botanist; b. at Cawnpore, India, in 1800; became a physician in the service of the East India Company; spent much time in the Himalayas, where he was superintendent of the company's botanical garden at Saharanpur; published his great work, *Illustrations of the Botany and other Branches of the Natural History of the Himalaya Mountains* (2 vols., 1839–40); wrote many valuable scientific papers upon India; was a promoter of the culture of tea, cotton, and other foreign plants in India; became lecturer on materia medica at King's College, London, and secretary of the British Association. D. at Acton, near London, Jan. 2, 1858.

Rshef, or **Rzhef**: town; in the government of Tver, Russia; on both sides of the Volga (see map of Russia, ref. 6–D). It is on the railway line from Moscow to St. Petersburg, is well built, has many educational and benevolent institutions, and carries on an extensive trade in fish, hemp, linen, and agricultural produce. Pop. (1890) 30,278.

Ruatan', or **Roatan**: an island in the Bay of Honduras (Caribbean Sea), 30 miles from the northern coast of Honduras, to which it belongs; area about 80 sq. miles. It is long and narrow, partly hilly, wooded, and has a good soil and climate; its inhabitants (about 1,000) are engaged in fishing and turtle-catching. In 1742 this island was seized by Great Britain, and in 1797 about 5,000 Caribs were transported to it from St. Vincent; most of them since passed over to the mainland. Subsequently Great Britain gave the island to Honduras, but temporarily held it again 1841–42.

Rubasse: a variety of crystallized quartz, discolored and stained with specks of red and yellow iron oxide, which give it a fine red. Artificial rubasses of all colors are made from rock-crystal heated and dipped in cold colored aniline solutions, which cracks the crystal, when the color fills the cracks throughout the mass.

Rubber: See INDIA-RUBBER.

Rubefacients [from Lat. *rubefa'ciens*, pres. partic. of *rubefa'cere*, make red; *rube're*, be red + *fa'cere*, make]: in medicine, agents capable of producing congestion, and thus redness of the skin, by local contact. Such irritant applications have often the power of relieving congestion, pain, spasm, or undue irritability of deep-seated organs, and are much used for the purpose in therapeutics. Very many drugs have the property of reddening the skin, all blistering agents producing simple hyperæmia as the initial effect of their irritation, but the means most employed strictly as rubefacients are the following: *Heat*, by means of hot baths, cloths wrung out in hot water, bottles of hot water, or heated solids, as earthen platters, bricks, bags of sand, etc.; *mustard*, in the form of prepared mustard-paper moistened, or thick poultices of mustard-meal mixed with cold water; *oil of turpentine*, applied by means of flannels first wrung out in hot water and then in the oil previously warmed; *capsicum* (cayenne pepper), in the form of poultice, or, better, as a lotion mixed with hot spirits; and *ammonia*, in the form of liniment of ammonia (volatile liniment). Plaster of Burgundy pitch and resin cerate are also feebly rubefacient. Revised by H. A. HARE.

Rubens, PETER PAUL: painter; b. at Siegen, Westphalia, June 29, 1577. He was of middle-class family, but his parents were persons of influence. He was well educated, and for a time was a page in the household of the Countess of Lalaing at Brussels. His masters in painting were first Tobias Verhaecht, or Vanderhaecht, then Adam Van Noort, and finally Otto Van Veen, or Vaenius, all of Antwerp. At the age of twenty-two he was received as a master painter by the Antwerp guild of painters. In 1600, during the summer, he made the journey to Italy, and seems to have gone first to Venice. Soon after he attached himself to the ducal court of Mantua, then very brilliant and artistic in a certain way. The Duke Vincenzo Gonzaga employed Rubens permanently, and in 1601 sent him to Rome with letters of recommendation to the Cardinal Alessandro Montalto. There he copied pictures and also produced original works, painting pictures at the order of the Archduke Albert VII., who at this time had become sovereign of the Spanish Netherlands. His high character, thorough education, especially in languages, and dignified bearing seem to have given him a peculiar position among artists; he was trusted and treated as a person of high rank by the sovereigns with whom he came in contact as a painter. In 1603 he was sent by the Duke of Mantua on a private mission to Madrid, where he had an exceptional opportunity to study the paintings of Titian. Many pictures of his own are in the Madrid Gallery, and it is thought that several of these were painted during this visit. He was in Mantua from 1604 to 1606, a second time in Rome, and left Italy finally in 1608, after nearly eight years' employment by the Duke of Mantua. Once in Antwerp the Archduke Albert and his wife, Isabella Clara Eugenia, daughter of Philip II. of Spain, forbade his departure; in 1609 he was made their court painter, and in the same year he married. In the next year he painted the *Elevation of the Cross*, now in the cathedral at Antwerp, and in 1611 the *Descent from the Cross*, also in the cathedral, and commonly called the painter's best work. Until 1620 he remained at Antwerp, master of a large studio, with many pupils and assistants, many of whom rose to great distinction. Jakob Jordaens, Franz Snyders, Gaspar de Crayer, Jan Breughel, and even Antony Van Dyck were among his fellow workmen.

In 1620 Rubens undertook a series of pictures for the Luxembourg Palace at Paris for the Queen Dowager Marie de Médicis. This business called for his presence in Paris on several occasions, but the pictures were painted at Antwerp. They are now at Munich. In 1626 he went to Holland, and in 1628 again to Madrid, on business almost wholly diplomatic in character. In 1629, while still in Madrid, Rubens was appointed secretary of the privy council for the Spanish Netherlands, and was commissioned as envoy to London, where he arrived in May. He left London in Mar., 1630, having previously received knighthood from King Charles I., who also granted him an augmentation of his escutcheon. In Dec., 1630, he married Helena Fourment, niece of his former wife. Her portrait occurs very frequently in his pictures from this time on. The remaining years of his life were filled with artistic work. In 1635 he had to design a most elaborate decoration of the whole city of Antwerp as a welcome to Ferdinand of Austria, son of King Philip III. of Spain, the new governor-general of the Netherlands, appointed on the death of the archduchess. This was a prodigious undertaking, and many vestiges of it yet remain in published and unpublished drawings, and in the pictures which formed part of it. Many large paintings were under way and were left unfinished at his death, which occurred May 30, 1640.

In spite of his active and varied life the amount of work left behind him was enormous, and a great deal of it is preserved. His works are singularly even in quality. They seem to moderns to be lacking in charm, but they are full of vigorous drawing and strong color. They are easy to understand, both in subject and in the more pictorial qualities.

Besides the two great pictures in the Cathedral of Antwerp, named above, it is generally thought that the best places to study this master are the gallery at Antwerp and the old Pinakothek at Munich. Of those at Antwerp, *The Crucifixion between the Two Thieves*, *The Adoration of the Magi*, and *The Virgin with the Body of Christ* are especially important. At Munich there are about fifty canvases, most of them large; there may be named *The Fall of the Rebel Angels*, and another of nearly the same subject, *The Massacre of the Innocents*, *St. Peter and St. Paul*, a picture in which something of the Italian feeling is seen, a remarkable *Silenus with Satyr and Bacchante*, and a number of portraits of the highest interest and value, as *Helena Fourment*, *Lord and Lady Arundel*, the *Archduke Ferdinand*, ruler of the Netherlands, *Philip IV. of Spain*, the *Artist with his First Wife*. In the National Gallery in London are the *Abduction of the Sabine Women*, the *Plague of the Brazen Serpents*, two large *Landscapes*, and a remarkable decorative drawing, *The Birth of Venus*. At the Madrid Gallery, at the Hermitage, St. Petersburg, at the Museums of Berlin, Vienna, Brussels, Darmstadt, and Dresden, at the Louvre, at the Pitti and the Uffizi in Florence, and in such important private collections as Blenheim and the Lichtenstein Palace are pictures impossible to enumerate —perhaps 300 in number in actual public view.

There are many books which treat of Rubens, among them C. Ruellens, *Pierre Paul Rubens, ses Lettres*, etc. (Brussels, 1877); A. Michiels, *Rubens et l'École d'Anvers* (Paris); and Charles W. Kett, in the Great Art Series (1879). A good study of him exists in the *Gazette des Beaux-Arts* (1867–68), and many other notices scattered through the later volumes. RUSSELL STURGIS.

Ruberyth'ric Acid [*ruberythric* is from Lat. *ru'bia*, madder + Gr. *ἐρυθρός*, red]: a glucoside, $C_{26}H_{28}O_{14}$, found in madder-root by Rochleder. It is crystalline, and forms yellow prisms having a silky luster; has a faint taste; is sparingly soluble in cold, readily in hot water; gives a golden-yellow solution in alcohol and in ether, and a blood-red solution in alkalies. It gives red precipitates with baryta-water, with an alum solution after the addition of ammonia, and with basic acetate of lead after addition of a little alcohol. Schunck did not find this acid in madder, and considers it a product of the decomposition of rubian. Rochleder considers rubian to be impure ruberythric acid. See RUBIAN, ALIZARIN, MADDER, etc. Revised by IRA REMSEN.

Rubia'ceæ: See MADDER FAMILY.

Rubian [from Lat. *ru'bia*, madder]: a glucoside ($C_{16}H_{16}O$) discovered in madder-root by Schunck in 1847. It is obtained by treating a hot decoction of madder with bone-black, washing this to remove chlorogenine, extracting it repeatedly with boiling alcohol, and evaporating to dryness. It is then dissolved in water, precipitated with acetate of lead; the lead compound is decomposed by sulphuretted

hydrogen, and the filtrate is evaporated to dryness. As thus obtained, it is a brittle, amorphous mass, resembling gum arabic, deep yellow in thin layers, and dark brown in masses. It is very soluble in water, less soluble in alcohol, and insoluble in ether, which precipitates it from alcohol in brown drops. It is very bitter. Boiled with dilute acids or caustic alkalies, or treated with erythrozyne (madder ferment), it is resolved into glucose, alizarin, and perhaps other products:

Rubian. Alizarin. Glucose.

$$2C_{16}H_{16}O_8 + 6H_2O = C_{14}H_8O_4 + 3C_6H_{12}O_6.$$

Others consider the reaction as follows:

Rubian. Alizarin. Glucose.

$$C_{26}H_{32}O_{16} = C_{14}H_8O_4 + 2C_6H_{12}O_6.$$

It is not determined whether there are several glucosides in madder which are decomposed by the ferment, one yielding alizarin, another purpurin, etc., or whether there is but one, from which all the coloring-matters are developed. Schunck favors the former view, while the investigations of Kopp, Schützenberger, and Bolley favor the latter. See Alizarin, Madder, Ruberythric Acid, etc.

Revised by Ira Remsen

Rubicelle: See Spinel.

Ru'bicon: a small river of Northern Italy emptying into the Adriatic, immortalized by the passage of Cæsar 49 B. C. It then formed the boundary between Italy and his province of Cisalpine Gaul. To pass it would be a declaration of war against the senate. Whether the modern Luso or the Fiumicino was the Rubicon can not be determined. A papal bull in 1756 pronounced for the Luso, which the peasants also call il Rubicone. The weight of argument, however, identifies it with the Fiumicino. E. A. G.

Rubid'ium [Mod. Lat., from Lat. *ru'bidus*, red, deriv. of *rube're*, be red]: one of the alkali metals, discovered by Kirchhoff and Bunsen in 1860 as one of the first fruits of spectroscopic investigation. It occurs in extremely minute proportions in some saline mineral waters, in association with Cæsium (*q. v.*). The water of Bourbonne-les-Bains contains in 1,000,000 parts 19 parts of chloride of rubidium. Some lepidolites contain it, associated with lithium and cæsium. Among these are the lepidolite of Hebron, Me., which contains about $\frac{1}{400}$th of its weight. The ashes of some plants, as the tea and the coffee plants, show it. It is a white metal with a yellowish tinge and silvery luster. Density = 1·52. It is as soft as wax, melts at 101·5° F., and yields even below a red heat a greenish-blue vapor. It is more easily oxidized by the air than potassium, and is more electro-positive than the latter. It kindles on water, and burns like potassium. Revised by Ira Remsen.

Rubies, Cape: See Cape Rubies.

Ru'binstein, Anton Gregor: composer and pianist; b. at Wechwotynetz, Roumania, of Jewish parents, Nov. 30, 1830; received instruction from his mother, Villoing in Moscow, Liszt in Paris, and Dehn in Berlin. After two years spent in Vienna in teaching, he returned to Russia in 1848, and studied in St. Petersburg for eight years. All this time he was composing, and when he made a concert tour in 1857 he created a remarkable sensation, both by his playing and his works. In 1858 he was appointed imperial concert conductor in St. Petersburg with a life pension. In 1862 he founded the St. Petersburg Conservatory, and remained its principal till 1867. In 1869 the emperor ennobled him. He visited every European country and the U. S. in his concert tours. His compositions include fifteen operas, some of them being what he called sacred operas, such as *Paradise Lost*, *The Tower of Babel*, and *Moses*; six symphonies, of which the best known are the *Ocean*, No. 2, op. 42, and the *Dramatic*, No. 4, op. 95; overtures, piano sonatas and concertos, sonatas and concertos for other instruments, much chamber music, and numerous piano solos, and vocal pieces for one or more voices. D. at Peterhof, Russia, Nov. 20, 1894. D. E. H.

Ruble: See Rouble.

Rubric [from O. Fr. *rubriche* < Lat. *ru'brica*, red earth, red chalk, the title of a law (because written in red), deriv. of *ru'ber*, red]: any writing or printing in red ink. In MS. and printed missals the directions preceding the prayers and offices were usually written or printed in red ink; hence the term rubric is commonly used to denote the rules and directions for the performance and celebration of divine service. As the date and place on a title-page were sometimes printed in red ink, and the place where the book was sold was given instead of that where printed, the word rubric has also been used to signify the false name, as many books printed at Paris bear the *rubric* of Genoa, London, etc. W. S. P.

Rubruk (or **Rubruquis**), **William of**: a distinguished Franciscan monk and missionary; b. at Rubrouck, in French Flanders; was sent to Tartary by Louis IX. to open communication with the Tartar prince Sartak, who was alleged to be a Christian (1253–55). The narrative of his journey was written in Latin, and is one of the best of its kind in existence. The best edition is that in the *Recueil de voyages* (vol. iv., 1839) of the Paris Geographical Society. There is an English translation in *Purchas his pilgrimes* (vol. iii.), and a French one, Paris, 1877. The name often given to him, William of Ruysbroeck, arose by confounding him with the Flemish mystic, John of Ruysbroeck. D. after 1293. Roger Bacon speaks of him, and may very likely have seen him; and, as gunpowder was then in use among the Tartars, it has been conjectured that Rubruk may have given Bacon a clew to the discovery.

Ruby, or **Red Sapphire**: a variety of Corundum (*q. v.*). The finest and most highly prized rubies are of the so-called pigeon's-blood color; they are found in the valley of Mogok, in Burma, where the mines have been worked by the Burmese for centuries, and are now leased by the British Government to a London syndicate. Lighter-colored rubies, sometimes almost pink, often very beautiful, occasionally with a tinge of purple or currant-wine color, are found at Ratnapura, Ceylon. More recently the mines in Siam have been extensively worked, and some fine gems have been found, although nearly all of the rubies found there are very dark red, almost garnet-colored, frequently with a brownish tinge. Small rubies have been found in the vicinity of Franklin, N. C., and in the government of Perm, in Russia. Rubies from 1 carat upward, when fine, are of great value, and when from 2 to 4 carats in weight command from five to ten times the price of a white diamond of similar quality. A ruby of 10 carats has been sold in the U. S. for about $50,000. The so-called reconstructed rubies are not, as generally believed, made by fusing small bits of ruby, but are artificial rubies made by a direct process, and are distinguishable by the presence of round bubbles and other peculiarities. They are sold only under the name of artificial rubies in France, with heavy legal penalties for failure so to designate them. The so-called Cape, Arizona, Colorado, and Utah rubies, often very beautiful, are fine pyrope garnets, possessing only very slight value compared with the true ruby. G. F. Kunz.

Ruby-spinel: See Spinel.

Rückert, Johann Michael Friedrich: poet; b. at Schweinfurt, Bavaria, May 16, 1788; studied law at Jena; lived in Stuttgart, where he edited, 1816–17, the famous *Morgenblatt*; traveled in Italy 1818; studied Oriental languages under Hammer in Vienna; was appointed Professor of Oriental Languages at Erlangen in 1826, at Berlin in 1840, but retired in 1848 to his estate, Neuses, near Koburg, where he died Jan. 31, 1866. Under the pseudonym *Freimund Raimar* he published in 1814 his *Deutsche Gedichte*, in which were the famous *Geharnischte Sonette*, a collection of sonnets directed against Napoleon. They are full of strong patriotic sentiment, and display an extraordinary command of the poetical form. The character of Rückert's lyrics in general is rather philosophical than naïve and spontaneous, a fact which may account for the poet's immense productivity. In the six volumes of his *Gesammelte Gedichte* (1834–38), and especially in the collection *Liebesfrühling*, there are many bits of genuine lyric poetry, but there is also much that is insignificant. His translations from the Arabic, *Die Makamen des Hariri* (1826), *Hamasa* (1846), the Chinese *Schi King*, *Chinesisches Liederbuch* (1833), and the Sanskrit *Nal und Damajanti* (1828), etc., reproduce the difficult meters of the originals with skill and ease. In *Weisheit des Brahmanen* (1836–39) he successfully imitated the didactic style of Hindu poetry and exhibited a wealth of wisdom and philosophic thought. See Fortlage, *Friedrich Rückert und seine Werke* (1867); C. Beyer, *Friedrich Rückert* (1868); F. Muncker, *Friedrich Rückert* (1890); P. de Lagarde, *Erinnerungen an Friedrich Rückert* (1886). Julius Goebel.

Rūdagī, roo-dăă-gee': Persian poet of the tenth century, sometimes called the father of Persian literature. His name Rūdagī comes from the village of Rūdag, in the region of Bokhara or Samarkand, where he was born toward

the end of the ninth century. His full name is given as Farīd ad-dīn Muḥammad Rūdagī. Biographical tradition makes him a sort of blind Homer, but as to his blindness there is doubt. His poetical renown won him a position at the court of the Sāmanīd Nasar II., ben Ahmad of Khorassān. The literary activity of Rūdagī appears to have been great; he is said to have composed more than a million verses. The remains that have been preserved are comparatively meager, but they are of high merit. Among the deplorable losses may be mentioned his translation of the Indian book of fables, *Kalilah and Dimnah*, rendered into Persian from the Arabic version of Abd-allah ibn al Muḳaffa. Rūdagī outlived his royal patron, and fallen on evil days he seems to have died about A. D. 954. See Ethé's *Rūdagī der Sāmanīdendichter* in *Göttinger Nachrichten* (1873, pp. 663–742). A. V. Williams Jackson.

Rudbeck, Olof: scientist; b. at Vesteraas, Sweden, Sept. 30, 1630. He studied natural science at the University of Upsala, where he became a professor in the faculty of medicine. By his discovery, at the age of twenty-three, of the lymphatic canal he gained European renown. In addition to investigations in several branches of science, he devoted himself to the study of archæology and literature, both classical and Scandinavian, publishing several sagas and Swedish provincial laws (from 1679). His great botanical work, *Campi elysii eller Glysisvald*, was left uncompleted. He is best known by his ingenious and learned *Atland eller Manhem* (4 vols., Upsala, 1675–1702), commonly called *Atlantica*, in which he sought to establish the identity of Sweden with Plato's fabled land and the Garden of Eden. By the fire in Upsala in May, 1702, his library and collections, including the unpublished continuation of *Atlantica*, were destroyed, and his death followed a few months later (Dec. 12).—His son, Olof Rudbeck (d. 1740), acquired considerable eminence as a zoölogist, and his grandson, also of the same name (d. 1777), was the author of a number of comic poems.

D. K. Dodge.

Ruddiman, Thomas: Latin grammarian; b. at Raggel, Banffshire, Scotland, Oct., 1674; graduated at King's College, Aberdeen; was afterward a publisher and printer to the University of Edinburgh (1728), and principal keeper of the Advocates' Library (1730). He is chiefly known as the author of a once very famous work on *Latin Grammar* (1732), whose learned Latin introduction and appendices are still of value. In 1739 he brought out a magnificent folio edition of Anderson's *Diplomata et Numismata Scotiæ*, and produced his celebrated "immaculate" edition of Livy (4 vols. 12mo, 1751). D. at Edinburgh, Jan. 19, 1757. See G. Chalmers, *Life* of Ruddiman (1794).

Revised by A. Gudeman.

Rude, rüd, François: sculptor; b. at Dijon, France, Jan. 4, 1784. His father was a blacksmith and made stoves, and young Rude was kept at this work, receiving instruction in drawing, during leisure hours only, at an art school in the town. Medals were won for drawing, etc., by the young man, who in 1804 made a bust of the engraver and medalist, Louis Gabriel Monnier. In 1807 he went to Paris, taking with him his statuette of *Theseus picking up a Quoit*. In 1809 he gained a second prize for sculpture at the Imperial Academy, and in 1812 the Grand Prix de Rome, but did not go at once to Italy. At the second restoration Rude went to Belgium with the Frémiet family of Dijon, settled in Brussels, and in 1821 married Sophie Frémiet, who was afterward known as a portrait-painter. In 1827 he returned to Paris, where he was invited to take the atelier for students formerly managed by David d'Angers (see David, Pierre Jean). Except for a short visit to Italy, Rude remained faithful to steady and arduous work. He was a man of singular strength of body and simplicity and direct force of character, a republican by conviction, but primarily and all his life long an artist. D. in Paris, Nov. 3, 1855. Of his work there must be named the group of the *Departure for the War*, on the Arc de l'Étoile at Paris, the northern group on the side toward the Champs Élysées, a noble composition, well known to all students; *Mercury fastening his Winged Sandal*, in the Louvre; *Neapolitan Fisher-boy*, also in the Louvre; *Joan of Arc*, in the Luxembourg Garden; and *Hebe and the Eagle of Jupiter* and *Love the Conqueror*, in the Museum of Dijon. There are also a great many portrait-statues and busts, as *La Pérouse*, the explorer, in the Louvre, *Louis David*, *General Cavaignac*; and what may be called historical portraits, as of men whom he had no chance to study from life, *Napoleon*, at Fixin in Burgundy, *Marshal Ney*, at Paris, *Marshal Bertrand*, at Chateauroux; and as decorations of the new buildings of the Louvre, statues of *Houdon*, the sculptor, and *Nicholas Poussin*. There exists a life of Rude, published at Dijon in 1856, and Hamerton wrote an account of him in his *Modern Frenchmen*.

Russell Sturgis.

Rü'dinger, Nicolaus, M. D.: anatomist; b. at Rüdesheim, Germany, Mar. 25, 1832; studied medicine at the Universities of Heidelberg and Giessen, where the teachings of Henle, F. Arnold, and T. Bischoff inclined his attention to anatomy; graduated M. D. at the University of Giessen in 1855; and became prosector and adjunct to Bischoff at the University of Munich. In 1881 he was elected Professor of Anatomy, and raised the standard of anatomical teaching at that school, utilizing photography to depict his dissections. D. Aug. 23, 1896. His most important works are *Atlas des peripherischen Nerven-systems des menschlichen Körpers* (Stuttgart, 1872); *Topographisch-chirurgische Anatomie des Menschen* (Stuttgart, 1873–79); *Atlas des menschlichen Gehörorganes* (Munich, 1875). He was coeditor of *Monatsschrift für Ohrenheilkunde* 1867–70, and of the *Beiträge zur Anthropologie und Urgeschichte Bayerns* in 1877.

S. T. Armstrong.

Rudolph: the name of two German emperors. Rudolph I. of Hapsburg, b. in 1218, founder of the house of Austria, and German emperor 1273–91, was the oldest son of Albert IV., Count of Hapsburg and Landgrave of Alsace, which countries he inherited after the death of his father in 1240. He was successful in enlarging his possessions, but it was, nevertheless, not the importance of his political position, but the righteousness and valor of his personal character, which gained for him the German crown. In order to strengthen his authority among his vassals and procure the necessary support, he married his daughters to the two most powerful among them, the count-palatine, Louis, and Duke Albert of Saxony, and then marched against two others who refused to do homage, King Ottocar of Bohemia and Duke Henry of Bavaria. The latter was easily defeated; and Ottocar submitted on the approach of the imperial forces and made peace in 1276. Later, however, he broke the truce, and in the new war was killed in the battle of Marchfield in 1278. Rudolph gave Bohemia and Moravia to the sons of Ottocar, but Austria, Styria, Carinthia, and Carniola he separated from the heritage and gave to his own son, Albert, thus founding the state of Austria. Against his external enemies, the Count of Savoy, the Duke of Burgundy, etc., he was also successful, and his internal government was distinguished by justice and love of order and peace. He traveled from place to place in the empire, and sat in court on all important occasions, for which reason his people called him the living law—*lex animata*. D. in 1291, and was buried at Spires. His *Life* has been written by Lichnowski (1836), Schönhuth (1843), and Hirn (1847).—Rudolph II. (1576–1612), b. July 18, 1552, a son of the Emperor Maximilian II. and Marie, daughter of Charles V.; was educated at the Spanish court; crowned King of Hungary in 1572, of Bohemia in 1575, and elected Emperor of Germany after his father's death Oct. 12, 1576. He was superstitious, weak, and entirely in the hands of the Jesuits. Immediately after his accession to the throne the Protestant worship was forbidden throughout his Austrian dominions, the Protestant schools were closed, and the preachers and teachers banished. In the empire he espoused the cause of the Roman Catholic Church with violence, and the formation of the Protestant Union (May 4, 1608) and the Roman Catholic League (July 10, 1609) brought Germany to the verge of civil war. Meanwhile, the Hungarians arose and Bohemia revolted. The house of Austria seemed near its ruin when Matthias, a younger brother of the emperor, took the lead in the affairs of the family, and compelled Rudolph to cede to him all his hereditary possessions. Unable to maintain his authority in the empire, and embittered by his misfortunes, the emperor retired into private life, and died at Prague, Jan. 20, 1612. He felt some interest in science and literature, and several great scholars and scientists lived at his court. His *Life* has been written by Gindely (1863–65) and von Bezold (1885).

Revised by F. M. Colby.

Ru'dolstadt: town of Germany; capital of the principality of Schwarzburg-Rudolstadt; beautifully situated on the Saale, 18 miles S. of Weimar (see map of German Empire, ref. 5–E). It has a fine palace with a picture-gallery and a library, and manufactures of woolens, porcelain, and dyestuffs. Pop. (1895) 11,907.

Rue [viâ O. Fr. from Lat. *ru'ta* (whence O. Eng. *rūde*, rue) = Gr. ῥυτή, rue]: an herb, *Ruta graveolens*, of the Old World (order *Rulaceæ*), having a strong smell and poisonous qualities. It was once used as an aspergil for sprinkling holy water. It was believed by the superstitious to be a powerful charm against witches, and is used in some places for flavoring food. By some persons it is employed as a means of produeing abortion. This it rarely succeeds in doing, and if that event occurs often costs the woman her life. Revised by H. A. Hare.

Ruff: the *Philomachus pugnax*, a sandpiper, or wading bird of the sub-family *Tringinæ*. It was formerly very common in the fens and marshes of England, but has nearly disappeared sinee its favorite haunts have been so largely reclaimed and eultivated. It is still found throughout Northern Europe and Asia, and it migrates southward in winter. It is aecidental on the eastern coast of the U. S. The ruff derives its name from a circlet of long, closely set feathers upon the neck of the adult male, whieh he raises or lowers at pleasure. The male ruff is polygamous and courageous, is about 10 inches in length, with the head and shoulders of a dark purple, barred with chestnut, the back chestnut spotted with black, the wings brownish black, eaeh feather having a white shaft, and the tail brown mottled with black. The species is remarkable from the fact that no two male birds in the breeding plumage are colored exactly alike. The female is called a reeve. F. A. Lucas.

Ruffed Grouse: the *Bonasa umbellus*, a species of the family *Tetraonidæ*, distinguished from other grouse by the absence of feathers on the lower half of the tarsi. It has also, on the sides of the neck, a ruff of soft, broad, and truncate feathers, to which the name refers; the tail is somewhat convex, and about as long as the wings; the color of the cervical tufts is a glossy black or brown, with a semimetallic steel-blue or grcenish border; the tail has two bands of gray, and between them a broad blaek one. The species, as understood by Baird, Brewer, and Ridgway, is generally distributed throughout the north temperate parts of North America, but is differentiated into several sub-species, or geographieal races, viz.: (1) *umbellus*, inhabiting the eountry E. of the Roeky Mountains; (2) *umbelloides*, inhabiting the Roeky Mountains and the interior of British America up to Yukon river; (3) *sabini*, found in Oregon, Washington, British Columbia, etc.; and (4) *logata* from Eastern Oregon and Washington to Nova Scotia and Maine, ranging southward to the mountains of New England and New York; these are distinguished by slight differences of color. The species in some sections (New England and the Western States) is known under the name of partridge; in others (the Middle States) as the pheasant; and in some of the British provinces as the birch-partridge. It is chiefly found in hilly and woody regions and along the borders of watereourses, but also in the lowlands and cane-brakes, as in Kentucky; rarely or never, however, on open plains. F. A. Lucas.

Ruffin, Edmund: agrieulturist; b. in Prinee George co., Va., Jan. 5, 1794; was for many years president of the Virginia Agricultural Society; edited *The Farmer's Regisler* 1833–42, and other agricultural papers; published treatises on scientific methods of agriculture; editor of Col. William Byrd's *Weslover Manuscripls* (1841); was an ardent seeessionist, beeame a member of the Palmetto Guard of South Carolina, and fired the first gun at Fort Sumter Apr. 14, 1861. He committed suicide near Danville, Va., June 15, 1865, because unwilling to live under the U. S. Government.

Rug: See the Appendix.

Rugby: town; in Warwickshire, England; on the Avon; 83 miles by rail N. W. of London (see map of England, ref. 10–H). It is the center of a great hunting distriet. Its eelebrated sehool, founded in 1567 by Lawrence Sheriff, acquired a national reputation under Thomas Arnold as head master (1828–42). Pop. (1891) 11,262.

Ruge, roo'ge, Arnold: author; b. at Bergen, island of Rügen, Sept. 13, 1802; studied philology and philosophy at Halle, Jena, and Heidelberg, but was sentenced in 1824 to a five years' imprisonment in the fortress of Colberg as a member of a secret political soeiety; published in 1830 a translation of *Œdipus Coloneus* and *Schill und die Seinen*, tragedy; was appointed Professor of Æsthetics at the University of Halle in 1831, and attracted much attention as a philosophical eritic in the *Hallische Jahrbücher* (1838–43); joined Karl Marx in Paris, and published with him the *Deutsch-französische Jahrbücher* (1843–45); published in 1845 *Zwei Jahre in Paris*; at Zurich and Leipzig published *Poetische Bilder* (2 vols.) and *Polilische Bilder* (2 vols., 1847); was eleeted a member of the German Parliament in 1848, and founded in the same year the *Reform* at Berlin. This paper was soon suppressed, and, after some attempts at revolutionary intrigue in Dresden and Carlsruhe, he went in 1849 to London, where he formed a European Democratie Committee with Ledru-Rollin and Mazzini. He published *Unser System* (1850); *Aus früherer Zeil* (1862–67); *Manifest an das deulsche Volk* (1886), etc. D. at Brighton, Dec. 31, 1880.

Rü'gen: an island in the Baltie, a mile off the coast of Pomerania; comprises an area of 361 sq. miles, with (1895) 46,732 inhabitants, and belongs to Prussia. The soil is fertile, and the fisheries are very rich. Capital, Bergen.

Ruger, Thomas Howard: soldier: b. in New York, Apr. 2, 1833; graduated at the U. S. Military Academy 1854; promoted brevet seeond lieutenant of engineers; resigned Apr. 1, 1855; praeticed law at Janesville, Wis., 1856–61; in June, 1861, entered the army as lieutenant-colonel and colonel Third Wisconsin Volunteers; was appointed brigadier-general U. S. volunteers Nov., 1862; served in the Army of the Potomac, participating in its eampaigns and battles from Winchester, May, 1862, to Gettysburg. In Oct., 1863, he was transferred to the West, and at the battle of Franklin, in command of a division, he won the brevet of major-general. He was in command of the department of North Carolina until June, 1866; colonel Thirty-third Infantry July, 1866; transferred to the Eighteenth in 1869; superintendent of the U. S. Military Academy 1871–76; brigadier-general Mar. 19, 1886; major-general 1895, becoming commandant of the department of the East. Retired Apr. 2, 1897.

Ruggles, Timothy: lawyer and soldier; b. at Roehester, Mass., Oct. 20, 1711; graduated at Harvard 1732; praeticed law at Sandwieh and Hardwick; was seeond in command at the battle of Lake George 1755; served as brigadier-general under Lord Amherst 1758–60; judge of common pleas 1756; chief justice 1762; Speaker of Assembly 1762–63; delegate to Stamp Act congress at New York 1765; was an inactive loyalist at the outbreak of the Revolutionary war, but lost his property by confiseation; removed to Nova Scotia 1775, and was a founder of the town of Digby. D. at Wilmot, N. S., Aug. 4, 1795.

Ruhmkorff, Heinrich Daniel: eleetrieian; b. in Hanover, Germany, in 1803: settled in Paris in 1839; brought out a convenient form of thermo-battery in 1844; in 1851 produced his famous coil. (See Induction Coil and Electricity.) D. in Paris, Dec. 21, 1877.

Ruhnken, roon'ken, David: Greek scholar; b. at Stolpe, Pomerania, Prussia, Jan. 2, 1723. After studying some time in his native land, he emigrated to Holland, attracted by the fame of Hemsterhusius, whose devoted disciple he became. Together with Valckenaer, Ruhnken sueceeded in establishing the study of Greek upon a firm basis in Dutch universities, Latin having, before the time of his great teacher, received almost exclusive attention. His principal works are *Timæi lexicon* (1754); *Historia critica oratorum Græcorum* (1768); *Homeric Hymns to Demeter and Dionysos*; *De vita et scriptis Longini*, parts of whose works he discovered amid the *Rhetoric* of Apsines; Velleius Paterculus, and *Elogium Hemsterhusii*. See D. Wyttenbaeh, *Vita D. Ruhnkenii*, edited with notes by Bergmann (1824). A. G.

Ruisdael, or **Ruysdael**, rois'daăl, Jacob, van: landseape-painter; b. at Haarlem, Holland, in 1629 or 1630; was under the influence of Allaert von Everdingen; went to Amsterdam in 1659 and established himself there, receiving the rights of citizenship. Ruisdael died in an almshouse at Haarlem, Mar. 14, 1682, and was buried in that city. His pietures were not appreciated in his day. Ruisdael also produeed a few etchings. The figures in his landscapes are said to have been put in by A. van de Velde, Ph. Wouverman, or Lingelbaek. Hobbema was a pupil of Ruisdael; Jan van Kessel and J. R. de Vries were his followers. Ruisdael's works are to be found in all important European galleries. W. J. S.

Rule Britannia: a British national song or hymn, the words of which were composed by David Mallet (1698–1765), and the music by Arne. It was first performed in 1740 as part of *Alfred, a Masque*, by Mallet and James Thomson.

Ruled Surface: in mathematies, a surface generated by a right line, which moves subject to three conditions, or, in other words, whose position involves one indeterminate eonstant. Thus an hyperboloid of one sheet is generated by a line which intersects three given lines in space, and a ruled

hyperboloid of revolution is generated by a line revolving round an axis which it does not intersect. Ruled surfaces of the second order, such as those mentioned, can be generated by the movement of a line in two distinct ways; and each line of one system intersects all the lines of the other system. This is not the case with other ruled surfaces. The surface is called a developable, that is, capable of being opened out into a plane, if two consecutive generating lines intersect. If the intersection is a fixed point, the surface is a cone, and if the lines are parallel the surface is a cylinder. See CONE and HYPERBOLOID. R. A. ROBERTS.

Rule Nisi: in law, a rule or order obtained on an *ex parte* motion, which, after due service upon the party against whom the rule is obtained, will be made absolute, unless (*nisi*) the party appears and shows good cause why it should not be made absolute. F. S. A.

Rule of the Road: See ROAD, LAW OF THE.

Ruling-machines: instruments designed for the subdivision of a given unit of length into any required number of parts, either equal or unequal. These are called "line-dividing engines" or "circular-dividing engines," according as the unit to be subdivided is a rectilineal measure or a circular arc.

The circular-dividing engine consists of a disk capable of accurate movement about a true center and of suitable mechanism for making this movement automatic. A graduating attachment produces automatically the marks upon the metal surface which correspond to the movement in revolution. There are, in general, two types of mechanism by which the movement in revolution is effected. According to the first type, the disk is moved by means of a gear and a worm cut in the periphery of the disk. In this type, the accuracy of the subdivision depends entirely upon the accurate workmanship of the worm and gear. Since the action is automatic there is no chance for the correction of known errors during the operation of graduation. In the second type the subdivision is effected by means of an arm attached to the disk, by which it is carried a definite distance, determined by the position of two metal stops, one of which is fixed, while the other is adjustable by means of a stout micrometer screw. The arm is connected with the revolving disk by means of electro-magnets. These clamp the arm to the disk during the forward motion and are released during the backward motion.

In the operation of the engine it is assumed that the master circle has been graduated without sensible error by successive approximations; at least to single degrees. When the stops are set at the proper distance apart the master circle can be exactly copied, and still further subdivision can be effected by setting the stops at the distance apart required to produce aliquot subdivisions. Suppose, for example, that it is required to graduate a circle to ten minutes of arc. First the stops are set to correspond to this distance approximately. It is not to be expected that this can be done with the utmost exactness, but when the machine is started in operation the microscope under which the lines of the master circle are viewed, having a high magnifying power, will easily detect any deviation as small as one-tenth of a second of arc. As soon as the slightest deviation is detected it can be corrected by the motion of the adjustable stop, since ten divisions of the micrometer screw by which this movement is effected are equivalent to this distance. Thus an accumulation of errors can be prevented while the engine is in operation, and before any sensible error has been introduced.

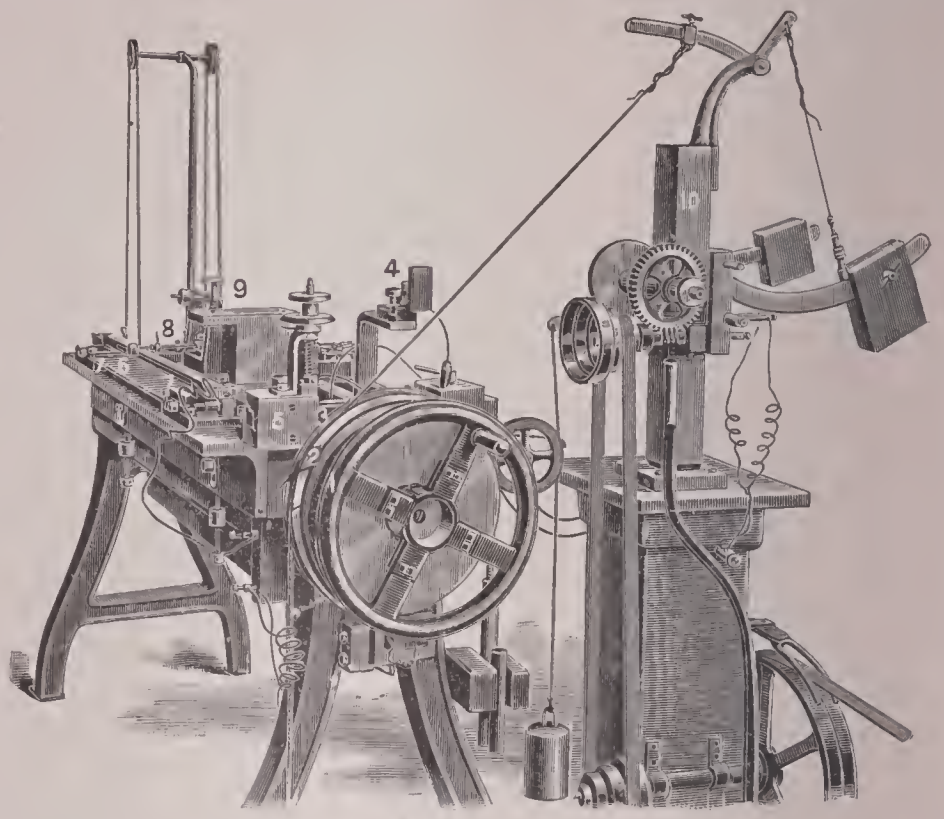

FIG. 2.—The Rogers dividing-engine, front view.

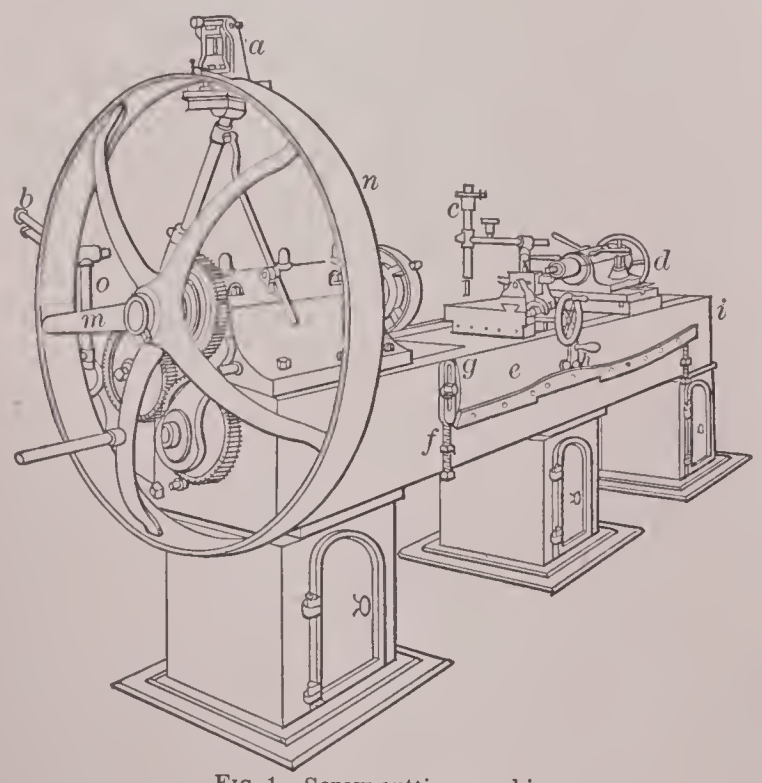

FIG. 1.—Screw-cutting machine.

The Line-dividing Engine.—The movement by which the subdivision of a given unit may be effected, as shown in Figs. 2 and 3, is usually produced by a screw of superior construction. A perfect screw, however, can give good results only when it is properly connected with the ruling carriage. If the screw has considerable length and a relatively small diameter the flexure must be taken into account. All kinds of constrained motion must be avoided, since under changes of temperature the effect of this constrained action will be variable. Usually the carriage to which motion is given by the nut moves over V-shaped ways. Since, in the construction of ways of this form, it is, to say the least, exceedingly difficult to maintain plane surfaces upon both surfaces of the ways and at the same time to maintain them straight and parallel, this form of construction is to be avoided in a dividing-engine in which great precision is desired. The form of ways shown in Fig. 3 is to be preferred. In this form each way is perfected independently by measurement tests made during the process of construction. It has been found to be not at all difficult to reduce the departure from a true plane to a limit corresponding to a radius of curvature as great as 500 miles for a distance of 40 inches.

The carriage moved by the nut and the screw is kept in contact with the face of the vertical wall by means of cylindrical plugs backed by springs acting against the opposite wall. In Fig. 3 the plate shown at 2 is pressed against the left wall at 1, and the spring plugs act against the right wall.

In the construction of a screw for a dividing-engine four difficulties must be overcome if great precision is desired. (1) Every half of every revolution of the screw must at every point be equal to every other half. Errors which depend upon a single revolution of the screw are called periodic errors of single revolution. The writer has had good success in the elimination of errors of this class by grinding the

screw with a nut made up of four symmetrical sections which are made interchangeable without affecting the position of the axis of revolution. (2) Every revolution of the screw must be equal to every other revolution; in other words, the screw must have no linear errors. Errors of this class may be eliminated by means of an arm attached to the nut, at the other end of which is attached a roller. The latter in turn acts upon a template which is filed away to match the observed errors of the screw, as shown in Fig. 1 at *fi*. Since the nut is mounted so as to be practically free with respect to the carriage during a revolution of the screw, the template arm can give to the screw a motion which is independent of the forward motion of the nut. This construction is shown at *h* in Fig. 1. (3) The nut, which is supposed to have been made free from the two kinds of errors described above, must have a perfectly free action in its movement upon the screw. This is accomplished by means of four cylindrical plugs fitted to four arms which project downward from the under side of the carriage. When feeling contacts have been made with the end faces of the nut, they are clamped in position by means of set-screws. These four plugs guide the nut during the independent revolution of the nut by means of the correction-arm. (4) Even if the screw has no errors of appreciable magnitude after it has been ground, when supported in a vertical position, the errors due to flexure must be taken into account. There are two methods of overcoming this difficulty. First, a following nut may be mounted so that its supports shall rest upon the ways and take up the flexure during the progressive motion of the nut. The writer has not found this method satisfactory, chiefly owing to the constrained motion between the nut and the screw. It has been found far better to admit the flexure of the screw and to eliminate its effect by means of a template, in the manner already described. In the case of a screw 2 inches in diameter and 5 feet in length the change in length at the middle point, under a load of 40 lb., was found to be a little over one-thousandth of an inch.

In the screw-cutting machine which is represented in Fig. 1 an attempt has been made to fulfill the following conditions, viz.: (1) The ways upon which the tool-carriage is supported and moves must lie in a horizontal plane. (2) The vertical wall against which the tool-carriage is pressed must lie in a vertical plane which is at right angles to the horizontal ways at every point. (3) The line between the centers must be parallel to both sets of ways. (4) The movement of the tool-carriage must be parallel to the line between the centers at every point.

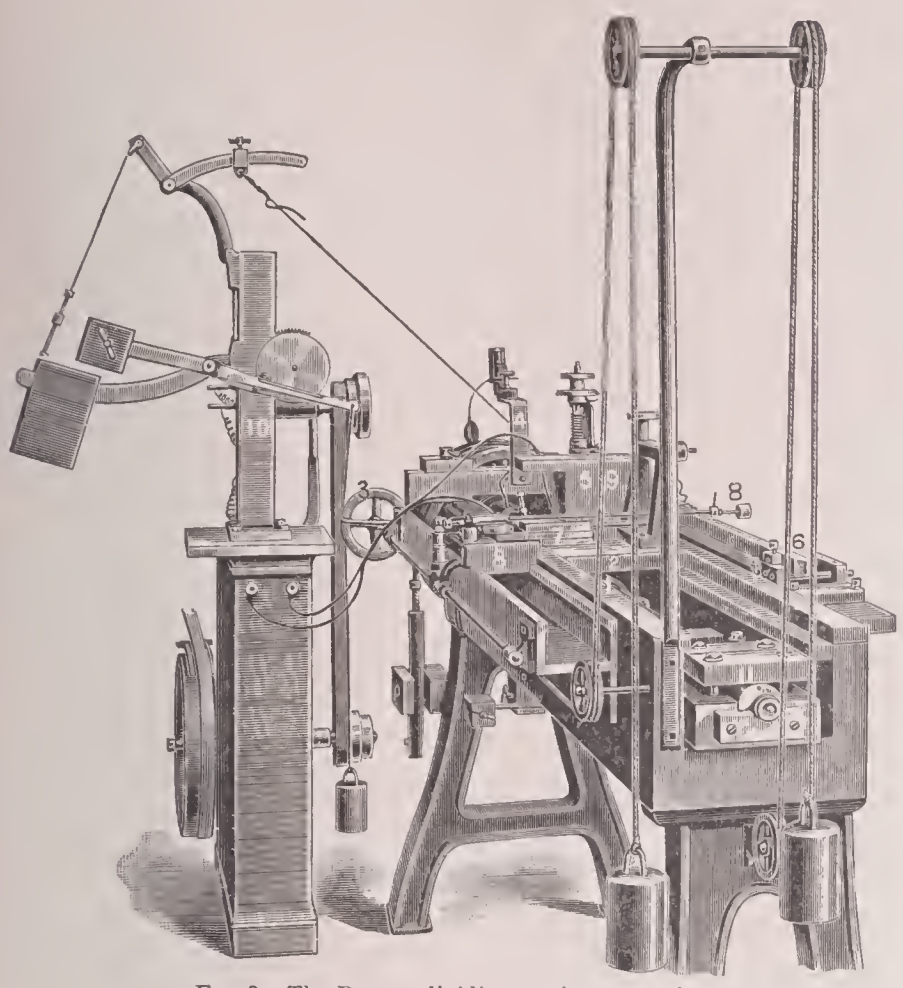

FIG. 3.—The Rogers dividing-engine, rear view.

Two views of the dividing-engine are given in Figs. 2 and 3. The automatic driving attachment is shown at 10. The index, which is subdivided into 1,000 equal parts, is shown at 2. At 3 is shown the circular electro-magnet arm, which moves between two stops, one of which is seen at 5. At 4 is a holder for the microscope with which the divisions of the index-wheel are read. A microscope is clamped to the carriage, which is driven by the screw, at 9. This microscope is adjusted over a graduated bar which rests upon adjustable supports at 7. If another bar rests upon a second set of supports at 7 and is viewed by a second microscope, the instrument is converted into a convenient form of comparing apparatus. See the article MEASURING-MACHINES.

In Fig. 3 the automatic ruling attachment is shown at 8. It is carried along independently of the screw by a weight movement. When the index-wheel at 4 has been set, a line can be ruled by a slight movement at 3, the cutting tool being automatically lifted during the backward motion and released in time for action during the forward motion. The instrument is therefore adapted either to continuous automatic action or to an isolated movement at the will of the observer.

WILLIAM A. ROGERS.

Rum [apparently abbreviated from *rumbullion*, a great tumult, a strong distilled liquor. The Fr. *rhum*: Germ. *rum* are from Eng.]: a spirituous liquor distilled from molasses and the refuse juice and scum from the manufacture of sugar. It is largely produced on the sugar-plantations in the West Indies; that from Jamaica is considered the best, and the product of Santa Cruz also has a high reputation. The wort is prepared by mixing about 100 gal. of molasses, 300 gal. of skimmings from the clarifiers, 200 gal. of lees from previous fermentations, called dunder, and 400 gal. of water. This mixture averages about 15 per cent. of sugar. The fermentation is complete in from nine to fifteen days. The mixture is then distilled, and a quantity of molasses or caramel is added to color and flavor it. The peculiar flavor of rum is chiefly due to butyric ether, produced during the fermentation. Acetic and other ethers are present. Pineapples and guavas are often thrown into the still. Rum is greatly improved by age. It was formerly largely manufactured in New England, especially at Newport, R. I., and was a prominent article of exportation to Africa in connection with the slave-trade. Great quantities of liquor sold for rum are produced by flavoring and coloring rectified proof spirit.

Revised by IRA REMSEN.

Rumford, BENJAMIN THOMPSON, Count: statesman; b. at Woburn, Mass., Mar. 26, 1753; educated at Woburn and Medford; became a student of natural science, attending the lectures of Prof. Winthrop, of Harvard; sympathized with the early movements for resistance to British oppression, but went over to the British. He went to London, where he gave valuable information to the government as to the state of the colonies. He lived for several years in England, where he continued his studies and was chosen F. R. S. 1778, but returning to the colonies in 1781 he raised a regiment of loyalists; served in the Carolina campaign against Marion 1782. In 1783 he entered the service of the Elector of Bavaria; settled at Munich; acquired great influence with the elector, who took his advice on nearly every subject, made him major-general, councilor of state, lieutenant-general, commander-in-chief of the general staff, Minister of War, and Count of the Holy Roman empire 1790, on which occasion he chose as his title the name of the town in New Hampshire where he had resided and married. Many vigorous reforms were effected by Count Rumford in the Bavarian administration, as well as improvements in military training, in methods of agriculture, stock-raising, and in the practice of mechanic arts. Continuing his scientific studies he published in pamphlets accounts of a large number of scientific experiments, which he collected under the title *Essays, Political, Economical, and Philosophical* (London, 1796, 1798), and several times reprinted; left the Bavarian service on the elector's death 1799; was chiefly

instrumental in founding the Royal Institution in London in that year; settled at Paris and published his *Philosophical Papers* (vol. iv. of his *Essays*, 1802); married the widow of Lavoisier 1804, and spent the remainder of his life in quiet prosecution of his scientific studies at his wife's villa at Auteuil, near Paris, where he died Aug. 21, 1814. He contributed to science a considerable number of valuable observations and discoveries, especially upon his favorite subject, that of heat, of which he came near discovering the mechanical equivalent; made a series of experiments which directly led at a later period to the discovery of the correlation of forces; was also one of the pioneers of modern researches in optics and magnetism; left prizes to be awarded by the Royal Society of London and the American Academy of Sciences at Boston for discoveries on light and heat, and was himself the recipient of the first Rumford prize from the Royal Society; and endowed in Harvard College the Rumford professorship of the physical and mathematical sciences as applied to the useful arts. See his *Life*, by Rev. Dr. George E. Ellis (1871), and his *Works*, edited by the same gentleman (4 vols., London, 1876).

Rūmī, roo-mē′, Jalāl ad-dīn: Persian Sūfī poet and philosophic teacher; b. at Balkh, A. D. 1207. He was descended of high ancestry and his father, Bahā ad-dīn Valad was so famous for his learning and the influence of his teaching as to excite the enmity of the jealous sultan, and to be obliged in consequence to leave Balkh with his family. After various travels he found his way to Asia Minor and settled at Iconium, where he founded a college under the patronage of the Sultan of Rūm, as Asia Minor is termed in the Orient. Hence the appellation Rūmī, by which his more distinguished son is known. Jalāl ad-dīn was an enthusiastic student, and his thirst for spiritual knowledge was fostered under his father's teaching. His father died in 1231, and Jalāl continued under scholarly guidance zealously to pursue his studies, and he succeeded ultimately to his father's chair and to the superintendence of the colleges of Iconium. Sorrow, which came to him in the untimely death of his son and in the sad fate of a beloved teacher, seems to have deepened his religious devotion, to have given tone to his mystic philosophy, and at the same time to have enriched his poetic talents. He became the founder of the Maulavī sect of dervishes, and his zealous devotion to this order seems to have been a source of inspiration for his spiritual and mystic odes. His great work is the *Masnavī*, or *Mathnavī*, a production of high poetic merit, religious fervor, and philosophic thought. It is a huge collection of precepts and tales, and it comprises between 30,000 and 40,000 rhymed couplets. Jalāl ad-dīn Rūmī died in 1273, shortly after the completion of this monument, by which his name is known to fame. His teachings and doctrines continued to be cherished by the Maulavī sect that he had founded, and the leadership of this dervish order has traditionally remained in the direct line of his descendants. There is a versified translation of the first book of the *Masnavī*, by J. W. Redhouse (London, 1881, Trübner's Oriental Series). Selected portions have been rendered into German by Rosenzweig (Vienna, 1838). For other details, see Sir Gore Ouseley, *Biographical Notices of Persian Poets*, pp. 112–116 (London, 1846); H. Ethé, in *Morgenländische Studien*, p. 95, *seq.* (Leipzig, 1870); S. Robinson, *Persian Poetry for English Readers*, pp. 367–381 (Glasgow, 1883).

A. V. Williams Jackson.

Rummell, Franz: See the Appendix.

Rumohr, roo′mōr, Theodor Wilhelm: novelist; b. in Copenhagen, Denmark, Aug. 2, 1807. His romances, of which he wrote a great number, treat for the most part of popular national heroes, such as Niels Juel and Tordenskjold. His collected works, *Fædrelands historiske Malerier* (14 vols.), were published at Copenhagen, 1850–65. D. K. D.

Rump Parliament: the popular name applied in English history to a remnant of the Long Parliament. It consisted of sixty members, who, after the expulsion of three-fourths of that body, Dec. 6, 1648 (known as Pride's Purge), were allowed by Cromwell to carry on the farce of legislation, and cooperated with him and with the army in effecting the trial and condemnation of Charles I. The Rump, having attempted to resist certain encroachments of the army, was dissolved by Cromwell Apr. 20, 1653; was restored by a military movement during the protectorate of Richard Cromwell; was a second time expelled by the army Oct. 13, 1659; reassembled on the advance of Gen. Monk from Scotland 1660, and decreed its own dissolution Mar. 16, 1660.

Rumsey, James: inventor; b. at Bohemia Manor, Cecil co., Md., about 1743; became a machinist; made several improvements in the mechanism of mills; in Sept., 1784, exhibited on the Potomac river, in the presence of Gen. Washington, a boat which ascended the stream by mechanical appliances; in 1785 was granted by the Assembly of Pennsylvania exclusive right for ten years "to navigate and build boats calculated to work with greater ease and rapidity against rapid rivers." A year later he introduced a steam-engine of his own construction into his boat on the Potomac; obtained a patent for steam-navigation from the State of Virginia 1787; published at Philadelphia his *Short Treatise on the Application of Steam* (1788), which involved him in a controversy with John Fitch; organized at Philadelphia a Rumsey Society for the promotion of steam-navigation 1788; went to England soon afterward; organized there a similar society; built a new steamboat; obtained patents in England, France, and Holland, and made a successful trip on the Thames in Dec., 1792. D. suddenly in London, Dec. 23, 1792.

Runcorn: town; in Cheshire, England; on the estuary of the Mersey; 12 miles E. S. E. of Liverpool (see map of England, ref. 7–F). The Mersey is crossed here by a railway viaduct 1,500 feet long and 95 feet above high water. There is a large traffic by the Bridgewater Canal, which enters the river at Runcorn by a succession of locks. The industries include ship-building, rope-making, quarrying, etc. Pop. (1891) 20,050.

Runeberg, roo′ne-bārch, Johan Ludvig: poet; b. at Jakobstad, Finland, Feb. 5, 1804; studied at the University of Åbo from 1822 to 1827. In 1830 he became lector of æsthetics at the University of Helsingsfors, and published his first collection of poems, but removed in 1837 to Borgå, and in 1842 became Professor of Greek Literature at that gymnasium. Although he was born in Finland and spent his whole life in that country, he wrote in Swedish; and although he was liberally supported by the Russian Government, he sang the valor and perseverance of his countrymen in resisting the invading and conquering Russians. The immense popularity which his poems acquired both in Finland and Sweden was principally due to his talent. His genius was lyric-epic, and his lyrical faculty was delicately harmonious. His numerous minor poems evince a strong sense of reality. His idyls, *Hanna* (1836) and *Julqvällen* (Christmas Eve, 1841), and his tales in verse, *Elgskyttarne* (The Elk-hunters, 1832) and *Nadeschda* (1841), are true epics, with a lyrical swing in the outlines. His dramas, of which *Kungarne på Salamis* (1863), a tragedy in antique form, is the most remarkable, contain real characterization. The most celebrated of his works is *Fänrik Ståls Sägner* (Ensign Staal's Tales, i., 1848; ii., 1860), a collection of ballads treating subjects taken from the war between Sweden and Russia, when Finland was conquered by the latter. D. at Borgå, May 6, 1877.

Revised by D. K. Dodge.

Runes [O. Eng. *rūn*, rune, secret, mystery: Icel. *rūn*: O. H. Germ. *rūna*: Goth. *rūna*, secret, mystery; cf. Gr. *ἐρευνᾶν*, track out, deriv. of *ἔρευνα*, search]: the earliest graphic system used among the Germanic tribes. The name rune, first mentioned by Venantius Fortunatus (sixth century A. D.), and most probably older than the letters themselves, may in its first meaning have been applied to the *notæ* of Tacitus (*Germ.*, c. 10), which were cut on staves and used for divination by the priests for sorcery and as charms. Whether the runes were already known at the time of Tacitus is very doubtful, though the Germans were not ignorant of writing; the *litterarum secreta* (*Germ.*, c. 19) refers to secret correspondence. The investigations of Kirchhoff and Wimmer are the only ones that satisfactorily account for the origin of the runes; the Latin alphabet of the early empire is the source of the twenty-four runes of the oldest alphabet. The question as to the date of its introduction is more difficult to settle. The fact that Ulfilas (died 381 A. D.) chose two runic characters in devising his Gothic alphabet justifies us in fixing the date with certainty as early as the close of the second century. That this alphabet was common to all Germanic peoples is proven by the corresponding names of the letters and by the inscriptions on three monuments: the Swedish *bractea* of Vadstena, with twenty-three signs; the clasp found at Charnay, in Burgundy, with twenty runes; and the short sword found in the Thames, containing twenty-eight characters. The first two are the older, and date probably from the seventh century. The latter inscription (about 800 A. D.) slightly deviates from the original order, and shows

some characters of a later Anglo-Saxon alphabet. This had developed out of the general Teutonic system, several signs being modified and others added to suit the phonetic system of the language. In Scandinavia six of the runes were gradually dropped; this later Norse alphabet of only sixteen signs is found in inscriptions beginning with about 850 A. D. Still later (about 1000 A. D.) diacritical marks were added. The form and arrangement of the original alphabet, called *futhark* after its first six letters, are as shown here.

General Teutonic runes.

That the distribution of the runes in sets of eight, as marked in the Vadstena inscription, was original appears, besides, from the fact that one sign had no meaning, and from a peculiar kind of secret writing in which lines and dots noting the number of the row and the position of the character indicated the value of the latter. The form of the runes was to some extent determined by the material employed for inscriptions. Wood seems to have been used first, metal afterward; stone monuments are considerably younger, and occur only in England and Scandinavia. That the runes were not drawn or painted is proven by the etymology of the verb *to write*, O. Eng. *wrîtan* = Germ. *ritzen*, to scratch. This necessitated avoiding curves and horizontal bars along the grain of the wood, and explains the many changes the letters underwent in their transition from the Latin to the runic alphabet. The runes were written from left to right originally; in later inscriptions the letters sometimes run in the opposite direction; instances of boustrophedon (writing alternately from right to left and left to right) occur also. No relics have been found in Central Germany, Austria, and Bavaria. Only two of the few specimens found on the Continent are unquestionably Gothic; one is Burgundian, the others are of West Germanic origin. Of the numerous English monuments none (with the single exception of a coin of about 600 A. D.) is older than the eighth century. The vast majority are Norse, the oldest going back to about 400 A. D. The use of the runes was gradually discontinued after Christian missionaries introduced the Latin alphabet. Otfrid complains of the neglect of the native alphabet; Rabanus Maurus asserts that the runes were used only in pagan rites. England followed in the adoption of the Latin characters; in Scandinavia the runes were preserved longest and used till late in the Middle Ages, especially in rural districts. Here are also found the only MSS. written exclusively in a runic alphabet—e. g. the Schonic laws (about 1300). W. Grimm (*Ueber deutsche Runen*, 1821, and *Zur Literatur der Runen*, 1828) laid the foundation to a scientific study of the runes. A. Kirchhoff, *Das gotische Runenalphabet* (2d ed. 1854), and Z. Zacher, *Das gotische Alphabet Vulfilas und das Runenalphabet* (1855), prepared the ground for L. Wimmer's excellent and exhaustive treatise, *Runeskriftens Oprindelse og Udvikling i Norden* (1874). A German translation by F. Holthausen, with valuable additions, appeared under the title *Die Runenschrift* (Berlin, 1887). The articles by S. Bugge and R. Henning, *Die deutschen Runendenkmäler* (1889), deserve special mention.

H. Schmidt-Wartenberg.

Runjeet' Singh: maharajah of the Punjaub, commonly known as the King of Lahore; b. at Gugaranwalla, Nov. 2, 1780; poisoned his mother when he was seventeen years old, and assumed the government himself. He was faithful to treaties, and was bent not only on conquest, but also on raising his people to a higher standard of civilization. By the aid of French officers he organized and disciplined his army and subjugated the neighboring Sikh chiefs. Those, however, whose dominions were situated between the Sutlej and the Jumna asked for help from the East India Company in 1809, and obtained it. A British army was sent against Runjeet Singh, but a friendly agreement was concluded by which the Sutlej was established as the boundary of his dominions. He then attacked the Afghans, conquered Kashmir in 1819 and Peshawur in 1829, and at his death at Lahore (June 27, 1839) he left an empire comprising more than 20,000,000 inhabitants and a disciplined army of 70,000 men. See H. T. Prinsep, *Origin of the Sikh Power in the Punjaub, and Political Life of Runjeet Singh* (1839), and Sir L. Griffin, *Ranjit Singh* (Oxford, 1892).

Runkle, John Daniel, LL. D.: mathematician; b. at Root, N. Y., Oct. 11, 1822; graduated at the Lawrence Scientific School at Cambridge, Mass., 1851; developed a remarkable talent for mathematics and astronomy: was employed in 1849, while still a student, to assist in preparing *The American Ephemeris and Nautical Almanac*; founded and edited *The Mathematical Monthly* (1869–71); became Professor of Mathematics in the Massachusetts Institute of Technology 1865; was president of that institute 1870–78, and has since been Walker Professor of Mathematics. He is the author of *New Tables for Determining the Values of the Coefficients in the Perturbative Function of Planetary Motion* (*Smithsonian Contrib.*, 1856).

Revised by S. Newcomb.

Running: See Gaits.

Runnymede, or **Runnimede**: a long slip of green meadow stretching along the right bank of the Thames, near Egham, in Surrey, England; memorable as the spot where the signature of King John to Magna Charta (*q. v.*) was extorted by the insurgent barons June 19, 1215. Charter island, in the river close at hand, is sometimes claimed as the locality of this event, it being alleged that the river has since then changed its channel. Runnymede has been from time immemorial noted for the annual Egham horse-races in August, whence some authorities derive the name (i. e. Running-mead).

Rupee [from Hind. *rūpiyah* < Sanskr. *rūpya-*, silver, coin, deriv. of *rūpa-*, form, pattern]: a silver coin current in India. There were a large number of rupees struck by different Indian princes, varying considerably in weight and value. A lakh of rupees is 10,000, and a crore 10,000,000. The rupee is the monetary standard of India, which rests upon a silver basis. The constant fluctuations in its gold value, tending on the whole to a much lower level, led to an agitation to secure stability. After the failure of the international monetary conference at Brussels to secure any change, the Indian Government closed the mints to the coinage of silver (June, 1893). In the budget estimate of 1893–94 the exchange value was taken at 1*s.* 2¾*d.*, and in U. S. money the value was proclaimed by the Secretary of the Treasury as $0.22 on Oct. 1, 1894.

Rupert, or **Robert**, Prince: soldier; b. at Prague, Bohemia, Dec. 18, 1619; son of Frederick V., elector palatine and King of Bohemia, by his wife Elizabeth, daughter of James I. of England; took part in the Thirty Years' war from childhood, having become a colonel of cavalry in active command at the age of eighteen years; was placed in command of a regiment of cavalry at the beginning of the civil war in England, and distinguished himself in nearly all the battles as the most dashing leader of the royalists. At the Restoration he was made a privy councilor and admiral of the fleet; was one of the founders of the Royal Society; first governor of the Hudson Bay Company 1670; governor of Windsor Castle during the later years of his life; spent much of his time in painting and engraving, in experiments in mechanics, chemistry, and alchemy, and has been credited with the invention of mezzotint, of pinchbeck or prince's metal, and of the glass bubbles called Rupert's drops. D. in London, Nov. 29, 1682, and was buried in Westminster Abbey.

Rupert's Drops: See Prince Rupert's Drops.

Rupert's Land: a geographic designation used in the older literature for the region about the southern part of Hudson Bay, being the territory granted by Charles II. to his cousin, Prince Rupert.

Ruphia, or **Rouphia**: river of Greece. See Alpheus.

Ru'pia [Mod. Lat., from Gr. *ῥύπος*, filth, dirt]: a severe and chronic skin disease, usually syphilitic in its origin. It generally begins in blebs filled with a sanious fluid. These finally become ulcers covered by a thick scab. The disease appears in broken-down patients, and is to be met with tonics, good food, cleanliness, the use of iodide of potassium, etc. Locally, the ulcers may be poulticed and then touched with caustic.

Rupture: See Hernia.

Rupture (of the heart): See Heart Disease.

Rurik (Old Norse, *Hrörikr*): founder of the Russian empire, a Varangian from Sweden. Invited by the Slavs living

on the shores of Lake Ladoga, he and his brothers Sineus and Truvor crossed the Baltic and subjugated this region. He soon extended his dominion to the east and south, and in 862 he established himself in Novgorod and ruled the country as absolute monarch until his death, which occurred about 880. His descendants ruled Russia for more than 700 years until 1598, and Russian princes still trace their pedigrees to Rurik. See RUSSIA; also C. C. Rafn, *Antiquités Russes.* RASMUS B. ANDERSON.

Rush [M. Eng. *rusche, rische* < O. Eng. *risce.* Cf. Lat. *rus'cum*, butcher's broom, whence probably the O. Eng. form]: any plant of a family (*Juncaceæ*) of monocotyledonous herbs, of which the genus *Juncus* is the type; also any one of various plants belonging to the *Cyperaceæ* (mostly species of *Scirpus*), with naked, tough, and flexible stems. There are many species, mostly in wet and cold regions. They are employed in making chair-bottoms, mats, etc. Rushes are used in Europe for strewing the floors of cottages instead of carpets. The pith of some kinds is used sometimes for a candle-wick; hence the name rushlight. Most of the numerous species found in the U. S. are also European and Asiatic. *Juncus bulbosus* is the black grass of the salt-marshes, and makes excellent hay. *Scirpus lacustris* is called bulrush in the East, and tule in California, where it covers vast areas of wet land. Revised by CHARLES E. BESSEY.

Rush, BENJAMIN, M. D., LL. D.: signer of the Declaration of Independence; b. at Byberry, near Philadelphia, Pa., Jan. 4, 1746; graduated at Princeton 1760; studied medicine at Philadelphia, Edinburgh, London, and Paris; began practice at Philadelphia Aug., 1769, being at the same time chosen Professor of Chemistry in the medical college of that city; was a member of the provincial conference of Pennsylvania 1776, in which he moved the resolution to consider the expediency of a declaration of independence; was chosen to the Continental Congress to fill a vacancy in June, and was one of the signers of the Declaration of July 4, 1776. He was surgeon to the Pennsylvania navy 1775–76, was appointed in Apr., 1777, surgeon-general, and in July physician-general, of the military hospitals for the middle department; resigned that post Feb., 1778, and resumed his duties as professor and practitioner in Philadelphia; established in 1785 the first dispensary in the U. S.; was a member of the Pennsylvania convention of 1787 for the ratification of the Federal Constitution; published four letters to the people of Pennsylvania pointing out the defects of the Constitution of 1776; sat in the convention which formed the constitution of 1780; exchanged his professorship for that of the theory and practice of medicine on the death of Dr. John Morgan, Oct., 1789; rendered eminent services to humanity during the yellow-fever epidemic of 1793, which were subsequently recognized by testimonials from the King of Prussia (1805), the Queen of Etruria (1807), and the Emperor of Russia (1811); was one of the founders of Dickinson College, vice-president of the Philadelphia Bible Society and of the American Philosophical Society, president of the Philadelphia Medical Society and of the Society for the Abolition of Slavery, and was treasurer of the U. S. mint from 1799 until his death, in Philadelphia, Apr. 19, 1813. From his nineteenth year he was a frequent writer upon professional, scientific, political, religious, social, and ethical topics. Selections from his productions were republished under the title *Medical Inquiries and Observations* (5 vols., 1789–98; 2d ed., 4 vols., 1804; 3d. ed., 4 vols., 1809), and the best of his miscellaneous works were collected by himself into three vols., *Medical Inquiries and Observations upon the Diseases of the Mind* (1812; 5th ed. 1835); *Sixteen Introductory Lectures to Courses of Medicine* (1811); and *Essays, Literary, Moral, and Philosophical* (1798; 2d ed. 1806). He had published an early volume of *Medical Tracts*, and left unfinished a treatise on *The Medicine of the Bible.*

Rush, RICHARD: statesman; son of Dr. Benjamin Rush; b. in Philadelphia, Pa., Aug. 29, 1780; graduated at Princeton 1797; was admitted to the Philadelphia bar 1800; became attorney-general of Pennsylvania Jan., 1811; comptroller of the State treasury Nov., 1811; was Attorney-General of the U. S., Feb. 10, 1814–Dec. 15, 1817, having temporarily acted as Secretary of State in the latter year; was minister to England 1817–25; negotiated treaties respecting the fisheries (1818), the northeastern boundary, the Oregon question, and the slaves carried from the U. S. in British vessels after the Treaty of Ghent; was Secretary of the Treasury under President J. Q. Adams 1825–29; was a candidate for the vice-presidency on the ticket with Adams 1828; negotiated in Holland a loan for the corporations of the District of Columbia 1829; was a commissioner to adjust the boundary between Ohio and Michigan 1835; went to Great Britain in 1836 as commissioner to lay claim in the chancery court to the Smithsonian legacy (see SMITHSON, JAMES); returned with the money Aug., 1838; was minister in France 1847–51, after which he spent his closing years in retirement at Sydenham, near Philadelphia, where he died July 30, 1859. He wrote much in periodicals in support of the war of 1812, against the U. S. Bank, and on other subjects; superintended the publication of an edition of the laws of the U. S. (5 vols., Philadelphia, 1815); edited a pamphlet, *Washington in Domestic Life, from Original Letters and Manuscripts* (1857), and published two volumes of reminiscences of court life in London. His sons published in 1860 his *Occasional Productions, Political, Diplomatic, and Miscellaneous.*

Rushville: town; capital of Schuyler co., Ill.; on the Chi., Burl. and Quincy Railroad; 11 miles N. W. of Beardstown, 50 miles E. N. E. of Quincy (for location, see map of Illinois, ref. 6–C). It is in a coal-mining, grain, and fruit-growing region, and contains a number of manufactories, a State bank with capital of $25,000, a private bank, a public library, and a tri-weekly, a monthly, and two weekly periodicals. Pop. (1880) 1,662; (1890) 2,031; (1900) 2,292.

Rushville: city; capital of Rush co., Ind.; on Flat Rock creek, and the Cin., Ham. and Dayton, the Cleve., Cin., Chi. and St. L., the Ft. Wayne, Cin. and Louisv. and the Pitts., Cin., Chi. and St. L. railways; 39 miles E. S. E. of Indianapolis, 84 miles N. W. of Cincinnati (for location, see map of Indiana, ref. 7–F). It is in an agricultural region; has manufactories of flour, lumber, furniture, bent wood, washing-machines, clay-working machinery, drain-pipe, shirts and trousers, extension-tables, and other articles; and contains electric-light and natural-gas plants, 8 churches, 2 national banks with combined capital of $200,000, a private bank, and a semi-weekly and 2 weekly newspapers. Pop. (1880) 2,515; (1890) 3,475; (1900) 4,541.
EDITOR OF "REPUBLICAN."

Rushworth, JOHN: historical writer; b. in Northumberland, England, about 1607; educated at Oxford; studied law at Lincoln's Inn; began in 1630 to take notes of proceedings in the higher courts and in Parliament; was assistant clerk to the Long Parliament; became secretary to Lord Fairfax; took an active part in negotiations during the civil war; was for many years a member of Parliament, and afterward secretary to Lord Keeper Bridgman, but becoming involved in debt spent his last years (from 1684) in the King's Bench prison, London, where he died May 12, 1690. In 1659 he began the publication of *Historical Collections of Private Passages of State, Weighty Matters in Law, and Remarkable Proceedings in Five Parliaments* (from 1618 to 1648); issued vols. ii. and iii. in 1680, and in the same year his *Tryall of Thomas, Earl of Strafford.* He left in MS. the materials for vols. iv. and v., which were issued in 1692, and for vols. vi. and vii., completing the work, which appeared in 1701. A new and better edition of the whole, together with the *Tryall*, was reprinted in 1721 (7 vols. folio).

Rusk: town; capital of Cherokee co., Tex.; on the St. Louis S. W. Railway; 16 miles S. E. of Jacksonville (for location, see map of Texas, ref. 3–J). It is in an agricultural and iron-mining region; contains a branch of the State penitentiary, the convicts of which are chiefly employed in developing the iron interests of the vicinity; has an iron furnace at the penitentiary and another between Rusk and New Birmingham, and a national bank with capital of $50,000, a private bank, and two weekly newspapers. Pop. (1880) 626; (1890) 1,383; (1900) 527.

Rusk, JEREMIAH MCLAIN: agriculturist; b. in Morgan co., O., June 17, 1830; brought up on a farm; at fifteen became a driver of a stage-coach between Zanesville and Newark; removed to Wisconsin 1853, where he managed a farm and drove a stage; elected sheriff 1855; member of Wisconsin Legislature 1861; enlisted in Twenty-fifth Wisconsin Volunteer Infantry 1862; served to the close of the war, obtaining the rank of brigadier-general; elected State bank comptroller of Wisconsin 1865; re-elected 1867; elected to the Forty-second Congress by the Republicans 1870; re-elected to the Forty-third and Forty-fourth Congresses; elected Governor of Wisconsin 1881; twice re-elected. The

Department of Agriculture was created a month before the inauguration of President Harrison (1889), on whose accession the office of secretary of the department was tendered to Gen. Rusk, who occupied it until the close of the administration. D. at Viroqua, Wis., Nov. 21, 1893. C. H. T.

Rusk, Thomas Jefferson: U. S. Senator; b. at Camden, S. C., Aug. 8, 1802; became a lawyer in Georgia; went to Texas 1835; was a member of the convention that declared Texan independence Mar., 1836; was the first Secretary of War; took command of the army at San Jacinto after Gen. Houston was wounded; became chief justice of Texas; was president of the convention which effected annexation to the U. S. 1845, and U. S. Senator 1846–56. D. at Nacogdoches, Tex., July 29, 1856.

Ruskin, John: art critic; b. in London, England, Feb. 8, 1819; only son of a wealthy wine-merchant, a Scotchman by birth, from whom he derived in childhood a fondness for art, and from whom he inherited a fortune of £200,000, most of which he spent in charities and philanthropic schemes and for the promotion of sound art. He accompanied his father on many of his professional trips through England and Scotland, and afterward on pleasure-tours to France, Switzerland, and Northern Italy, studying architectural remains and mountain scenery, and making drawings after Prout's *Sketches in Flanders and Germany* and the vignettes from Turner in Rogers's *Italy*, a copy of which last had been presented to him on his fourteenth birthday. In 1836 he entered Christ Church, Oxford, where he graduated in 1842, having gained the Newdigate prize in 1839 by a poem entitled *Salsette and Elephanta*. Up to 1846 he continued to write verses for *The Keepsake*, *Friendship's Offering*, and other annuals and miscellaneous periodicals. A collection of his poems was issued in 1850 and another in 1891, but Ruskin's poetry is amateurish and comparatively unimportant.

He first drew public attention by his *Modern Painters* (vol. i., 1843; ii., 1846; iii. and iv., 1856; v., 1860). This was an assertion of the superiority of Turner and his school in the art of landscape-painting to all the ancient masters. The doctrine of the book, and Ruskin's lifelong message in art criticism, is "sincerity." He attacked academic traditions and the imitators of Claude and Poussin, and insisted upon the duty of the artist to render not merely the general but the specific truth of rocks, plants, cloud-shapes, and other landscape details, treating nature with humble and loving fidelity, "selecting nothing, rejecting nothing." In preparation for the later volumes of *Modern Painters* and for the other works that followed the author spent many years in the study of art, residing for protracted periods in Italy, doing a great deal of mountain-climbing among the Alps, and filling his portfolios with sketches. He is an accomplished draughtsman, but has used his pencil almost entirely for the purpose of illustrating his own books on art, among which are *The Seven Lamps of Architecture* (1849); *The Stones of Venice* (vol. i., 1851; ii. and iii., 1853); *Pre-Raphaelitism* (1851); *Giotto and his Works in Padua* (1853–60); *The Elements of Drawing* (1857); *The Political Economy of Art* (1857); several series of *Notes* on the exhibitions of the Royal Academy and the Society of Painters in Water-colors (1855–59); *The Two Paths* (1859); *The Elements of Perspective* (1859); *Lectures on Art* (1870); *Aratra Pentelici* (1872); *The Relation between Michael Angelo and Tintoret* (1872); *The Laws of Fesole* (1877-78); *The Art of England* (1883); *Verona and other Lectures* (1893); besides many notes, reports, and catalogues of Turner's works and of other collections, numerous addresses, and articles in periodicals relating to different branches of the fine arts. In 1853 he delivered a series of lectures on architecture and painting at Edinburgh; was appointed professor at the Cambridge School of Art in 1858; became Rede lecturer at Cambridge in 1867; was elected to the Slade professorship of the fine arts at Oxford in 1869, and re-elected in 1876. He resigned the Slade professorship in 1879, was again re-elected in 1883, and resigned it finally at the end of the following year in consequence of the vote endowing vivisection in the university, a measure against which he strongly protested. See *The Bishop of Oxford and Prof. Ruskin on Vivisection* (1885).

The movement known as Preraphaelitism, was largely due to a study of Ruskin's earlier works, and received his cordial support. (See Prerapiiaelites.) In 1871 he gave £5,000 for the endowment of a mastership of drawing in the Taylor Galleries, Oxford. Since 1860 his writings have taken a wider range, including speculations in ethics, social science, and political economy, with studies in mythology, botany, and miscellaneous æsthetics, set forth in a multitude of little volumes under fanciful titles, such as *Unto this Last* (1860); *Munera Pulveris* (1862–63); *Sesame and Lilies*, one of his most popular works (1865); *The Ethics of the Dust* (1866); *The Crown of Wild Olive* (1866); *The Queen of the Air* (1869); *The Eagle's Nest* (1872); *Love's Meinie* (1873; part iii., 1881); *Proserpina* (1875–86); *Deucalion* (1875–83); *St. Mark's Rest* (1874–84), etc. In these writings the influence of Carlyle is plainly seen. The author denounces competition in trade and the *laissez-faire* theory in government; approves of paternalism and a modified form of state socialism, and praises the guild system of the Middle Ages; declaims against railways, factories, and machinery, and proposes to restore artistic handiwork by trained workmen. From 1871 to 1884 he published a series of letters, at first monthly and afterward at irregular intervals, entitled *Fors Clavigera*, addressed to workingmen, inviting them to join him in establishing a fund for rescuing English country life from the tyranny and defilement of machinery. In pursuance of this object, the St. George's Guild was formed, Ruskin devoting to it £7,000. Trustees were chosen to administer the fund; a building was bought at Walkley, in the suburbs of Sheffield, for use as a museum; and the money subscribed has been used to promote co-operative experiments in agriculture, manufacturing, and education.

Ruskin is one of the greatest modern masters of English prose, especially in the department of imaginative and poetic description. His influence as a thinker has been impaired by his whims and crotchets, his puzzling contradictions, and his over-vehemence of statement. His strong religious feeling has coexisted with heterodox views in theology; his moral earnestness has led him to identify good art with good ethics; while in politics his description of himself as a "king's man" and a "violent Illiberal" has by no means prevented him from holding some very un-Toryish opinions. Later he lived mostly in retirement at Brantwood, a property which he bought in 1871, at Coniston, in the English lake-country. Among his numerous publications should also be mentioned *The King of the Golden River* (1851), a favorite fairy tale which has been through many editions; *Arrows of the Chace* (1880), a collection of his letters in two volumes; and the fascinating but incomplete *Præterita* (1885–89), an autobiography issued in twenty-eight parts. See also *The Life and Work of John Ruskin*, by W. G. Collingwood (2 vols., Boston and New York, 1893). D. Jan. 20, 1900.

Russell, Charles Russell, Baron: jurist; b. at Newry, Ireland, in 1833; educated at Trinity College, Dublin; became a writer of political articles for a Catholic journal. Admitted to the bar in 1859, he won recognition by his keenness as a cross-examiner and power as an advocate, and was appointed a Q. C. in 1872. He sat in Parliament in the Liberal interest from 1880 till 1886, when he was appointed Attorney-General in Gladstone's cabinet, and was knighted. Among the many famous cases in which he has appeared was the Parnell investigation, in which he acted as Parnell's counsel. In 1892 he again became Attorney-General; was one of the British counsel in the Bering Sea arbitration case; became in 1894 a Lord of Appeal in Ordinary (with a life peerage); and in the same year was made lord chief justice and a baron.

Russell, Henry: See the Appendix.

Russell, James Earl: See the Appendix.

Russell, John, R. A.: painter and draughtsman in pastel and crayon; b. at Guildford, Surrey, England, Mar. 29, 1745. He was sent to the studio of Francis Cotes, R. A., in London, and worked under him, as pupil and assistant, until 1767, when he received his first order to paint portraits at Lord Montague's house at Cowdray. He continued work at Guildford, and returned to London in 1768. At this time he was a most ardent religious reformer. In 1770 he was married, and in 1772 was made an associate of the Royal Academy. Little of his painting of this epoch is preserved or is accessible. From the year of his becoming an A. R. A. he exhibited at the Royal Academy every year until his death, often sending the full number of eight pictures. In 1780 he was made an academician. He enjoyed great popularity as a portrait-painter, and obtained prices equal to those paid to Sir Joshua Reynolds, the first portrait-painter of the time and president of the Royal Academy. He published a

work on oil-painting, and one which had a large circulation on pastel, under the title *Elements of Painting with Crayons.* He was greatly interested in astronomy, and drew and engraved a lunar map and also an elaborate machine called the selenographia, for showing the moon's phases. D. Apr. 20, 1806. In the National Portrait Gallery, London, are portraits in oil-color of *William Wilberforce* when a child, and the *Rev. Dr. Dodd*; also a pastel portrait of *Richard Brinsley Sheridan*, the dramatist and orator. At the Royal Academy permanent exhibition is Russell's diploma picture, *Ruth and Naomi*, in pastel. At the South Kensington Museum are several pastel drawings. In the Louvre is a pastel painted in 1781, *A Child holding Cherries.* The greater number of the pictures known to exist are in private collections. A valuable monograph on the artist and his work, with many illustrations, has been published by George C. Williamson (London, 1894). RUSSELL STURGIS.

Russell, JOHN RUSSELL, Earl: statesman; third son of the sixth Duke of Bedford; b. in London, England, Aug. 18, 1792; educated at Westminster School and at the University of Edinburgh; traveled in Spain and Portugal during the Peninsular war 1809–10; entered Parliament as a Whig 1813, representing the family borough of Tavistock; displayed great zeal in his opposition to the Tory ministry and in advocacy of Roman Catholic emancipation and parliamentary reform; became intimate with the literary men of the time; published the *Life* of his ancestor, William, Lord Russell (1819), *An Essay on the History of the English Government and Constitution* (1821), *Memoirs of the Affairs of Europe from the Peace of Utrecht* (2 vols., 1824–29), and several other works; was the parliamentary leader of the great movement which effected in 1828 the repeal of the Test and Corporation Acts, in 1829 the emancipation of the Roman Catholics, and in 1832 laid the foundation of the modern era of English history by the long-delayed victory of the Reform Bill. In 1830–34 Lord John Russell was paymaster of the forces in the Grey administration; was Secretary of State for the Home Department 1835–39, and afterward for War and the Colonies (1839–41) in the second Melbourne ministry, of which he was the leader in the House of Commons. He carried several important measures of reform in regard to ecclesiastical and municipal affairs, education, marriage, and civil and criminal law; was returned to Parliament in the election of 1841 for the city of London, which he continued to represent for many years; was the leader of the opposition to the Peel ministry 1841–45; declared in favor of the immediate repeal of the Corn-laws Nov., 1845, upon which basis he was invited to form a ministry Dec., 1845, but failed through the dissensions of Earl Grey and Lord Palmerston, and had to yield to Sir Robert Peel the honor of procuring the enactment of the repeal. Upon the dissolution of the old Tory party in 1846, Lord John Russell became Prime Minister and First Lord of the Treasury, and conducted the affairs of state through the difficult period embracing the Irish famine, the Chartist agitations, and the continental revolutions of 1848–49. His ministry was overthrown in Feb., 1852, but the Earl of Derby having been unsuccessful in his attempt to carry on the government, the Aberdeen cabinet was formed Dec., 1852, in which Lord John Russell accepted the position of Secretary of Foreign Affairs. He introduced a new Reform Bill 1854; became Colonial Secretary in the first Palmerston ministry Feb., 1855, and soon afterward went as commissioner to the Vienna Conference, intending to put an end to the Crimean war, but lost public favor by his support of the Austrian programme, and retired from the cabinet July 16. In June, 1859, he returned to office as Secretary of Foreign Affairs in the second Palmerston ministry; was elevated to the peerage as Earl Russell of Kingston-Russell July, 1861; favored the cause of Italian unity and independence, and protested against the annexation of Nice and Savoy by France; incurred severe criticism by his course toward the U. S. during the civil war, especially in the Trent and Alabama affairs, as also by his fruitless manifestations of sympathy for Poland and Denmark in their struggles with Russia and Germany. On the death of Lord Palmerston, Earl Russell again became Prime Minister, Oct., 1865, Mr. Gladstone being, however, the real leader of the cabinet, which resigned in June, 1866. After that period he accepted no office, but took an active part in the debates of the House of Lords and devoted himself anew to literature. He edited the *Correspondence of John, Fourth Duke of Bedford* (3 vols., 1842–46), the *Memorials and Correspondence of C. J. Fox* (4 vols., 1853–57), the *Memoirs, Journal, and Correspondence of Thomas Moore* (1852–56) and selections from his own *Speeches and Dispatches* (1870); and wrote the *Life and Times of C. J. Fox* (1859–66), *The Rise and Progress of the Christian Religion in the West of Europe* (1873), and an autobiographical work, *Recollections and Suggestions, 1815–73* (1875). D. at Richmond Park, Surrey, May 28, 1878. Revised by F. M. COLBY.

Russell, JOHN SCOTT, F. R. S.: naval engineer; b. in the Vale of Clyde, Scotland, in 1808; studied at the Universities of Edinburgh, St. Andrews, and Glasgow, graduating at the latter 1824; devoted himself to applied mechanics, engineering, and natural philosophy; delivered a course of lectures on the last subject in the University of Edinburgh in 1832; engaged at Edinburgh in the construction of small steamboats for canal and river navigation, and of steam-carriages which ran upon the common roads between Paisley and Glasgow; introduced the wave system into the construction of ocean steamships 1835; established himself in London 1844 as a builder of the largest class of steamships, and built the Great Eastern, which was designed by Brunel upon his system; read in 1857 to the British Association a paper upon *The Mechanical Structure of the Great Ship*; was one of the founders of the Institution of Naval Architects, of which he was vice-president, and contributed largely to its *Transactions.* He published an elaborate and costly illustrated work, *The Modern System of Naval Architecture for Commerce and War* (1864) and of *Systematic and Technical Education for the English People* (1869). He was well known as a philanthropist. D. in the Isle of Wight, June 8, 1882.

Russell, JONATHAN, LL. D.: statesman; b. at Providence, R. I., in 1771; graduated at Brown University 1791; studied law, but exchanged its practice for commercial pursuits; was an accomplished and effective writer and an active politician; was U. S. minister to Sweden 1814–18; signed the Treaty of Ghent 1814 as one of the five American commissioners, and was member of Congress 1821–23. D. at Milton, Mass., Feb. 19, 1832.

Russell, WILLIAM, Lord: statesman; son of the fifth Earl of Bedford; b. in England, Sept. 29, 1639; educated at Cambridge; entered Parliament 1660; married Lady Rachel, daughter of Thomas Wriothesley, Earl of Southampton, and widow of Lord Francis Vaughan, 1669; first became prominent in 1673 as one of the leaders of the Protestant or "country party," which carried on a vigorous opposition to the unscrupulous measures of the court; proposed in Nov., 1678, the removal of the Duke of York from the royal councils, and on June 16, 1680, appeared before the king's bench in Westminster to present that prince as a recusant, and headed the deputation of 200 members of the House of Commons which carried up to the House of Lords the bill for the exclusion of James as a papist from the succession. When a reaction had set in against the Protestant alarmists, the court determined to be revenged upon Russell, Sidney, and other prominent Whigs, who were accordingly accused by suborned witnesses of participation in the Rye House plot. Arraigned for treason at the Old Bailey, July 13, 1683, Russell was refused counsel, but his wife was permitted to act as his secretary during the trial. Condemned to death and attainted July 14, he was beheaded in Lincoln's Inn Fields July 21, 1683. The trial was in violation of the forms of law, and no evidence was given to prove him guilty of the specific offense charged—i. e. conspiring against the life of the king. His attainder was reversed after the revolution of 1688, and in 1694 his father was made Duke of Bedford, to which title Lord William's son, Wriothesley, succeeded. Lady Russell, born 1636, survived her husband forty years, and died at Southampton House, Sept. 29, 1723. Her *Letters* to her husband were published 1773, became widely popular, and have been often reprinted. See *Life of Lord Russell*, by Lord John Russell, 1819.

Russell, WILLIAM CLARK: novelist; b., of English parents, in New York, Feb. 24, 1844. He spent much of his early life at sea, and afterward resided near Ramsgate, England, and became a contributor to London journals. His published sea stories and novels include *The Wreck of the Grosvenor* (1878); *A Sailor's Sweetheart* (1880); *My Watch Below* (1883); *A Sea Queen* (1883); *Round the Galley Fire* (1883); *Jack's Courtship* (1884); *The Frozen Pirate* (1887); *The Death Ship* (1888); *Marooned* (1889); *The Romance of Jenny Harlowe* (1889); *The Good Ship Mohock* (1895).

Russell, WILLIAM EUSTIS: See the Appendix.


RUSSIA
Scale of Miles
50 100 150 200
Longitude East from Greenwich
ARCTIC OCEAN
KARA SEA
NOVA ZEMBLA
GULF OF OBI
GULF OF BOTHNIA
GULF OF FINLAND
WHITE SEA
LAPLAND
ARCHANGEL
VOLOGDA
PERM
VIATKA
KOSTROMA
YAROSLAV
NOVGOROD
OLONETZ
ESTHONIA
COURLAND
ST. PETERSBURG
URAL MOUNTAINS
Arctic Circle
North Cape
Kanin Nos
Kolgouev I.
Catharine Harbor
Kola
Mezene
Pinega
Onega
Kemi
Uleaborg
Helsingfors
Riga
Reval
Stockholm
Upsala
Gefle
Hernosand
Umea
Tornea
Obdorsk
Berezov
Solvytchegodsk
Ustiug
Tcherdyn
Solikamsk
Perm
Yekaterinbourg
Vologda
Galitch
Kostroma
Yaroslav


PRUSSIA
KONIGSBERG
KOVNO
GRODNO
MINSK
PLOCK
WARSAW
PIOTRKOW
KIELCE
LUBLIN
CRACOW
VOLHYNIA
GALICIA
LEMBERG
PODOLIA
KIEFF
POLTAVA
KHARKOFF
CHERNIGOFF
KURSK
VORONEJ
TAMBOFF
OREL
TULA
KALUGA
SMOLENSK
MOGHILEV
VITEBSK
MOSCOW
VLADIMIR
NIJNI NOVGOROD
PENZA
SIMBIRSK
SARATOFF
ORENBURG
KAZAN
UFA
SAMARA
URALSK
SOUTH RUSSIA
EKATERINOSLAV
KHERSON
TAURIDA
SIMPHEROPOL
ODESSA
KISHINEFF
BESSARABIA
HUNGARY
TRANSYLVANIA
ROUMANIA
BUCHAREST
BULGARIA
CONSTANTINOPLE
KASTAMOONI
BLACK SEA
ARCHIPELAGO
COSSACKS
STAVROPOL
KUBAN
CAUCASIA
CAUCASIAN PROVINCES
KUTAIS
TIFLIS
KARS
ERIVAN
ELIZABETHPOL
BAKU
DERBEND
ASTRAKHAN
CASPIAN SEA
URALSK
Elizabethpol
ELIZABETH POL
Erivan
Baku
S.E. part of RUSSIA
(Same scale)
A 102 B 107 C Longitude East 112 D from Washington E 117
F 122 G H 127 I 132 J

Russell, William Howard, LL.D.: journalist; b. in Dublin, Ireland, Mar. 28, 1821. He was educated at Trinity College, Dublin; went to England in 1842, and after serving as reporter and correspondent to the London *Times*, *The Sporting Magazine*, and *Morning Chronicle*, became permanently attached to the staff of *The Times* in 1847. He was special correspondent of that journal in the Crimea (1854–55), in India during the Sepoy mutiny (1857–59), and in the U. S. during the civil war (1861), where he earned the nickname of Bull Run Russell. He was also war correspondent of the London *Times* in the Franco-German war of 1870, and in 1875 became honorary secretary to the Prince of Wales, whom he accompanied on his visit to India. He has published his Crimean war correspondence (2 vols., 1855–56); *My Diary in India*; *My Diary during the Last Great War* (1873); *The Prince of Wales's Tour* (1877); *Hesperothen* (1882), etc. In 1860 he established *The Army and Navy Gazette*. H. A. Beers.

Russellville: town; Pope co., Ark.; on the Dardanelle and Russellv. and the St. L., Iron Mt. and Southern railways; 75 miles N. W. of Little Rock, the State capital (for location, see map of Arkansas, ref. 2–C). It contains cotton, saw, and grist mills, a national bank with capital of $50,000, a State bank with capital of $28,000, and a weekly and a semi-monthly periodical. Pop. (1890) 1,321; (1900) 1,832.

Russellville: town; capital of Logan co., Ky.; on the Louisv. and Nashv. Railroad; 29 miles W. S. W. of Bowling Green, 50 miles N. by W. of Nashville, Tenn. (for location, see map of Kentucky, ref. 5–E). It contains Bethel College (Baptist, organized in 1854), Logan Female College (Methodist Episcopal South, chartered in 1867), flour-mills, carriage and tobacco factories, 3 state banks with combined capital of $156,000, and 2 weekly newspapers. Pop. (1880) 2,058; (1890) 2,253; (1900) 2,591.

Russia: the largest continuous empire in the world; covers Eastern Europe and Northern Asia; occupies about one-seventh of the earth's total land-surface, and extends from lat. 38° 20′ to 77° 30′ N., and from lon. 17° 38′ E. to 170° W. It has an extreme length from W. to E. of 6,000 miles, and a width from N. to S. of 2,300 miles. It is bounded N. by the Arctic Ocean, E. by the Pacific, S. by China, Independent Turkestan, Persia, Asiatic Turkey, and the Black Sea, W. by Roumania, Austria, Germany, the Baltic, and the Scandinavian Peninsula. Area, 8,645,803 sq. miles (excluding the Sea of Azov, 14,478 sq. miles), of which 6,564,778 belong to Asiatic Russia, including Siberia, Turkestan, the entire region of Caucasus (*qq. v.*), and the Trans-Caspian region, and 2,081,025 sq. miles to European Russia, to which this article is mostly restricted.

Physical Features.—European Russia forms one vast plain, broken occasionally by minor table-lands like the Valdai Hills in Novgorod and Tver, and stretching to the Ural Mountains on the east and the Caucasus in the southeast, which form the conventional division between Europe and Asia. In the Crimea is the isolated chain of the Yaila Mountains, rising at one point 5,000 feet. In the southwest are some slight spurs of the Carpathian Mountains and in the northwest branches of the Scandinavian range. To the north and northwest the plains are marked by immense forests and numerous lakes; to the south by dry and treeless steppes. In the middle, western, and central southern region is the fertile wheat land. From a broad central plateau the country naturally divides itself into the four great basins of the Arctic Ocean, the Baltic, the Black and the Caspian Seas, traversed by the greatest rivers of Europe. The frozen, swampy, sterile basin of the Arctic is coursed by the Onega, Dwina, Mezen, and Petchora. The Baltic receives the Neva, Duna, Niemen, and Vistula. To the Black Sea flow the Pruth, Dniester, Bog, Dnieper, and Don, and into the Caspian empty the Ural and the Volga, which is the great water highway of Russia.

Geological Structure.—This embraces almost every formation, but inasmuch as these cover one another horizontally it is marked by simplicity and immensity. The Tertiary formations cover much of South Russia and extend to Lithuania and Poland. The Silurian system, concealed in large part by more recent deposits, appears on the surface in Esthonia, Livonia, and the district of St. Petersburg. In the north the granite and the Permian formations prevail. The chain of the Ural Mountains exhibits the Silurian group, with eruptions of the most ancient period. The Crimea has the Jurassic formation which, with cretaceous rocks, marks the Caucasus. Carboniferous deposits cover much of Eastern Russia. There are three important coal-bearing regions, the Donetz and Moscow basins and the Urals.

Climate.—Climatic conditions, while exceedingly uniform over wide expanses, nevertheless present great differences in the extremes. Cold winters and hot summers are the rule. The mean temperatures of the hottest and coldest months in the different parts of the country vary as much as 83°. In many localities fluctuations of temperature exceed those in any other part of the earth's surface. There is no portion of the great domain in which tropical plants can be raised, but there is a small area in the south in which the climate corresponds to that of Central Italy or the eastern shore of Virginia. The mean yearly temperature varies from 28·4° F. in the far northeast to 59° on the southeastern coast of the Black Sea, and between 33·8° F. in the government of Perm and 53·6° on the Terek: the January temperature between 3·2° in the governments of Orenburg and Ufa, W. of the Ural chain, and 32° in Crimea; the July temperature from 60·8° in the southern parts of the governments of Archangel and Uleaborg to 77·9° at Astrakhan. A notable climatic condition of Central Russia is that the winter temperature rapidly declines from W. to E.; so marked is this that N. of 50° the temperature sinks faster from W. to E. than from N. to S. The most favored locality of the whole empire in climate is probably the government of Volhynia and adjacent region.

Soil.—In regard to the composition, properties, and fertility of the soil, Russia may be divided into two vast regions by a boundary taking in the main a direction from S. W. to N. E., from Bessarabia to Ufa, presenting, however, considerable deviations, the soil of the southern region sometimes encroaching upon the northern and *vice versa*, and in places each appearing in isolated patches in the midst of the other. The southeastern half is commonly called the region of the Chernoziom or "black earth," the northwestern that of the non-Chernoziom lands. In a botanico-geographical sense this difference in soils corresponds almost exactly to the division of Russia into the steppe (Chernoziom) region and the forest-land region. Within the Chernoziom region there occur considerable areas of gray forest land, also of lime soil, the largest of the latter being in the valley of the Volga below Simbirsk. Salt-marshes occur in patches, and vary in amount of their saline ingredients to such an extent that while some are comparatively fertile others are entirely barren. In the northern region, the non-Chernoziom, all possible soils are found, beginning with a heavy clay and ending with fine sand, including soils so rocky that their cultivation is impossible until after the removal of the stone. Formerly all of this region was covered by forest, and owing to this condition it has undergone less change than that of Southern Russia.

Agriculture.—In the greater portion of Russia the conditions of climate and soil permit of agricultural development. Cotton and rice are among the productions of the empire, and are to be found growing farther N. than in the U. S., or perhaps any other part of the world, appearing above 42° in the Trans-Caucasian region. The cereals can also be cultivated much farther N. than elsewhere on the globe, except Scandinavia. The most valuable portion of the empire is that S. of the Valdai Hills and of Moscow, extending to the Volga on the E. and to the frontier of Galicia on the W., and including the country of the Don almost to the Sea of Azov. The wheat grown in this region is exported in vast quantities to Europe and Asia, and also distributed to the less fertile parts of Russia. Besides wheat, rye, oats, barley, and maize are pretty generally grown, and the products far exceed the home consumption. In the Baltic provinces flax, hemp, and hops are cultivated. In Bessarabia and the Crimea vineyards are maintained with great success, and the vine is much grown in districts far more northern, even where it has to be laid upon the ground and covered in winter. The potato is everywhere raised, and the cultivation of the beetroot, for the manufacture of sugar, has become a very important branch of agriculture. Excellent apples, pears, apricots, peaches, plums, and cherries are grown in Bessarabia, the Crimea, and Taurida. Tobacco is cultivated along the Volga and the Don and in Bessarabia to the average annual amount of 1,280,000 cwt. The amount of the principal crops of European Russia (exclusive of Finland) for the year 1892 was, in quarters: Wheat, 31,519,000; rye, 78,600,000; barley, 22,730,000; oats, 58,087,000; potatoes, 83,207,000; various other crops, 20,292,000. For 1900, according to the estimates of the Minis-

ter of Agriculture, the production was, in thousands of pounds, wheat, 658,824; rye, 1,401,726; oats, 721,562; and barley, 309,475.

The ownership of the 1,098,507,780 acres of land (exclusive of Arctic islands and of 40,925,060 acres forming the pasture-grounds of the Kalmucks and Kirghiz) comprising European Russia proper was in 1892 distributed as follows: The state, 410,801,867; the imperial family, 19,890,835; the peasants, 373,310,496; private owners, 294,504,582. The area unfit for cultivation, in roads, etc., was 210,058,770 acres (19·1 per cent.). The amount of arable land was 287,969,552 acres (26·2 per cent.), orchards, meadows, grazing, etc., 174,958,734 (15·9 per cent.), forest, etc., 425,520,714 (38·8 per cent.).

The raising of stock constitutes a very important branch of farming, sometimes intimately related to agriculture and sometimes an independent and exclusive occupation of the peasant. In the northwestern governments, in the Baltic provinces, and in Finland, the most important branch is the dairy and the fattening of cattle for slaughter. In the southeastern districts and in Bessarabia work cattle and horses are of great importance, but sheep-breeding for wool is also a profitable industry. In Northeastern Russia the breeding of horses for work purposes heads the other departments of stock-raising, but milch cows are also largely raised for the production of high-grade butter and cheese. In the central region the fertility of the soil precludes profitable herding on a large scale, but the breeding of milch cows, the fattening of fine beeves and hogs, and the raising of good trotters and of large draft horses are much developed. In the southern and southeastern steppe districts, and also in the region of the Don, herding is of great importance, owing to the great amount of pasture land, but the most extensive branch there is that of herding fine-wool merino sheep, exclusively confined to rich estates, the peasants raising as a rule only horned cattle. Horse-breeding is also centralized in this region. In 1898 European Russia, including Finland, but not Poland, had 17,004,300 horses, 24,425,300 cattle, 38,140,300 sheep, 9,148,800 swine, 119,800 camels, 1,364,200 goats, and 300,000 stags. The wide range of stock-raising in Russia is indicative of the vastness of the country and the extremes of its climate. Thus while reindeer are largely kept in the north, camels are extensively herded in Caucasia and Turkestan. Of wild animals the ermine, sable, marten, bear, etc., are found in the north (Poland and Lithuania), the wolf, deer, and fox everywhere, and the average annual value of the export of furs is almost $3,000,000.

Forests.—Of the total area of Russia about one-third is forest. The decrease since the nineteenth century began has been about 23 per cent. An important measure was taken by the Government in 1888 for the protection of forests, most of which have been placed under a special committee appointed in each province. The total area of forest in European Russia, Poland, Finland, and Caucasia is 498,177,000 acres. In this forest region of the north there are immense districts in which the only roads are the rivers flowing between interminable walls of trees. The predominating species in this region are the conifers, the pine, and the fir, while in the lesser forests of the south the oak is most commonly to be seen, plentifully interspersed in the east with the linden and in the extreme west and the Crimea with the beech.

Mining and Metallurgy.—The mineral resources are exceedingly great, and the mining industry is carried on with advanced scientific system and very successfully. Prior to the time of Peter the Great only the most primitive beginnings of a metallurgical and salt industry existed, but that monarch gave origin and impetus to the development of the present extensive system, establishing in 1700 the first separate official mining administration, known as the Prikase of Mining Affairs. He founded the mining-college in 1719, and in every way unceasingly fostered the industry. From that time to the reign of Alexander II. the metal interests of the empire underwent various vicissitudes of rise and decadence, and were finally revolutionized by the liberation of the serfs and the consequent modifications of economic conditions. The direction of mining affairs in the empire (exclusive of Finland) is now mainly concentrated in the mining department of the University of State Domains, and this administration directs not only the raising of ores, but also their mechanical, metallurgical, and chemical treatment. The vast salt and petroleum producing industries are excepted from the direction of this department. In the most important branches of mining the figures of production were for the year 1898 (and in some instances for 1897 and 1899) as follows:

PRODUCTS.	1897.	1898.	1899.
Gold, pounds	84,188	85,498	.....
Silver, pounds	10,555	13,098	.....
Platinum, pounds	12,347	13,753	.....
Copper, tons	6,383	6,495	.....
Lead, tons	443	238	.....
Zinc, tons	5,784	5,580	.....
Mercury, tons	.....	357	.....
Tin, tons	2	.....	.....
Pig iron, tons	1,851,000	2,206,000	*2,638,820
Coal, tons	11,031,000	12,051,000	.....
Salt, tons	1,538,000	1,474,000	.....
Petroleum, barrels	.....	62,752,240	68,752,240
Manganese ore, tons	.....	319,400	.....
Chrome iron ore, tons	.....	15,500	.....
Cobalt ore, pounds	.....	5,777	.....
Asbestos, tons	.....	1,640	.....

* Exclusive of Finland, which produced 27,000 tons in 1898.

The number of men employed in mining industries in 1898 was 592,500, showing an increase in twenty years of almost 100 per cent. The coal-mining industry on the Don has grown rapidly, and the district, which produces about one-half the total output of the empire, increased its output more than 100 per cent. from 1884 to 1892. Besides the output of the Don—viz., 3,507,000 tons in the latter year—Poland produced 2,837,300, the Ural region 230,000, Moscow 176,800, and Altai 19,200 tons. The Caspian naphtha (petroleum) industry has also extended rapidly, the output of crude petroleum more than doubling from 1887 to 1892, with a correspondingly great advance in refining.

Manufacturing.—It is only in very recent years that Russia has exhibited strength as a manufacturing nation at all commensurate with her importance in other respects. The patriarchal state of domestic economy under which each family was its own producer and consumer longer held sway here than in most other countries of Europe, and in many places the breaking away was not noticeable until about the middle of the nineteenth century. But the vast and vigorous growth of manufacture began in the decade following the emancipation of the serfs (1861), expanding in the succeeding one in which railway-building was begun on a colossal scale. Manufactures (including mining industries) amounted in value to 905,000,000 roubles ($452,500,000) in 1878, and in 1890 the total valuation of the output reached 1,656,000,000 roubles ($828,000,000), irrespective of the smaller industries, of which statistics are unobtainable. First place among the manufactures of Russia is held by cotton, of which the manufactured output not only supplies the home demand, but furnishes a considerable amount for export. The enormous increase has brought cotton almost into the position of a staple crop in Southeastern Russia in Europe and the Southern Asian regions of the empire, notably Turkestan. The total valuation of the output of this industry in 1890 was 487,100,000 roubles ($243,550,000). The number of spindles in Russia is about one-fourth those of continental Europe and about one-seventh those of England.

The petroleum-refining industry affords perhaps the most interesting figures. Customs protection was granted in the sixties. In 1876 Russia imported a large amount of petroleum products from the U. S., 2,666,666 poods (95,999,876 lb.) of illuminating oil alone. In the eighties the importation ceased, but the export increased, reaching in 1890 1,728,000,000 lb., and the home consumption, which, owing to the high price, reached only 144,000,000 lb. in 1876, rose to more than 1,080,000,000 lb. in 1890 owing to the rapid fall of price.

The beet-sugar industry has reached considerable proportions. In 1891 the growth of beets amounted to 80,000,000 cwt. The manufacture of woolens is sufficiently developed to clothe the army and satisfy the home demand for low-grade goods. Silk is manufactured to the value of $6,955,000; paper, $9,000,000; tannery products, $19,000,000. Of beer there were brewed 99,606,087 gal. Tobacco-manufactures amounted to 34,202,000 lb. (of which 5,882,400 lb. was in cigarettes). The number of flour-mills in the empire in 1890 was 7,003, and they produced 2,462,569 tons of flour, valued at $73,000,000. The total number of manufactories in Russia (exclusive of Poland and Finland) is 65,000, employing about 1,000,000 work-people; Poland has 21,000, employing 142,900; Finland (1890), 6,496 manufactories, employing 59,176.

Trade and Commerce.—The exports of the empire have

increased and the imports decreased since 1870, the former in round numbers $50,000,000, the latter $34,000,000. Exports in 1899 (bullion not included) were valued at $322,634,625; imports, $331,030,670. The average quantity of wheat exported is 35,000,000 cwts.; of rye, 20,000,000; oats, 10,000,000. As to the trade with the U. S., in 1900 Russia's imports amounted to $7,438,317, and her exports to $7,245,973. The greater proportions of trade were with Great Britain (31·7 per cent.), Germany (29·6), France (5·5), Netherlands (5), Austria-Hungary (4·3), while the percentage with the U. S. was only 4·1.

The merchant sea-fleet of Russia numbers 2,143 sailing-vessels on foreign seas. At White Sea ports 396 vessels are registered; at Baltic ports, 586; on the Black and Azov Seas, 773; on the Caspian, 539. The steam merchant fleet on external seas numbered in 1898—on the Baltic, 95 vessels; White Sea, 33; Black and Azov Seas, 263; Caspian, 213. On an average 9,300 vessels leave the ports of Finland every year. The Caspian ports have 20,144 arrivals and in the coasting trade of the ports of the White, Baltic, and the Black Seas the entrances during the year are over 47,000. The interior trade is summarized as follows: Product of manufacturing and mining, $1,242,000,000; breadstuffs, $1,050,000,000; foreign imports, $312,000,000; turn-over for the transport of goods and passengers, $392,250,000—total, $2,996,250,000. The fairs still hold an important position. The greatest of all is the world-famous fair of Nijni-Novgorod, to which there were shipped (and nearly all sold) in 1898 goods to the value of $80,000,000.

Transportation, Rivers and Railways.—In 1900 Russia had 55,000 English miles of navigable rivers and 1,218 miles of canals, and 136,413 vessels and 282,359 rafts were unloaded at the ports upon them; the merchandise transported being 29,003,000 tons, valued at $241,320,538, to which should be added over 7,000,000 tons of lumber.

The first railway in Russia, from St. Petersburg to Tsarskoye Selo and Pavlovsk, was completed in 1836. In 1900 34,485 miles were open for traffic. Of these 20,111 miles belonged to and were worked by the Government; 9,591 miles belonged to public companies; 2,310 miles were unconnected or isolated railways; and 752 miles short local lines. On Dec. 28, 1899, the trans-Siberian trunk from the Lake Baikal to Sryetensk (685 miles) was opened, establishing uninterrupted steam communication between Western Europe and the Russian Empire on the Pacific coast. The trains are transported across Lake Baikal on an ice-breaking ferry-boat. Russian railways in 1898 carried 83,708,100 passengers and 118,106,000 tons of freight, their total gross receipts being $465,741,008, working expenses $277,576,194, and net receipts $188,164,814. In 1898 the length of the state telegraph lines, about nineteen-twentieths of all, was 93,052 miles; and of telephone lines, 35,300 miles.

Population and Political Divisions.—Ethnic Elements.—The general divisions of Russia, having a well understood significance among the people, are as follows: Great Russia, or Muscovy (comprising the whole of the northern and central part of the country); Little Russia, or Ukraine (Kieff, Chernigoff, Poltava, and Kharkoff); New Russia (Bessarabia, Kherson, Taurida, Ekaterinoslaf, and the Don Cossack territory); Red Russia (Lithuania, Volhynia, Podolia, and parts of the present Galicia); White Russia (Vitebsk and Moghilev); Black Russia, or Minsk; and the Baltic provinces (Courland, Livonia, St. Petersburg, and Esthonia. The division into governments, together with the area (in English square miles) and population of each in 1897, according to the imperial census taken on Feb. 9 of that year, is as follows:

DIVISIONS OF RUSSIA—CONTINUED.

GOVERNMENTS.	Square miles.	Population.
I. European Russia Proper—Cont.:		
Minsk	35,293	2,156,343
Moghilev	18,551	1,707,613
Moscow	12,859	2,433,356
Nijni-Novgorod	19,797	1,603,034
Novgorod	47,236	1,392,931
Olonetz	57,439	366,647
Orel	18,042	2,054,609
Orenburg	73,816	1,608,388
Penza	14,997	1,483,948
Perm	128,211	3,002,655
Podolia	16,224	3,031,040
Poltava	19,265	2,794,756
Pskoff	17,069	1,136,580
Ryazan	16,255	1,827,537
St. Petersburg	20,760	2,104,511
Samara	58,321	2,761,851
Saratoff	32,624	2,419,756
Simbirsk	19,110	1,550,458
Smolensk	21,638	1,550,973
Tamboff	25,710	2,715,265
Taurida	24,539	1,443,835
Tula	11,954	1,431,322
Tver	25,225	1,812,559
Ufa	47,112	2,219,838
Vilna	16,421	1,591,912
Vitebsk	17,440	1,502,895
Vladimir	18,864	1,570,730
Volhynia	27,743	2,999,346
Vologda	155,498	1,365,313
Voronej	25,443	2,547,320
Vyatka	59,117	3,082,615
Yaroslav	13,751	1,073,593
Totals	1,887,613	94,188,750
II. Poland:		
Kalisz	4,392	846,334
Kielce	3,897	764,087
Lomza	4,667	585,781
Lublin	6,499	1,152,662
Piotrkow	4,729	1,406,951
Plock	4,200	555,819
Radom	4,769	819,781
Siedlce	5,535	774,139
Suwalkj	4,846	604,973
Warsaw	5,623	1,932,063
Totals	49,157	9,442,590
III. Grand Duchy of Finland (1895):		
Abo-Björneborg	9,335	413,351
Kuopio	16,499	297,120
Nyland	4,586	258,834
St. Michel	8,819	183,811
Tavastehus	8,334	271,943
Uleaborg	63,971	256,730
Vasa	16,084	429,445
Viborg	16,627	372,015
Totals	144,255	2,483,249
Total European Russia	2,081,025	106,114,589

GOVERNMENTS.	Square miles.	Population.
I. European Russia Proper:		
Archangelsk	331,505	347,560
Astrakhan	91,327	1,002,316
Bessarabia	17,619	1,936,403
Chernigoff	20,233	2,322,007
Courland	10,535	672,539
Don, Region of the	61,886	2,575,818
Ekaterinoslaf	26,148	2,112,651
Esthonia	7,818	413,724
Grodno	14,931	1,615,815
Kaluga	11,942	1,178,835
Kazan	24,601	2,190,075
Kharkoff	21,041	2,510,378
Kherson	27,523	2,728,503
Kieff	19,691	3,564,433
Kostroma	32,702	1,428,893
Kovno	15,692	1,549,972
Kursk	17,937	2,394,893
Livonia	18,158	1,300,401

According to this table, 82 per cent. of the population of the empire dwell upon what is approximately 23 per cent. of its surface. The total population of both European and Asiatic Russia is about 129,000,000.

More than 110 nationalities, belonging to the branches and groups of the Mediterranean and Mongolian races, dwell in Russia, and they speak more than forty languages. The Slavs constitute about three-quarters of the entire population, however, and the Russian people proper about two-thirds of the whole. The smaller and exceedingly antipathetic race, the Poles, form about one-twelfth or one-thirteenth of the whole people, and number approximately 8,500,000. A vigorous national policy has been for many years in operation for the Russianizing of the Poles and also the small non-Slavic elements. The principal non-Slavic races are the Fins in Finland, the Germans in the Baltic provinces and Southern Russia, the Tartars, and other tribes of Mongolian derivation in the southwest, and the Jews, supposed to number over 3,500,000, chiefly concentrated in Poland and Western Russia. The Russians themselves are subdivided into Great, Little, and White Russians, the first greatly preponderating, and their tongue being the accepted language of the empire and used by the Government and a great majority of the people.

Government.—The Government is an absolute monarchy. The supreme legislative, executive, and judicial powers are united in the emperor. Their administration is exercised through four great councils. The first is the committee of ministers, each of whom is named by, and responsible directly to, the sovereign, there being no prime minister. The second is the council of the empire. It generally numbers from sixty to seventy members, appointed by the emperor,

including the ministers who have seats *ex officio* and several members of the imperial family. It is a consultative body in legislation, and its chief function is to review projects of laws presented by the ministers, and to consider the annual budget. It is divided into the three departments of legislation, administration, and finance, with a special department for the discussion of appeals to the emperor from decisions of the senate. The third of the councils is the ruling senate, whose members are appointed by the emperor chiefly from persons of high rank or office. While the council of the empire is consultative in its nature, the senate is partly executive and partly judicial. It promulgates the laws and constitutes the high court of justice. Seven of its nine departments are administrative, and two are courts of cassation. The former examine into the general administration, review the acts of governors and settle disputes with the zemstvos. A special department of seven members passes judgment in political offenses. The fourth council is the holy synod, which is composed of the metropolitans and bishops of the Church, and has the superintendence of religious affairs.

For administrative purposes the empire is divided into governments and districts. European Russia proper contains fifty governments, each of which is subdivided into districts varying from eight to fifteen. Poland, Finland, Moscow, Kieff, and Vilna constitute general governments, each composed of a number of the minor governments. Asiatic Russia embraces four general governments, Caucasus, Turkestan, Stepnoye, and Amur, comprising about thirty governments and territories, besides a number of districts which are treated as distinct. Each general government has a governor-general representing the czar, who has supreme direction of civil and military affairs. In the minor governments the governor is assisted by a council of regency, to which all measures must be referred. A council of control is also provided, depending directly on the ministry or Department of General Control. In the frontier provinces military as well as civil governors are established.

In European Russia the local administration is largely in the hands of the people. They do not dwell on scattered farms but are grouped in villages, and each of these villages constitutes a commune or mir, which is the unit of political organization. The number of communes reaches 107,493. The land held by a village is regarded as belonging to the whole community, and is apportioned among the families according to the number of their working units. The communal assembly is composed of all the householders, who elect one of their own number elder (starosta) or executive, and consider and decide all communal affairs. The communes are united into volosts, each containing about 2,000 householders. The volost assembly is composed of delegates from the village communes, one for every ten houses, who elect a volost elder (starshina), and who have the same powers for the volost which the communal assemblies have for the commune. Their freedom is, however, restricted by the supervision of an imperial official. The volost assemblies also choose a peasants' tribunal of several judges, who have jurisdiction of offenses of all classes and of property disputes involving not over 100 roubles. Disputes of larger amount come under chiefs of the districts who are taken from the nobility, and have a certain control over the peasants' tribunals. The system of local self-government is extended measurably to the district and province where the administration of economical affairs is placed in the hands of an assembly called the zemstvo, made up of nobles possessing a certain amount of land and delegates elected by other landed proprietors, by the householders in the towns, and the peasantry. The executive power rests with the uprava, who is nominated by the delegates. The powers of the zemstvos extend to matters of education, roads, saloons, public health, taxation, etc., and in many cases they have done valuable work and shown a progressive spirit; but their independence is affected by the supervision exercised by the governor as the representative of the imperial Government. Of the votes which elect the zemstvos, 64 per cent. belong to the peasants, 12 per cent. to nobles, and the remainder to the clergy, merchant, and artisan classes. Of the delegates elected 38 per cent. by the latest statistics belong to the peasants, and 35 per cent. to the nobles. In Central Russia two-thirds of the executives are nobles and in East Russia two-thirds are peasants.

The cities and towns have a municipal organization similar to that of the zemstvos. All houseowners and taxpayers are enrolled according to their assessment, and are then divided into three classes, each class holding an equal proportion of the total valuation, and each electing an equal number of representatives to the duma, or municipal assembly. The duma chooses the uprava, or executive.

The annual revenue of the imperial Government is about 1,600,000,000 roubles, or $824,000,000, and the expenditures about the same. The chief sources of revenue are the excise on spirits (about $200,000,000), tobacco and sugar, the customs (about $92,000,000) and stamp duties, and returns from state domains. The direct land and personal taxes for the imperial treasury amount to about $25,000,000. The annual receipts of the zemstvos, or provincial assemblies, approach $25,000,000, of which the bulk is in land taxes. The land paying the tax pays an average of 9·6 copecks, or 4·8 cents, per acre. The aggregate expenses of the zemstvos at the last accessible accounts averaged 1·6 roubles, or 80 cents, per male of population. The expenses of the village communes average 1·16 roubles, or 58 cents, per male. The total sum of direct taxes annually paid by the peasants to the imperial treasury amounts to 118,000,000 roubles, of which 41,000,000 are for the redemption of debt for the purchase of land, or about 5 roubles per head of adult males.

Theoretically, each able-bodied male in European Russia (with the exception of doctors, teachers, clergymen, etc.) should serve five years in the active army, thirteen years in the reserve, and five years in the second reserve (Zapas); in practice, however, over two-thirds are enlisted directly in the reserves, which drill six weeks twice a year. The peace footing for the entire empire is nearly 900,000 men and about 160,000 horses; the war footing is over 2,500,000 combatants and 575,000 horses. The navy embraces powerful flotillas on the Baltic and on the Black Sea, and smaller ones on the Caspian and on the Pacific coast of Siberia. See SHIPS OF WAR.

Religion and Education.—The established and official religion of the empire is that of the GREEK CHURCH (*q. v.*) or Orthodox Catholic faith. There are no very accurate figures as to membership in this Church and the various sects, but estimates made with care for 1888 show the number as follows: For Russia proper, Greek Church (without army and navy), 69,808,407; Roman Catholics, 8,300,000; Protestants, 2,950,000; Jews, 3,000,000; Mohammedans, 2,600,000; United Church and Armenians, 55,000; pagans, 26,000. In Poland the adherents in 1890 were: Roman Catholics, 6,214,504; Jews, 1,134,268; Protestants, 445,013; Greek Church (without army), 398,855. The number of Dissenters is estimated to be at least 12,000,000, and it is probable that many of them are wrongly accredited to the Greek Church. They have felt, like the Jews, but far less rigorously, the persecutions of the state and society. With the exception of these two bodies all religions enjoy freedom from restraint. The affairs of the Roman Catholic Church are centered in a collegium, and those of the Lutheran Church in a consistory, both located in St. Petersburg. The Protestants are mainly Lutherans, who came into the empire originally from Germany and are mostly settled in the provinces of the Baltic. The preponderance of the Roman Catholics is in Poland, the Jews inhabit mostly the towns and villages of Poland and Western and Southwestern Russia, while the Mohammedans are in the eastern and southern part of the empire. Besides these there are a great number of small sects, embodying almost every conceivable variety of fantastic fanaticism. See RASKOLNIKS.

The schools of the empire are for the most part under the ministry of Public Instruction, and the empire is divided into fourteen educational districts, corresponding to the large cities, but some special schools are under separate ministries. The money contributed for education in the budget for 1899 was $26,297,364. The educational system is as yet only in a formative condition, and though a good beginning has been made and many excellent schools of the higher class—universities and special schools—are in existence, the general level of education is low. Libraries are not numerous outside of St. Petersburg, Moscow, and Warsaw, but there are valuable ones in those cities, and the Imperial Library in the capital is one of the richest in the world. In the arts, sciences, and literature Russia has developed much that is admirable and exhibited occasionally the finest fruits of genius, sometimes startling and strange, and nearly always vigorous and virile. The press pours forth an immense production of books—10,651 in the year 1894 (exclusive of Finland), with an aggregate of 32,208,372 copies, the preponderance in Russian (8,082), and the remainder in the Polish, Hebrew, German, Lettish, and Estho-

nian languages. Periodicals numbered 743 in 1892 (exclusive of Finland), of which 589 were in the Russian language. The separate publications for 1893 (exclusive of Finland) reached 10,242, of which 33,875,200 copies were printed, and in 1894 there were 779 periodicals.

History.—It was not until the advent of Peter the Great (1689–1725) that Russia really entered the arena of modern civilization, and became a forceful factor in Europe. Its origin lies in obscurity, and for centuries its history consists of faintly traced migrations and conflicts of primitive and rude nomadic tribes and fragments of nations. Four centuries before Christ the Greeks founded commercial stations among semi-savages called Scythians and Sarmatians, whom they discovered upon the northern coast of the Black Sea, along the Sea of Azov, and in the Crimea. There, for 800 years, this barbarous horde hung upon the boundaries of an unknown expanse and the frontiers of the Greek and Roman world. But in the fourth century came other masses of semi-savages, the Goths and Huns, Avars and Alans, who swept over them in successive waves. Then in the sixth century the Slavs appeared on the pages of history. Believed to have been related to the Sarmatians, they occupied the country as far N. as the upper Volga. Encountering the Finns, they drove the major portion toward the Baltic and Arctic, and, absorbing the remainder, developed the composite Russian type with sallow complexion and flaxen hair. Flourishing in power the Slavs founded Kieff and Novgorod, each the capital in time of a principality. After the lapse of a century, which is a blank in their annals, they were overrun by a tribe of the Northmen, the Varangians, called by the Slavs the Rus, from whom the name Russian was derived, first appearing in the ninth century. The Rus dominated both the Finns and Slavs, but the latter, after throwing off the yoke, long suffered from outward attack and internal dissension, and at a crucial moment, to avert anarchy, importuned the Rus or Varangian chief Rurik to become their ruler. He went to Novgorod in 862, and it was he who laid the foundation of the Russian empire, over which his family reigned seven centuries. His cousin and successor, Oleg (879–912), a powerful and wise ruler, conquered Kieff, thus greatly enlarging his dominion, defeated various bordering tribes, and even attacked, with 900 vessels, the Emperor of Constantinople, with whom he concluded in 911 an advantageous peace. Igor, the son of Rurik (912–945), added to the country by conquest, made unsuccessful war against the Emperor of Constantinople in 941, and was killed in battle against the Drevlians, a Slavonic tribe. His widow, Olga, whose name to this day is a national word with the Russians, reigned during the minority of her son Sviatoslaff, and introduced Christianity into the country, she herself being baptized in Constantinople in 957. Sviatoslaff (945–972) remained a pagan, extended the borders of the empire to the Sea of Azov, and in 970 divided it among his three sons, Yaropolk I. (972–980), Oleg, and Vladimir. War arising between the brothers, Oleg was slain, Vladimir fled, and Yaropolk, originally ruling Kieff, reunited the empire, only to be reconquered and put to death by Vladimir, who returned in 980 with a horde of the Rus or Varangians, and became the sole ruler of all Russia. Surnamed The Great because of his conquests and his beneficent measures, he made Christianity the official religion of the empire, founded churches, schools, and new towns, and divided the empire among his twelve sons, who engaged in fratricidal war before the death of their father, after which Sviatopolk (son of Yaropolk I., but adopted by Vladimir) ascended the throne after murdering three of his brothers, only to be deposed in war with another brother, Yaroslaff (1019–54), who succeeded in reuniting and extending the empire by successful wars, and emulated his father's example in reforms. During the next three centuries events led to an ultimate enlargement of dominion, and a more thorough organization of the government, preceded by the breaking of the Russian monarchy into a confederacy, its restoration, the constant struggle of internecine war, and the seizure of large regions of Western Russia by the Poles, Lithuanians, Danes, and the Teutonic knights. The early part of this period was nevertheless one of general progress, and important cities were founded, among them Tver and Moscow, the latter in 1147. But in the beginning of the thirteenth century came the sweeping Mongol invasion from Eastern Asia under Genghis Khan, which the Russians, save at Moscow, could not withstand. This was followed by internal war, famine, and pestilence. In 1230 30,000 men died of the plague in Smolensk, and 42,000 in Novgorod. Then came another Mongol horde demanding tribute, and putting to fire and sword all who failed to render it. In the next century the Russians had gathered strength, and under the Prince of Moscow, Dmitri Donskoi, they repelled the incursions of 1378 and 1380, only to be overwhelmed by the numbers of the invaders in 1382, when Moscow was burned and 24,000 of its people slain. Ivan the Great (1462–1505) so built up the power of arms that the Mongols were defeated, and, decay having set in among them, an era of freedom from their assaults was entered upon, greatly to the relief of the Russians, who began to extend their dominion to the E., conquering Kazan in 1469 and parts of Siberia in 1499. It was under this ruler that one of the fixed features of the "Russian policy," a jealous regard for Constantinople, had its inception. Russia looked to Constantinople as its model of civilization, and took its initiatives in art, especially architecture, in literature, in religion, and in the externals of life, and when that city fell into the hands of the Turks in 1453 Ivan became the devotee of the Byzantine policy, which has influenced all subsequent Russian statesmanship. Ivan IV., The Terrible (1533–84), conquered Astrakhan (1556), the region of the Don Cossacks (1570), and a portion of Siberia (1581), opened a road to Archangelsk, established a printing-press in Moscow in 1569, and did many meritorious acts and a single infamous one, which gave him the surname of The Terrible, namely, the slaying and torture of 60,000 citizens of Novgorod, that city having revolted from his iron rule in 1570. The house of Rurik ceased to exist with the death of Ivan's son Feodor I. (1584–98), believed to have been poisoned, and, after the brief reigns of several rulers and much intrigue, revolution, war, and among other evils a great famine in 1601 by which 100,000 people perished in Moscow alone, the first of the Romanoffs, Michael Feodorovitch, was elected czar by the boyars or noblemen in 1613. He promoted the internal prosperity of the country, revived the long prostrate commerce, and in 1639 extended the borders of the Asiatic possessions to the Pacific. He was succeeded by his son Alexis (1645–76), and his son Feodor III. (1676–82), whose reigns were signalized by many important reforms; and then, after intrigue and conspiracy, in which his sister Sophia sought the rulership, and in fact exercised a regency which her brother overthrew, there ascended the throne as czar the most colossal figure in Russian history, Peter the Great. Within a few years under his guidance Russia became the most powerful nation of Northern Europe, and was recognized as a potent member in the political system of the Continent. Peter was the first to bear the proud title of Emperor of Russia. In 1703 he founded St. Petersburg as the new capital of the empire. In 1696 he took Azov from the Turks; in 1709, by his decisive victory at Poltava over Charles XII., he ended an arduous campaign in the destruction of Sweden's supremacy; in 1721, by the peace of Nystadt, he added Ingria and parts of Karelia, Esthonia, and Livonia to his realm, and in 1723, by his prowess and shrewd diplomacy, secured the provinces of Daghestan and other territory on the Caspian, ceded by Persia. Besides all this he introduced varied internal reforms and improvements of vast extent and importance. His surpassing service, however, was in opening the door of Russia to Western Europe, and putting his people in touch with a civilization superior to the Byzantine standard, which they had long accepted. Never probably in the history of the world were so obdurate and refractory a people absolutely impelled by the will of one man to so great an advance as that which the Russians made under the virile sway of Peter the Great. He died Feb. 8, 1725, but the reforms he instituted, the great public works he began, and the policy he introduced, were carried forward by his successors, for they and the people seemed to have become infused with something of his spirit and energy. Thus Catherine I. (1725–27), Peter II. (1727–30), Anne (1730–41), Elizabeth (1741–62), each contributed something to progress, the last named founding in Moscow the first Russian university, and Catherine II. (1762–96), more than all combined. Catherine was the most picturesque of the rulers of Russia, shrewd, brilliant, capricious, of lax morals and large intellect, cultivating the arts and letters, given to show and also to great enterprises. While surrounding herself with an imposing array of statesmen, soldiers, and courtiers of doubtful repute, she was the professed patron of public morality, and founded innumerable churches, schools, and benevolent institutions; more imperiously despotic than any of her immediate predecessors, she nevertheless convoked an assembly of delegates from all the districts to frame a new and more

liberal code of laws; apparently absorbed in the sensual pleasures of a sumptuous life, and the petty personal intrigues of a corrupt court, she yet accomplished such solidly practical works as bringing 50,000 high-class German and Swiss immigrants into the country. By wars, and by diplomacy which compelled admiration, she acquired 225,000 sq. miles of territory, carrying on simultaneously an immense internal improvement and elaboration of the plan of government. In several successful wars she took from the Turks the Crimea and Azov, with other territories, and in the final dismemberment of Poland (1796) secured to the empire two-thirds of that kingdom. Under her rule Russia made signal advance as an influential power in Europe. Her son Paul (1796–1801) joined the coalition against the French republic, but after the victories of Suwaroff in Italy, followed by disasters on crossing the Alps, the fickle monarch veered to the side of Napoleon. But his rule was unbearable, and he was assassinated. Alexander I. (1801–25), through the shifting scenes of the long Napoleonic struggle, played a leading *rôle* in the European drama, and raised Russia to the foremost place in the continental balance of power. Ardent, impulsive, and impressionable, he conceived large policies, and his imagination was easily moved. Entering the third coalition against Napoleon he shared with Austria the defeat at Austerlitz (1805), where he was present on the field. The fourth coalition with Prussia followed, and after the sanguinary and indecisive battle of Eylau (1807) and the conclusive defeat of the allies at Friedland, Alexander accepted the peace of Tilsit (July 7, 1807), by which he allied himself with his former adversary, and closed the ports of Russia to Great Britain. The two monarchs proceeded as if dividing the world between them, Napoleon to take the West and Alexander the East. Alexander moved against Persia and gained Shirvan. By the peace of Frederikshamn (1809) he acquired Finland from Sweden, and after a war with Turkey added Bessarabia to his possessions. Growing restive under the continental blockade, he broke with Napoleon, and the memorable invasion of Russia in 1812 followed. At the head of more than half a million men Napoleon defeated Alexander at Smolensk, again at Borodino, and entered Moscow, which the Russians themselves then fired and well-nigh burned to the ground. Vainly seeking to negotiate peace he turned in hasty retreat, and began the disordered and appalling winter flight which destroyed his great army. In 1813 Prussia and Austria joined Russia in war against France, and the battle of Leipzig decided the contest, leaving Alexander foremost among the victorious sovereigns, and acclaimed as the liberator of Europe. In the reorganization of European politics through the congresses of Vienna and Aix-la-Chapelle his influence was dominant. He founded the Holy Alliance and became the pillar of reaction against the progressive tendencies of the age. His internal policy experienced a similar change. During his earlier years he had shown a liberal disposition. He sought to improve public education, founded universities, advanced the condition of the serfs, fostered industrial and commercial enterprises, and relaxed harsh political and judicial methods. In his later years, suppression, censorship, and police rigor became the rule. Detested ministers aroused general hostility, and secret societies multiplied. The gay hero of other days became the conscious object of wide discontent, and sank into a morose and dejected state. His death quickened the outbreak of a revolutionary conspiracy, which found its immediate occasion in the change of succession from the elder to the next brother; but the new sovereign, Nicholas I. (1825–55), suppressed it with great vigor, and sternly executed or exiled the chief conspirators. Throughout his reign Nicholas displayed reactionary tendencies. Commanding, imperious, and autocratic, he upheld the principle of absolutism with a resolute hand. In a war with Persia, from 1826 to 1828, Russia completely triumphed, and gained the provinces of Erivan and Nakhitchevan, a heavy indemnity, and the exclusive control of the Caspian Sea. Next came war with Turkey in defense of the struggling Greeks. The alliance of Russia, France, and Great Britain led to the victory of Navarino (1827), annihilating the Turkish fleet. Russia continued the contest, achieved full success, and forced Turkey, through the peace of Adrianople, to cede the mouths of the Danube and pay indemnity. The heroic Polish insurrection of 1831 was energetically suppressed, and followed by measures which reduced the kingdom to a province, stripped of the distinct constitution granted by Alexander, of its own diet and its own army. The policy of Russianizing these and other alien fragments of the empire into a homogeneous people became one of the features of Nicholas's reign. The revolutionary epoch of 1848 emphasized his reactionary spirit. In 1849 he sent a Russian army to aid Austria in crushing the Hungarian revolt. In 1853 Russia's demands for the protection of Greek Christians in Turkey precipitated the Crimean war, wherein Great Britain, France, and Sardinia joined Turkey upon the plea that Russia's demands covered the design of Turkish dismemberment. The defeats of the Alma, Balaklava, and Inkermann, and the siege of Sebastopol, deeply chagrined Nicholas, who died in disappointment, and left the war as a legacy to his son Alexander II. (1855–81), who hastened to bring it to a conclusion.

By the treaty of Paris (1856) Russia relinquished the right to keep war-vessels on the Black Sea, and lost a part of Bessarabia. But during the Franco-German war (1870), when no resistance could be made, she announced her resumption of supremacy on the Black Sea, and Bessarabia was restored by the treaty of Berlin (1878). From the first, Alexander evinced liberal tendencies. He opened the empire more than ever before to the arts, ideas, and civilization of the West. In 1861 he gained the title of The Liberator, by decreeing the emancipation of the serfs. This great reform reconstructed the economic and political relations of the people. The state indemnified the landlords, and the peasants became the collective possessors of the communal land. In 1863 a fresh Polish insurrection was suppressed by Mouravieff with great rigor. Aside from this severity, the reign was signalized by liberal progress and unprecedented material development. Conspicuous among its features was the prosecution of the Russian advance into Asia. In 1858, by treaty with China, Russia acquired all the left bank of the Amur. The capture of Schamyl in 1859 ended the persistent revolt in the Caucasus. A double advance into Central Asia was made in 1863, and in the period from 1865 to 1868 Tashkend, Khojend, and Samarcand successively fell into Russian hands. The Khiva expedition of 1873, ending in the capture of Khokan in 1875, completed the conquest of Central Asia. Outbreaks of the Slavonic Christians within the sultan's domains led Russia in 1877 to war with Turkey. The treaty of San Stefano (1878), which crowned Russia's triumph, modified by the Congress of Berlin, liberated and readjusted the Balkan principalities, enlarging Servia, making Roumania independent, and creating free Bulgaria subject to Turkish suzerainty. The later years of Alexander's reign were marked by the rapid development of Nihilism. His progressive policy, however, continued, and under the influence of the liberal minister Loris Melikoff a constitutional project providing for a consultative assembly of delegates elected by the provincial zemstvos had been signed and was about to be proclaimed by the emperor, when, after four attempts had failed, he was assassinated Mar. 1 (13), 1881. His son and successor, Alexander III. (1881–94), had been consulted as to the proposed project, and had assented, but upon his accession other influences prevailed, and the reform which would have been the first step toward parliamentary government was not promulgated. Melikoff gave place to Ignatieff, and reactionary forces became dominant. Panslavism asserted itself with new vigor. Violent anti-Semitic outbreaks occurred in different parts of the empire, and were followed by the May laws of 1882, which restricted the Jews to the pale of settlement, consisting of fifteen provinces of the southwest, and imposed other restraints upon them. After a short period these laws became obsolete, but in 1890 measures were again taken for their partial enforcement, until the public opinion of other countries remonstrated. Except in minor and spasmodic clashes in Central Asia, the reign of Alexander III. was free from war. In foreign relations he sedulously cultivated peace, and came to be known as the peace-keeper of Europe. He threw off the subserviency to Germany which had marked much of Russian statecraft, and without alienating the friendship of the powers of the Triple Alliance he encouraged France as a counterpoise for peace. In Bulgaria his hand rested heavily on Prince Alexander, who abdicated. In contrast with the policy of his predecessor, he discouraged Western influence, and devoted himself to developing the national spirit of his people. He was a Russian of Russians. He sympathized with the spirit of political and religious reaction, and it stamped the character of his reign. He died Nov. 1, 1894. His son and successor, Nicholas II., mounting the throne at twenty-six years of age, was married immediately after his accession to Princess Alix of Hesse. See Russia, History of, in the Appendix.

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Charles Emory Smith.

Russia Leather: See Leather.

Russian Language: the largest branch of the Slavic family of languages. It is spoken not only by the descendants of the former Slavic population of the great Russian plain between the Carpathians and the Don, between the Black Sea and the sources of the Volga, but also by various tribes of Finnish, Turkish-Tartaric, and Mongolian origin, which have been Russianized through colonization or subjugation. While the Slavs lost ground in Western Europe—namely, in Germany—they made extensive gains in the north and east. None of the alien tribes availed to affect the character of the Russian as a pure Slavic idiom, so far at least as its grammatical organism was concerned, but they have enriched its vocabulary with a considerable mass of loan-words, which are in part universally current. The grammatical type of the Russian remains entirely upon the old Slavic basis both as to sound and form. Dobrovsky was in error in explaining as a Finnism the so-called Russian *voll-laut* or anaptyxis; e. g. *solóma*, straw, Slav. *slama*; *gorod*, city, Slav. *grad*. The Russian has indeed of all the branches departed least widely from the ideal type of the Slavic mother speech—a fact which may have its explanation in the continuous residence in the original home of all the Slavs. All the other Slavic peoples may be regarded as emigrants, at least in comparison with the Russians and their home. A portion of the Poles alone remained as permanently located.

General Characterization.—The Russian language, with its variety of dialects, constitutes a unity distinguished from the other Slavic languages by the following characteristics: 1. It is distinguished from all other Slavic languages by the *voll-laut* (anaptyxis); Russ. *storoná*: all other Slavic languages *strona*, *strana*; Russ. *gólod*: all others *glod*, *glad*; Russ. *béreg*: all others, *brêg*; Russ. *molokó*: all others, *mlêko*, etc. 2. In Russian the two weak vowels (*ŭ*, *ĭ*) of proethnic Slavic are replaced by the vowels *o* and *e*: Russ. *son*, but Polish, Bohemian, Slovenian, *sen*, Servian *san*, Bulgarian *sŭn*. 3. In all Russian dialects the nasal vowels *e*, *a* are replaced by *ja*, *u*, whereas the other Slavic languages yield various different sounds: e. g. Russ. *piat'*: Polish, *piec*: Bohem. *pět'*; South Slav. *pet*. 4. The Russian in all its dialects changes by the so-called dental palatalization *dj* to *ž*, *tj* to *č*, whereas the other Slavic languages show various, in part different, resultants: Polish, *dz–c*, Bohemian, *z–c*, Slovenian, *j–č*, Servian-Croatian, *gj–c*, Bulgarian, *žd–št*; e. g. Russ. *mežá*: Pol. *miedza*: Moravian *meza*: Sloven. *meja*: Serv.-Croat. *megja*: Bulgar. *mežda*; further, Russ. *sviečá*: Pol. *świeca*: Bohem. *svíce*: Sloven. *sveča*: Serv.-Croat. *svijeca*: Bulgar. *svĕšta*. 5. The mobility of the accent, coupled with lack of distinction in quantity, characterizes all the Russian dialects as a whole, in contrast to the other Slavic languages, where in some cases the accentual mobility is lacking, as in Polish and Bohemian; in others the distinction of quantity also appears, as in the South Slavic languages.

The above-mentioned peculiarities, appearing uniformly in all dialects of the Russian, whereas the other Slavic languages in these points follow separate paths, are to be regarded as of characterizing and constitutive value. There are also to be found, of course, phenomena of the Russian which appear either in one or the other of Slavic languages—e. g. in the so-called labialism (*l epentheticum*) the Russian accords with the Servian-Croatian and Slovenian in contrast to the Polish and Bohemian; thus Russian, Servian-Croat., Sloven. *kupljen*: Polish, Bohemian *kupiony*, *kupěný* (*koupený*). By the blending of the two vowels *y* (hard velar) and *i* (soft palatal) in a middle (German) *i* of the Little or South Russian, the Russian agrees with the South Slavic languages, which also ignore the distinction between *y* and *i*. In the same way the hard *e* of Little Russian connects with the similar South Slavic *e*, whereas the Pole pronounces the original *e* much softer even than the Great Russian. Finally, the assibilated pronunciation of the dentals *t*, *d* in White Russian, i. e. as *ts*, *dz*, constitutes a notable connection between Russian and Polish.

It is therefore incorrect to group the Russian with the South Slavic languages into a special southeastern division in contrast with a northwestern division, to include the Bohemian, Polish, Lusatian Sorabian, and the extinct Polabic. Such a dualism can not in reality ever have existed. On the contrary, the Russian presents many indications of close relationship, particularly with the Polish; thus, e. g., in declension the use of the accusative plural for the nominative, in conjugation the loss of aorist and imperfect, the omission of the auxiliary verb *jesm* with the participle in *t* and elsewhere in the predicate. Many of the distinctive terms of civilized life during the fifteenth to the seventeenth centuries entered Russian from the Polish.

The Russian Dialects.—These appear in two unequal groups, the northern, or the Great Russian, and the southern, or Little Russian. The latter is the smaller group. The Little Russians, also called Ukrains or Ruthenes, are distinguished from the Great Russian not only in dialect, but also by various ethnological peculiarities, like costume, household economy, folk-usages, folk-songs, etc. Though dialectal divergences undoubtedly existed among the Russian Slavs from the beginning of the historical period (ninth to tenth century A. D.), yet, owing to the literary domination of the Church Slavonic, only scanty traces of the popular forms of speech appear in the oldest documents (eleventh century). It is certain, however, that a series of characteristic differences between Great and Little Russian owe their extension and establishment to a later period (thirteenth to sixteenth century). Here belongs, e. g., *ê* > Little Russ. *i* (narrow palatal), Great Russ. *e* (palatal); thus Gr. Russ. *d'élo* (pron. *djelo*), *zv'ezdá* (pron. *zvjezda*), *m'éra* (pron. *mjera*), but L. Russ. *d'ilo*, *zv'izda*, *m'ira* (pron. *djilo*, *zvjizda*, *mjira*), etc. Relatively late arose in Little Russian the change of *o* in closed syllable to palatalized *i*. Thus compare Gr. Russ. *dom*, *nos*, *plot*, *rog*, *rod* with L. Russ. *d'im*, *n'is*, *pl'it*, *r'ih*, *r'id*, but in oblique cases, *domu*, *nosa*, *plotu*, *roha*, *rodu*. The period at which L. Russ. obscured the distinction between *y* and *i* can not be determined. Gr. Russ. has *dym*, *ty*, *my* with velar *y*, and *bit'*, *t'icho*, *m'ilost'*, with palatalized *i*, but L. Russ. blends both vowels in an unpalatalized (hard) *i*: *dim*, *ti*, *mi*, *biti*, *ticho*, *milost'*. Genuine *e* is likewise palatalized in Gr. Russ., but hard in L. Russ.; thus Gr. Russ. *t'esat'* (pron. *tjesat'*): L. Russ. *tesati*. L. Russ. generally changes *g* to *h*; Gr. Russ. *noga*, *mnogo*: L. Russ. *noha*, *mnoho*. Besides these differences, which, as universally established, serve to give the Little Russian a distinctive character, there are certain others which may be mentioned; e. g. the L. Russ. mediation between *v* and *u*, pronounced neither as genuine *v* nor as *u*, but more like Engl. *w*; thus Gr. Russ. *vchod*, entrance, and *uchod*, exit become L. Russ. *wchid*. L. Russ. sets often a *v* before initial *o*, or its representative *i*; thus Gr. Russ. *otŭ*: L. Russ. *v'id* or *v'it*; Gr. Russ. *ovcá*: L. Russ. *v'ivc'a*. Fewer are the cases where the Gr. Russ. has departed from the original and L. Russ. has preserved it. Gr. Russ. has gone further in the umlaut of accented *e* to *io*, where L. Russ. has confined itself to the cases after palatals; L. Russ. *ovés*, *orél*, *médu*, *idéš*, *idé*, but Gr. Russ. pronounces *avjós*, *arjól*, *mjódu*, *idjóš*, *idjót*, though writing *oves*, *orel*, etc. The Gr. Russ. departs from the common Russian and Slavic basis in various inflexions, where the palatalization of *k*, *g*, *ch* to *c*, *z*, *s* before *ê* and *î* is relinquished, though kept in L. Russ.

Thus in Gr. Russ. the datives of *nogá*, *ruká* are *nog'ê*, *ruk'ê* (pron. *nogjé*, *rukjé*), while L. Russ. *noz'í*, *ruc'í* abide by the old Slavic *nozê*, *rucê*. Gr. Russ. locative of *duch* is *duch'ê* (pron. *duchje*) : L. Russ. *dus'i*. Gr. Russ. imperative of *ljagú* is *ljagí* : L. Russ. *ljaz'*. The Gr. Russ. has lost the voeat. sing. mase. and femin., while the L. Russ. has kept it; thus Gr. Russ. *drug moj*, *syn moj*, but L. Russ. *druže moj*, *synu moj*; Gr. Russ. *duší moja* : L. Russ. *dúšo mojá*.

On the whole, Great Russian has been more conservative than Little Russian, in part owing to the faet that the former has been more uninterruptedly and strongly influenced by the Chureh Slavonic. Although the Little Russians, like the Great Russians, are adherents of the Greek confession (only a fragment of the Little Russian—namely, in Galicia—holds to Rome), and use the same Chureh Slavonic in the liturgy, yet under the influenee of the Roman Catholie Poles and their higher civilization, which lasted for centuries, the prestige of the Chureh Slavonie yielded much earlier than with the Great Russians, and even as early as the sixteenth century the folk-speech aequired some reeognition. This is particularly true of the Ruthenian dialeet in Galieia, whieh was reeognized in the schools and in official use. In voeabulary and syntax it has been strongly influeneed by the Polish, and differs in many points from the mueh purer and more original Ukrain dialect.

The rivers Pripet and Desna, emptying into the Dnieper, form the northern boundary of Little Russian against the White Russian and Great Russian. The northern line extends on to the Don below the eities Kursk and Voronej, whose vieinity is South Great Russian. S. of this line dwell the Little Russians, stretching W. even beyond the boundaries of Russia into Galieia, and even over the Carpathians into Northeastern Hungary. Farther to the S. they border in Bessarabia upon the Roumanians, the Black Sea forming their southern bounday. They extend on the E. as far as the Don, though here mixed with the Great Russians. They also oecupy, mixed with Great Russians, the districts of Kuban and Tschernomorie to the E. of the Sea of Azov.

The South or Little Russian dialect consists of several closely related varieties. Of greatest extent is the Ukrain variety which covers Podolia and Bessarabia, the provinces of Kieff, Poltava, Kherson, Kharkoff, Ekaterinoslaf, Taurida, part of Voronej, and the lower valley of the Don. N. of this extends the Polesje variety, occupying a part of Volhynia and the provinee Chernigoff. W. of the Ukrain appears the so-called Red Russian (called in Galieia Ruthenian), covering Podolia, Galicia into the Carpathians, and on thenee into Hungary, and Bukovina.

The Great Russian in its widest sense includes the Great Russian proper and the White Russian. The latter forms in some sense a transition to the Little Russian, and is therefore by some authorities regarded as a braneh of Little Russian, while others prefer to treat the White Russian as a third main division. The linguistic facts favor, in the opinion of the writer, the reference of White Russian to the Great Russian group. The characteristic peculiarities of White Russian are, in the voealism, the spread of the vowel *a* or *ia* not only to displaee *o*, but also *e*, generally in unaecented syllables: *zjaljóny* (for *zeljony*), *bjarjóza* (for *b'erjoza*), *sjaljcó* (for *seljcó*), etc.; in consonantism, the pronunciation of soft *d* and *t*, as *dz*, *ts*, as *tsérem* for *t'erem*, *dzévjats* for *djevjat'*, etc.

The White Russians occupy the provinces of Vilna, Vitebsk, Minsk, Moghilev, and also extend into the provinees of Pskoff, Tver, and Smolensk. Physically they are the weakest and most unenergetic of the Russian raee, and until recent years were entirely subject to the dominating influence of the Poles.

The Great Russians proper, the most numerous, the strongest, and the most enterprising Russian tribe, early effeeted from old Novgorod the colonization of the north, and later from Moseow secured the control of all European and Asiatic Russia. They are divided into two groups on the basis of the pronuneiation of the unaeeented *o*-vowel—an *o*-group (northern) and an *a*-group (southern), the former ealled North Great Russian, the latter South Great Russian. The North Great Russians oeeupy the entire north of European Russia down to the provinee of Tver, the greater part of which speaks *o*, then on to the province of Moscow, where only a small territory in the extreme north speaks *o*. Almost the whole of the provinee of Vladimir and the northern parts of Nijni-Novgorod and Kazan are ineluded in the *o*-group; so also the Ural region and parts of Siberia.

The South Great Russians, or the *a*-speakers, occupy parts of the provinee of Smolensk, almost all of Moseow, all of Kaluga, Tula, Orel, Ryazan, Tamboff, Kursk, Voronej (so far as it is Great Russian), the southern parts of Nijni-Novgorod, and Kazan, the provinee of Penza, and also Simbirsk, Samara, and Saratoff.

The ehief differenee between the North Great Russians and the South Great Russians lies in the pronunciation of *o* as *o* by the former, and as *a* (either pure or as *a*°, i. e. midway between *a* and *o*) by the latter. This applies only to unaccented syllables. Cf. N. Gr. Russ. *slóvo*, *máslo*, *zachot'él* : S. Gr. Russ. *slóva*, *másla*, *zychat'él*. The *a*-speakers are distinguished by a broad pronuneiation, whereas among the *o*-speakers the sound *o* is often close, almost like *u*. They are therefore ealled also the Low Great Russians. A further differenee between the two varieties is that unaecented *e* in South Great Russian generally, exeept at the end of words, is pronounced almost as *i*—e. g. *p'iró* for *p'eró*, *v'izú* for *v'ezú*, *p'irichód* for *p'erechód*—whereas in North Great Russian this same unaeeented *e* is freely rendered as *jo*—e. g. *pjoró*, *vjozú*, *sjoló*, *bjodró* (S. Gr. Russ. *s'iló*, *b'idró*); ef. N. Gr. Russ. *jovó* (for *jegó*) : S. Gr. Russ. *jivó*. The North Great Russian exhibits furthermore two features laeking in South Great Russian: (1) Primitive Slavie *ê*, whieh usually beeomes soft *e* in Great Russian, is oeeasionally pronounced in North Great Russian as a soft *i*, just as in Little Russian : *s'íno* for *s'éno*, *sv'íčka* for *sv'éčka*, ete.; (2) the widely spread pronuneiation of *č* as *c* and *c* as *č* : *cort* for *čort*, *colov'ék* for *čolov'ék*, *car'* for *car'*, *cérkov* for *cerkov*. The confusion of the eonsonants is universal in the northern provinces, the old territory of the republie of Novgorod, whereas their correct use is limited to the southern provinees of the North Great Russian territory, viz., Tver, Vladimir, Yaroslav, Kostroma, Nijni-Novgorod, and Kazan.

The Standard or Literary Russian.—Until near the end of the seventeenth eentury, and especially since the establishment of Moseow as a political and religious eenter, it was a generally accepted prineiple that the language of the Church should be regarded as the medium of literature and of all that belonged to the intellectual or higher life. Its poverty in the means of expression oeeasioned, when it was applied to profane purposes—as in civil doeuments, laws, and later, too, in narrative literature—the adoption of popular expressions, construetion, and phrases, even in the face of protest from individual writers. A dualism was not felt and not recognized, even though it may have actually existed. It remained for Russia's great reformer, Peter the Great, to determine the separation of the profane from the sacred literature, and to give it outward indieation through the form of the alphabet. As early as 1697, during his residence at Amsterdam, Peter awarded a Dutch bookseller the privilege of printing Russian books in a style of type varying from the alphabet then used in Russia, and distinguished by a smoothness and roundness of form evidently borrowed from the Latin alphabet. This same form of letter was later introdueed (1707) into Russia itself, and was there (Moseow) reproduced in a sueeessful manner by the type-founder M. Jefremov. The first book printed in Russia in this new "civil type" appeared in 1708 at Moscow—a work on geometry. The czar approved so heartily of the undertaking that in 1710 he examined a colleeted list of letter-symbols and struck out with his own hand those which he did not approve, and gave orders that from that time those which had been approved should be used in the printing of books on historieal and general subjects. The seeularization of the Russian literature in speech and print was thus sanctioned through the all-powerful will of the autoerat. The language was nevertheless for some time subject to great confusion; every man wrote or translated according as knowledge or caprice might admit. Fortunately there arose soon after Peter the Great a second man of genius, who extended to the narrower field of literature and sciene the work begun in the larger field. This literary Peter the Great was a peasant's son from the high north, the academician, poet, physicist, grammarian, and historian, Lomonosov. He rendered to the langnage a serviee the value of which can not be easily overrated. He appreciated how to lead the confused and normless language into the right courses, into a healthy popular form tempered by historical traditions, and, while carrying out the prineiple of Peter the Great, he avoided laying the ban of interdiction upon the hitherto revered language of the Church. He eonceived it as desirable that the language should not cease to draw its nourishment from the rich sources of

the sacred literature. This conservatism framed as it were the golden bridge between the olden time and the new, and served to prevent a radical breach in the connections between the old literature and the new, thus saving the Russian literature from the dangers of dialectal disintegration. A further advance toward the nationalization of the Russian language was made at the end of the eighteenth century through the work of the famous imperial historian Karamzin, especially in his character as writer of love-tales and narratives of travel. Contemporary with him was, among others, the gifted story-teller Krylov. Later phases in the development of the Russian language as well as literature are marked by the famous poet-princes Pushkin and Lermontov, the great humorist Gogol, the exquisite novelist Turgenev, the unexcelled plastic Goncharov, to mention only the most eminent among those no longer living. Thanks to the immense progress made in the eighteenth century, the Russian literary language has become in its inner character truly Great Russian and national, but at the same time has kept itself, by a reasonable adherence to the graphic representation of individual words as historically determined, from decadence into the vulgar types of the separate folk-dialects. As written language, it appears in a form suited to conciliate the differences of dialects, to represent the inheritance of tradition, and so to adapt itself to the acceptance and understanding of all. Through this combination of the traditional form for the eye with the popular spoken form for the ear a relation was established between the written and spoken language similar to that now existing in French and English. Pronunciation is widely removed from orthography. The pronunciation follows the recognized Moscow standard, while the written form is based upon traditions that are centuries old—e. g. the standard pronunciation of the word *orel* is *arjól*, though *orjót* and *orél* are also heard; so *togo* is pronounced *tavó*, or also *tohó* and *togó*; *dobrago* is pronounced *dóbrava*, or also *dóbrogo*, *dóbroho*; and the words *tegkij*, *rubtj* are pronounced *ljockki*, *rup*.

From what has been said it can be readily understood how the separate letters of the Cyrillic alphabet, which were originally adapted to the Old Church Slavonic and then upon Russian soil were forced into the service of representing the Russian sounds, have with time come to possess a peculiar and often highly complicated value or function. For example, after a word ending in a consonant there is still written, in deference to early tradition, a vowel which now represents no sound whatever, but at most indicates the hard pronunciation of the preceding consonant, which even without this letter would be unmistakable. This is customarily called the "hard sign," in distinction from another letter which formerly indicated a narrow vowel between *e* and *i*, but serves as a sign of the palatization of the preceding consonant. Thus the words *dubŭ*, *bogŭ*, *rodŭ*, *mužŭ* are pronounced *dup*, *boh*, *rot*, *muš*, and *vlastĭ*, *znatĭ*, *m'edĭ*, *carĭ* as *vlast'*, *znat'*, *mjet'*, *car'*. The vowel-signs *e*, *i* indicate a soft *je*, *ji* affecting the pronunciation of the preceding consonant. The combinations *da*, *de*, *di*, *do* are not uniform in pronunciation; *da* and *do* have a hard sound, while *de* and *di* are pronounced nearly as *dje*, *dji*, or, more exactly, *d'e*, *d'i*.

The language is still very rich in forms, especially in declension, where six cases are still preserved. The vocative has been gradually eliminated from the literary idiom. In the verb-conjugation the lost tense-forms for aorist and imperfect are replaced by finely differentiated verbal stems; thus "I spoke" is *ja govoríl*, and, with change of stem, "I used to speak" is *ja govarival*. The Russian has in reality only a present tense, which may be made to represent the future or the present (e. g. *idú*, "I go"; *výjdu*, compounded of *vy* and *idu*, is future, "I shall go out"), and a participle inflected in number and gender, which, without the addition of an auxiliary, expresses the perfect; thus *ja p'isál*, "I (have) written" (masc.), *ja p'isála*, "I (have) written" (femin.). Besides these the Russian possesses only the imperative (second sing. and second plur.), the infinitive, and several participles. It is in close correspondence to the positive temper of the Slavic mind that the verb shows a lack in all the various subjective modal-signs, in which regard it is inferior to the Romanic and Teutonic languages. In other respects the Russian syntax is finely elaborated and original, and rich in many marvelous turns and varieties of expression. The modern Russian style, fashioned on French models, is brief and mobile. V. Jagić.

Translated by Benj. Ide Wheeler.

Russian Literature: literature in the language of the Russians. In her literature as in her history Russia has been a late comer into the family of nations, and for the same reasons. At one time but little behind the rest of Europe, she was cut off from the communion of thought and new life of the West by her conversion through Constantinople to the Greek Orthodox form of Christian belief, while her conquest by the Tartars made her a part of Asia, checked or destroyed her beginnings of civilization, profoundly modified her character, and, when the yoke was at length thrown off, left her so far in the rear of other lands that to this day she has not been able to make up all of the lost ground. After the conversion of the country to Christianity the language of the Church was the old Slavonic, a dialect of Bulgarian origin into which Cyril and Methodius, the apostles to the Slavs, had translated the Scriptures, and to suit which they had created the Cyrillic alphabet. This alphabet was taken chiefly from the Greek, with the addition of a few Coptic, Armenian, and Hebrew characters. With modifications it has remained that of the Russians, Servians, and Bulgarians, and the old Church Slavonic has not only influenced for centuries the language of Russia, but is still used for the liturgy. From Greece and Bulgaria a large number of tales and legends were adopted, but the first independent native work which we possess, though it doubtless had predecessors, is the invaluable *Chronicle of Nestor* (latter part of the eleventh century), and this was followed by chronicles of *Novgorod*, *Tver*, *Moscow*, etc., of a similar nature, by the lives of *Saints Boris and Gteb* and of *The Fathers at Kiev*, the *Will of Vtadimir Monomachus* (twelfth century), and the *Memorial of Daniel Zatochnik* (the Prisoner), etc., not to mention the famous *Tale of the Troop of Igor*, of doubtful authenticity. At this time, as for ages after, there existed among the people a great number of poetical tales and legends called *bylini*, most of them revolving about the person of the mythical national hero, Ilĭa Muromets, while others have reference to various historical or legendary events even as late as the invasion of Napoleon. These *bytini*, handed down from one to another by a succession of peasant bards, now nearly extinct, first attracted the attention of literary men about the beginning of the nineteenth century. They have been collected and published in large numbers, though they must differ greatly from their original versions.

During the disastrous period of Tartar domination Russian literature almost disappeared, only gradually struggling into new existence with the liberation of the country. The most important monuments of the time are the *Zadonchina*, an epic poem describing the victory of Dmitriĭ of the Don at Kulikovo (1380), and the *Domostroĭ* (Housekeeper's Manual) of the monk Silvester, the counselor of Ivan IV., the Terrible. Ivan III. had protected the establishment of the first printing-press at Moscow, which began its activity with the Acts of the Apostles and the Epistles of Paul (1564), and in 1581 the Bible was printed in Little Russian at Ostrog in Lithuania. The controversy between Ivan IV. and Prince Lithuania. The controversy between Ivan IV. and Prince Kurbskiĭ, the works of the Croat monk Krizhanich, written in a mongrel jargon meant to be comprehensible to all Slav peoples (about 1665), and a description of Russia by Kotoshikin (about 1666–67), a fugitive secretary from the foreign office, are works of much historical and some literary importance. Meanwhile that part of the country which had been severed from the rest and with the kingdom of Lithuania united to Poland awoke to fresher active life under the influence of the more advanced Polish civilization. Polish attempts to convert the Orthodox to Roman Catholicism, and particularly the propaganda of the Jesuits, led in self-defense and reaction to a study of the Russian language, to the foundation of Russian schools, and to controversial theological works, whose authors could hope to compete with their adversaries only after careful study and training. When in 1667 Kieff was conquered by the Czar Alexis the greater civilization and enlightenment that prevailed there gradually made their influence felt at Moscow. The three chief theologians of the time of Peter the Great—Simeon of Polotsk (d. 1682), Dmitriĭ of Rostov (d. 1709), and Feofan Prokopovich (1681–1736)—were all Little Russians.

Peter himself favored literature, especially when it had practical aims, as an ally in his reforms. He modified and improved the alphabet, encouraged the printing of Russian books, both original and translations, and he even occasionally contributed to the *St. Petersburg Gazette*, the first Russian newspaper, founded under his auspices in 1703.

With his reign the history of modern ideas in his country begins. The peasant Pososhkov (1670–1726) was at the same time an old-fashioned theologian and a liberal political economist. Prince Antiokh Kantemir (1708–44), who passed much of his life abroad, turned out satires in the style of Boileau, which even had the honor of being rendered into French. Vasiliĭ Tatistchev (1685–1750) wrote the first history of Russia; Trediakovskiĭ (1703–69) translated much and made a guide to versification, while unable to write good poetry himself. Far more important than any of these was Lomonosov (1711–65), not so much as an author, although he tried his talents at literature of many sorts, but as a grammarian and literary lawgiver. The language of Russian books was still under the yoke of the church Slavonic, and teemed with archaic expressions, while Western words, brought in with Western ideas, added to the general confusion in which there were no accepted models to follow. Lomonosov, in his grammar (1755), laid down the laws for all to obey, his own varied works served as examples of at least grammatical correctness, and by his successful introduction of tonic instead of the previous syllabic versification he brought Russian poetry back to the form suited to the natural genius of the language. The period that followed was very creditable, although few of the works then written are read to-day or possess originality. French influence and taste, then dominant in all Europe, were nowhere more supreme than at St. Petersburg. Sumarokov (1718–77), the first in his country to have no other profession than that of author, besides shorter poems, composed many stiff tragedies in alexandrine verse; Kniazhnin (1742–91), Kheraskov (1733–1807), and others followed in the same vein, and the last named likewise composed a ponderous epic, the *Rossiada*; von Vizin (1744–92) wrote two really good comedies, *Nedorosl* (the Minor) and *Brigadier*; Kniazhnin, with his *Khvastun* (the Boaster), etc., Kapnist (1757–1824), with his *Iabeda* (Calumny), succeeded nearly as well; and the Empress Catherine II. herself showed cleverness in one or two light satirical plays. Khemnitser (1745–84), and later Dmitriev (1760–1837), were successful writers of fables; Bogdanovich (1743–1803) gained a great reputation by his poem of *Dushenka*, though he ranks below Derzhavin (1743–1816), the greatest lyric poet of Russia of his time, and entitled to an honorable place among European writers of the century. He is best known for his stately if frigid odes, one of which, the *Ode to God*, was translated into many languages, including Chinese and Japanese, and hung up in a temple at Peking. The most important prose-writers of the same date were the Freemason publisher and bookseller Novikov (1744–1818), and Radistchev (1749–1802), author of the *Journey from St. Petersburg to Moscow*.

The last years of Catherine's reign were marked by a reaction against everything that savored of liberalism, and from then till after the fall of Napoleon the literary movement was less active. The most important figure was Karamzin (1766–1826), who did for Russian style much what Lomonosov had done for grammar, discarding antique forms, clumsy expressions, and foreign interpolations, besides furnishing by his own productions models for others to study and profit by. He was a many-sided writer, whose most famous works are his *Letters of a Traveler*, his sentimental novel *Bednaia* (Poor) *Luisa*, and especially his great *History of Russia*. He also founded the *Vestnik Evropy* (Messenger of Europe), still perhaps the best magazine in the empire. In his political ideas he was national and conservative, and may be looked on as an ancestor of the modern Slavophils. In this same transition period we find the dramatist Ozerov (1770–1816), whose plays, though still following for the most part the approved rules of classical tragedy, show the beginnings of the new romantic spirit.

The Romantic School.—The romantic school arose at about the same time in Russia as in other countries. The impulse to it came from abroad, especially from Germany and England. Goethe, Schiller, Shakspeare, and later, above all, Byron, displaced the French models of the previous generation. The great champion and genius of the new movement was Alexander Pushkin (1799–1838), the initiator was his friend Zhukovskiĭ (1783–1852), who has left comparatively few original works, but a great number of excellent translations, which made known to his countrymen many of the masterpieces of foreign literature. His friend Kozlov (1779–1840) did much the same thing with less success, while Batiushkov (1788–1855), who early became insane, was the author of a few remarkable poems that imitate the plastic perfection of classic masters. Griboedov (murdered in 1829 when ambassador at Teheran) left behind a comedy, *Gore ot Uma* (Trouble from Cleverness), which ranks with the first of its kind in all literature. The war against Napoleon had caused a general awakening that usually took on a patriotic or liberal form. The former characteristic brought about the discovery and study of the old national *bylini*; the latter led to the December rising at the accession of Nicholas I. The young poet Ryleev (1795–1826) was hanged with others of the chief conspirators, while his friends, the critic and story-teller Bestuzhev (pseudonym *Marlinskiĭ*, 1795–1837) and the poet Prince Odoevskiĭ (1802–39), were banished to Siberia and the Caucasus. Only a fortunate absence from St. Petersburg preserved Pushkin from being in the plot. He, too, had to suffer banishment from the capital on account of his liberal ideas, but his genius gained by the change of scene and particularly by his visit to the Caucasus. His first poem, *Ruslan and Liudmila*, like Victor Hugo's *Hernani*, in France, started a great controversy which resulted in the complete triumph of the romantic school. Pushkin's style both in prose and poetry approaches perfection. His shorter poems were the delight of his own and succeeding generations; his *Kapitanskaia Doch* (The Captain's Daughter) served as a model of a story; his *Boris Godunov* (Eng. trans. of parts by N. H. Dole in *Poet Lore*, Boston, No. 2, 1889: Nos. 3 and 11, 1890; Nos. 8 and 11, 1891) founded genuine Russian tragedy; his *Evgeniĭ Onegin* (Eng. trans. by Lieut.-Col. Spalding, London, 1881) is a long poem recalling *Don Juan* and *Beppo*, with passages of great beauty and still oftener of brilliant wit, and has a hero who can be looked on as the ancestor of the realistic characters of later writers. Around Pushkin gathered his friends and disciples, the poets Delvig (1798–1831), Baratynskiĭ (1800–44), Iazykov (1803–46), Venevitinov (1805–27), Gnedich (1784–1833), the translator of the *Iliad*, and the unfortunate Polezhaev (1807–38). The greatest of Pushkin's successors was the passionate and unhappy Lermontov (1814–41), the embodiment of the Byronic spirit, which he did not live long enough to outgrow. The most combative member of the romantic school was N. Polevoĭ (1796–1846); its great critic Belinskiĭ (1810–48). The poet Tiuchev (1803–73) was its last distinguished survivor. Contemporary with it, but not belonging to it, were the peasant poet Koltsov (1809–42), and the writer of fables Krylov (1768–1844), who has no equal of his kind except La Fontaine.

The realistic movement begins with Gogol (1809–52), the first of the great Russian novelists. His comedy the *Revisor*, his shorter stories, and his *Mertvyia Dushi* (Dead Souls) are among the masterpieces of literature. No countries, except Great Britain and France, can compare with Russia for the number and genius of her novelists and story-tellers of both the first and the second rank. Almost contemporary with Gogol we find the later Nihilist Alexander Hertzen (1812–70), whose chief novel, *Kto Vinovat?* (Whose Fault?), is a plea for free love; and the series of novelists continues uninterrupted to the present day. Three names stand out above all others: Turgenev (1818–83), Dostoevskiĭ (1822–81), and Lev Tolstoĭ (b. 1828). Not far behind them come Goncharov (1814–91), the author of *Oblomov*, *Obyknovennyia Istoria* (A Common Story), etc., and Pisemskiĭ (1820–81), from whose works all traces of ideal have disappeared; and then numerous men of second rank like Pisarev (1840–68), Vasiliĭ Krestovskiĭ (b. 1840), Potekhin (b. 1829), etc. Most of them have also written short stories. Among the many especial story-tellers mention might be made of Sollogub and Gleb Uspenskiĭ. As a satirical writer Soltykov (pseudonym *Stshedrin*, 1826–89) has no rival but Heine in the nineteenth century. Chernyshevskiĭ's famous romance *Shto Delat?* (What is to be done?) has less literary worth than value as the gospel of the earlier Nihilists. Among the most recent writers are Garshin—a disciple of Tolstoĭ—and the Little Russian Korolenko. The poets of the latter part of the nineteenth century have not equaled those of the earlier. The greatest of them was Nekrasov (1822–77), a champion of the poor and oppressed. Many of the most recent ones, however, without attaining the first rank, have written fine things. Among them are Khomiakov (1804–60), the Panslavist; Maïkov (b. 1821), distinguished by the beautiful finish of his verse; Shenshin (pseudonym *Fet*, b. 1820), a singer of love and nature; the melancholy Polonskiĭ (b. 1820); the peasant poet Nikitin (1824–61); Meĭ (1822–62); Stcherbina (1821–69); Plestcheev (1825–93), etc. One of the most promising of the younger poets to-day is the Grand Duke Konstantin Konstantinovich, who writes over the signature K. R. In tragedy the

first plaee belongs to the trilogy on the *Death of Ivan the Terrible*, by Alekscï Tolstoï (1817–75), and to two lyrieal dramas of Maïkov. Ostrovskiï (1824–86) has been the most remarkable and fruitful of the dramatists of popular life, but Pisemskiï, Turgenev, Lev Tolstoï, and others have also been sueeessful in this way. The literature of translation has also gone on inereasing, almost every Russian poet having added his quota, until it is doubtful if any other language possesses sueh fine reproduetions of the works of foreign genius.

History.—In the domain of history Karamzin has found worthy sueeessors, who, if they have not equaled him in brilliancy of style, have attained greater scientific aeeuraey. Russian historians have not as yet distinguished themselves greatly in treating of other eountries, but they have thoroughly investigated and satisfaetorily elueidated the story of their own, in spite of the jealous restraint of the eensorship, whenever they eome to deal with anything like reeent times. Kostomarov (1817–85) was perhaps the ablest of them, his longest work being his unfinished *History of Russia in Monographs* (13 vols.). Solovĭev (1820–79) left twenty-nine volumes, whieh will serve as a mine to future historians rather than as a book for the use of the public. Ustrĭalov and Bestuzhev-Rĭumin have likewise written general works, and many others have taken up particular subjects. Geography, ethnography, law, and seientifie topies have attracted an inereasing number of talents, and many foreign works in all these fields have been translated. Lev Tolstoï and others have dwelt on religion and morals. P. Polevoï, O. Miller, Galakhov, Pypin, ete., have treated of the history of language and literature.

Journalism.—In spite of the rigid wateh of the eensors, whieh, however, has varied very much in intensity at different times, Russian journalism has had a vigorous and exciting if eheekered life. In the newspapers, and still more in the magazines, all the literary and many of the politieal questions of the day have been ably and hotly discussed. The two great parties in the main have been the Slavophils, who have tended to ultra-nationalism in Chureh and state, to Panslavism, to distrust of Western Europe, and the Zapadniki, or Westerners, whose name indieates their more foreign and liberal tendeneies. The former have usually had the upper hand. Between 1855 and 1860 the *Kolokol* (Alarm Bell), published in London by the Nihilists Alexander Hertzen, the poet Ogarev, and others, penetrated into Russia by secret means in great numbers, and exereised mueh influenee even in the palaee of the emperor. It lost its authority by espousing the eause of the Polish rebels in 1863, when the position of leader of publie opinion was taken by the editor of the *Moskovskyĭa Vedomosti*, Katkov, the apostle of reaetion and nationalism. The Panslavists, headed by the brothers Aksakov, followed in the main the same aims, and it was they who sueceeded in foreing the Government into the war of 1878. Among the most important journals in Russia to-day are the *Novoe Vremĭa* (New Times), *Novosti* (News), *Grashdanin* (Citizen), *Petersburgskyĭa Vedomosti* (Petersburg Gazette), and the weekly *Nedetĭa* (Week), all in St. Petersburg; and the *Moskovskyĭa Vedomosti* and *Moskvitĭanin* (Museovite), both in Moscow. Perhaps the two best magazines are the *Vestnik Evropy* (Messenger of Europe) and the *Russkiĭ Vestnik* (Russian Messenger).

The literature of Little Russia eoineides in its first period with that of Great Russia, and its separate existence begins only with the annexation of Little Russia to Lithuania and Poland. In its seeond stage it was represented by theological writings, mysteries, educational works, annals, etc., besides a mass of popular songs and legends; Russia and Poland showed themselves equally hostile to it. The third and present period is hardly older than the nineteenth eentury. Ivan Kotlarewskij (1769–1839) was the first to make it a modern literature. He was the author of a travesty on the *Æneid* and two dramas, *Natalka Poltawka* (Natalie of Poltava) and *Moskal Czariwnik* (The Soldier as a Magieian). Kwitka (1773–1848, best novel *Marusja*), Wowezok, Kulisz (b. 1819), and numerous others eontinued the work, but the greatest of all was the poet Shevchenko (*q. v.*; 1814–61). In 1876 the imperial Government entirely forbade the printing of books in Little Russian, sinee which time literary produetions in that tongue have been eonfined to the Austrian province of Galieia, whose eastern part is inhabited by members of the nationality. They have produced many writers, though none of extended reputation. The popular poetry of the Little Russians is among the riehest and most interesting in the world. The first place belongs to the *Dumy* or historical songs whieh tell of the heroie times of Cossaek adventure. Tales, legends, proverbs, etc., are also numerous, and many of them have been colleeted. See, above all, the first volume of the *History of Slav Literature*, by Pypin and Spasovich (1879 in Russian, German trans. 1880).

The literature of White Russia eonsists of sareely more than a few songs and proverbs.

See in Russian the works of Belinskiï, Galakhov, P. Polevoï, and many others. The best eomplete history of Russian literature in any Western language is that of Reinhold in German (Leipzig, 1886); the little French one of Courrière (1874) is not without value. Specimens of many kinds with biographieal notes can be found in *La Littérature Russe*, by L. Léger, 1893. For the earliest times, Rallston's *The Songs of the Russian People* (1872); Miss Hapgood's *Epic Songs of Russia* (1886); Morfill's *Slavonic Literature* (1883); and Rambaud's *Russie Épique* (1876) may be eonsulted; for a few modern novelists, Melehior de Vogüé, *Le Roman Russe*, and Ch. Dupuy, *Great Masters of Russian Literature* (Eng. trans. by N. H. Dole, 1885). For examples of poetry, see Bowring's *Russian Poets* (2 vols., 1821–23), *Russian Lyrics in English Verse*, by C. T. Wilson (1887), *Rhymes from the Russian*, by John Pollen (1891), and Lermontov's *Demon*, by F. Storr (1894); for Pushkin alone, *The Bakchesarian Fountain* (trans. by W. D. Lewis, Philadelphia, 1849), Ivan Panin's *The Poems of Alexander Pushkin*, and artieles in *Blackwood's Magazine* (June, July, and Aug., 1845), and in *The Westminster Review* (Apr., 1883). Turgenev, Dostoevskiï, and L. Tolstoï have been translated into English, as have a few prose works of other writers, but more authors have been rendered into Freneh or German.

Archibald Cary Coolidge.

Russ'niaks, or **Red Russians**: See Ruthenians.

Russo-Turkish War: a confliet between Russia and Turkey in the years 1877 and 1878.

Causes.—The true eause of the war was Russia's long-cherished desire to acquire territory in the Balkan peninsula, with a view to bringing her nearer to the ultimate objeet of her Eastern policy, the possession of Constantinople. The proximate eause, however, was the trouble between the Porte and its Christian subjeets. In the summer of 1875 Turkish oppression provoked a revolt of the Christians of Bosnia and Herzegovina, who were privately aided by Servia and Montenegro. Disturbed by these troubles on her frontier, and sympathizing with the Christians, Austria negotiated with Russia and Germany for the adoption of a eommon poliey toward the Porte, and the three powers agreed to demand of Turkey the introduction of important reforms in her government of the Christian provinees, and the formation of a eommission eomposed equally of Christians and Mohammedans to see to the exeeution of these reforms. These demands, embodied in the so-called Andrássy note, which was supported by Great Britain and Franee, were aeeepted in all essentials by the Porte; but the insurgents, distrusting all promises till steps were taken toward their fulfillment, eontinued under arms. The eonfliet was renewed, and the fanatieal fury of the Turks showed itself not only against their Christian subjects but against the foreigner. While another eonference of the three Eastern powers was in session in Berlin, news arrived of the murder of the Freneh and German eonsuls at Saloniea by the Turks. Angered by this outrage, the conferenee drew up the Berlin memorandum demanding an armistiee of two months and the immediate appointment of the eommission deseribed in the Andrássy note. Franee and Italy eoneurred in this aetion, but Great Britain refused it her support. The Turkish massacres in Bulgaria, involving, it was said, not less than 12,000 victims, roused universal sympathy with the Christians, and caused a revulsion of feeling in Great Britain; but Beaeonsfield kept his Government from favoring any projeet for foreing reforms upon the Porte. Servia and Montenegro deelared war. Russia, determined on war if the eoneerted action of the powers failed of effect, formed the Treaty of Reichstadt with Austria (July 8, 1876), stipulating that the latter power should obtain Bosnia and Herzegovina if Russia undertook to liberate Bulgaria. At the instance of Great Britain another eonferenee was held at Constantinople, demanding of the Porte the exeeution of the reforms, but Turkey still remained obstinate. One final effort was made by the powers in the London protoeol Mar. 13, 1877, and upon the Porte's rejeetion of this Russia declared war Apr. 24, 1877.

The War.—Underestimating the strength of their enemy the Russians entered upon the campaign with inadequate

forces. After gaining a few successes in Armenia they were forced to retreat toward their own frontier. In the Balkan peninsula they divided their forces in Bulgaria, and though they gained possession of Nicopolis, Lovatz, and other places, garrisoned them by weak detachments, and allowed the approach of a Turkish army, 35,000 strong, under Osman Pasha, to escape their notice. In the first battle of Plevna (July 20) the Russians were defeated with considerable loss; in the second (July 30) they fared still worse, leaving a fifth of their number on the field. Gourko, who had led a Russian division beyond the Balkans, was forced to fall back upon Shipka Pass, where he was attacked by superior forces, and saved only by the timely arrival of re-enforcements. Russia now raised fresh troops and obtained aid from Roumania. After regaining Lovatz the allied Russians and Roumanians attacked Plevna, but though they succeeded in capturing one of the fortresses the attack on the inner line of defense was repulsed with enormous losses (Sept. 11–12). Public opinion laid the blame of these disasters upon the Russian headquarters, for both officers and men had acquitted themselves well on the field of battle. Todleben, the defender of Sebastopol, was now placed in control of the operations around Plevna. Cut off from all supplies, the Turks made a last desperate effort to break through the Russian lines on Dec. 10, but failed, and were forced to surrender. The victors crossed the Balkans, captured one Turkish army at Shipka, routed another on their way to Adrianople, and entered the latter city on Jan. 22, 1878. The Porte had already begun to negotiate for peace, and on Jan. 31 an armistice was granted by the Russians.

Results of the War.—Great Britain's dread of Russian designs on Constantinople led to the dispatch of a British fleet to that city, and brought the two nations to the verge of war. Nor were matters improved when the terms of the treaty of San Stefano (Mar. 3, 1878) between Russia and Turkey became known. By these, Bulgaria, with its territory enlarged so as to include the greater part of European Turkey, was to constitute an autonomous tributary principality, whose prince, elected by the people, was to be confirmed by the Porte. A Russian commissioner, holding office for two years, was to superintend the introduction of the new system, and a Russian army was to occupy the country for the same period. Improvements were to be introduced in the administration of Epirus, Thessaly, and the other parts of European Turkey for which the treaty did not provide a special constitution; also in Armenia, whose inhabitants were to be guaranteed security from Kurds and Circassians. In lieu of part of the war indemnity claimed by Russia she was to receive the districts of Kars, Ardahan, Batoum, and Bayazid in Asia, and the Dobrudscha in Europe, but the last-named district was to be ceded to Roumania in return for Bessarabia. Russia still claimed a balance of 3,000,000 rubles. A European congress was proposed, to be held in Berlin, but, to the chagrin of Great Britain, Russia denied the right of such a congress to decide finally upon the articles of the treaty. War seemed more imminent than ever, but at length Russia consented to certain modifications of the treaty, and the congress was opened on June 13. The work of the congress was embodied in the Treaty of Berlin (July 13), by which Bulgaria was limited to the country N. of the Balkans, the Russian commissioner was shorn of his powers, the portion of Bulgaria S. of the Balkans was formed into the autonomous province of Eastern Roumelia, subject to the direct authority of the sultan, and the Russian occupation was limited to nine months. Austria gained Bosnia and Herzegovina, and Turkey retained Bayazid. The powers recommended that Turkey should cede Thessaly and part of Epirus to Greece, a recommendation subsequently acted upon by the Porte. In other respects but slight changes were made in the provisions of the former treaty. See BERLIN CONGRESS and EASTERN QUESTION. F. M. COLBY.

Rustam, or **Rustem**, rōōs'tem: a great hero in the mythical times of ancient Iran. He was the son of Zāl and Rūdābah, and his feats of gigantic prowess and prodigious strength play a romantic *rôle* in the great Persian epic, the *Shāh-Nāmah*. (See FIRDAUSĪ.) The *haft khān*, or seven labors of Rustam, rival those of Hercules. The sad story of his slaying his own son Sohrāb, in single combat, forms one of the most pathetic episodes in the *Shāh-Nāmah*, and has parallels in other literatures; for example, in the old Germanic story of Hildebrand and Hadubrand and in the Celtic tale of Cuculin and Conloch. A. V. WILLIAMS JACKSON.

Rustchuk, roost-chook': town of Bulgaria, on the Danube; 40 miles by rail S. by W. of Bucharest (see map of Turkey, ref. 3–D); the northwestern corner of the Bulgarian quadrilateral. (See QUADRILATERAL.) It has played an important part in the wars between Russia and the Ottoman empire. Captured by the Russians in 1810, it was held by them till 1812. The fortifications then destroyed were rapidly rebuilt, but razed to the ground again in 1829 in accordance with the Treaty of Adrianople. They were once more erected in 1853. Rustchuk escaped capture in the Russo-Turkish war of 1877. Since the creation of the semi-independent principality of Bulgaria, the city has rapidly improved in appearance and business activity has developed. Pop. (1893) 28,121. E. A. GROSVENOR.

Rüstow, rüs'tō, WILHELM: soldier and writer on military subjects; b. at Brandenburg, Prussia, May 25, 1821; entered the Prussian army in 1838; was arrested and indicted in 1850 for his *Der Deutsche Militärstaat vor und während der Revolution* (1850), but escaped; settled at Zurich; became a celebrated military author; found practical employment in the Swiss army, and took part with distinction in the campaigns of Garibaldi in Sicily and Naples in 1860. Besides his *Geschichte des Griechischen Kriegswesens* (1852; supp. 1854–55) and *Heerwesen und Kriegführung Julius Cäsars* (1855), he published critical representations of all the recent European wars, and a number of theoretical works on tactics, strategy, elementary military organization and education: *Die Feldherrnkunst des 19ten Jahrhunderts* (Zurich, 1857; 3d ed. 1877); *Geschichte der Infanterie* (2 vols., Gotha, 1857–58; 3d ed. Leipzig, 1884); *Allgemeine Taktik* (Zurich, 1858); *Militärisches Handwörterbuch* (2 vols., Zurich, 1859); *Strategie und Taktik der neuesten Zeit* (3 vols., 1872–75). D. at Zurich, Aug. 14, 1878.

Rusts: the popular name for various parasitic fungi, especially for those which produce reddish or brownish discolorations upon the plants which they attack. Botanists are inclined to restrict the term to the UREDINEÆ (*q.v.*), which include the rusts of wheat and other cereals, besides many species attacking other plants of little or no economic importance. One of the species affecting wheat is the *Puccinia graminis* (Fig. 1), whose first stage develops in the

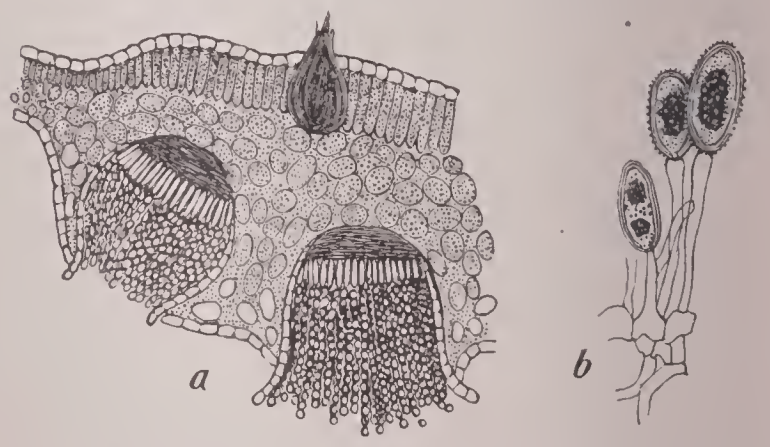

FIG. 1.—Wheat-rust: *a*, first stage, on barberry; *b*, second stage, red rust, on wheat (highly magnified).

leaves of the barberry, where it forms many bead-like rows of spores (*conidia*) in masses which are at first internal, but eventually burst through the epidermis in the form of minute cups (Fig. 1, *a*). The yellow spores of this "cluster-cup" stage germinate upon and penetrate the leaves of the wheat, where the threads of the parasite produce clusters of reddish-yellow spores (Fig. 1, *b*), which burst through the epidermis in elongated patches. This is the "red-rust" stage, so common when the wheat is about full-grown. The red-rust spores (called *uredospores*, or *stylospores*) serve to propagate the fungus still further; each one falling upon a wheat leaf and finding sufficient moisture germinates, and penetrates the epidermis, giving rise to another growth of parasitic threads, and another mass of red-rust spores. Somewhat later, the fungus forms small, dark-colored spore-sacs, each containing two relatively large spores (Fig. 2), which burst through the epidermis as elongated black patches. These spores (black-rust spores, or teleutospores) being thick-walled, are capable of remaining on the straw without injury during the winter, and in the following spring germinate in the moisture of the rotting straw, each spore forming a short thread upon which are borne a few very minute spores (*sporidia*). When the latter fall upon a

young leaf of the barberry they germinate and penetrate its tissues, giving rise to the cluster-cups first described, and thus completing the round of life.

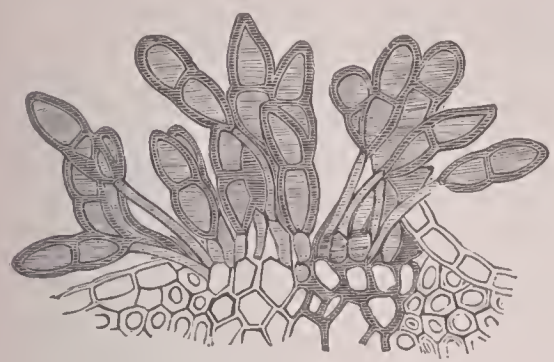

FIG. 2.—Wheat-rust, third stage, showing teleutospores (magnified).

The foregoing is essentially the structure and mode of development of most of the true rusts (*Uredineæ*). In all the species which affect the grasses and the sedges, the cluster-cups are developed upon some other host-plant, as in the wheat-rust described, but in many species attacking dicotyledons, and some monocotyledons, all the stages are upon the same host. For a long time it was thought by botanists that the three stages of rusts were distinct kinds of fungi, and were therefore given different names. Thus the cluster-cups were regarded as species of the genus *Æcidium*, the red rust as species of the genus *Uredo*, and the black rusts as species of *Puccinia*. Accordingly, we still speak of the first stage as the æcidium stage, and its spores as æcidiospores; and the second stage is often called the uredo stage, and its spores the uredospores.

Another wheat-rust, usually much more common than the one described above, is *Puccinia rubigo-vera*. Upon the Great Plains of the central part of the U. S. it appears to live perennially in the uredo stage, without the intervention of the æcidium stage. At all times in the year, on some area upon the region stretching from the Rio Grande to the Saskatchewan, the uredo stage is to be found upon wheat and other cereals, and many grasses; and from this affected area it spreads from field to field every year. In the spring the uredo stage advances with the season from the southern portion of the region to the northern. In Europe the æcidium stage, which occurs on *Boraginaceæ*, is well known, but in North America, if it occurs at all, it is very rare.

The two wheat-rusts may be distinguished in the uredo stage by the shape and size of the spores, which in *P. graminis* are elliptical, ovate, or pear-shaped, 24 to 45 micro-millimeters long by 14 to 21 wide, and with two opposite germ-spores; while in *P. rubigo-vera* they are globose, or ovate, 20 to 32 micro-millimeters long by 17 to 24 wide, and with three or four germ-spores.

No remedy or preventive is known for the wheat-rusts.

Apple-rust is a common disease of the apple-tree, in which the leaves become affected by yellow swollen patches. It is caused by a fungus of the order *Uredineæ*, and is in fact the æcidium stage of one of the species of *Gymnosporangium*, a genus closely related to *Puccinia*. Experiments have shown that the spores of the æcidium taken from the leaves of the apple may be made to produce the diseased growths on red-cedar trees known as cedar-apples, and microscopical examinations show that the latter consist of masses of teleutospores imbedded in a gelatinous matter. Here, as in the case of the wheat-rust, it was for a long time not known that the apple-rust had any connection with the cedar apples, but the matter is now settled conclusively. The former was called *Rœstelia pyrata*, and

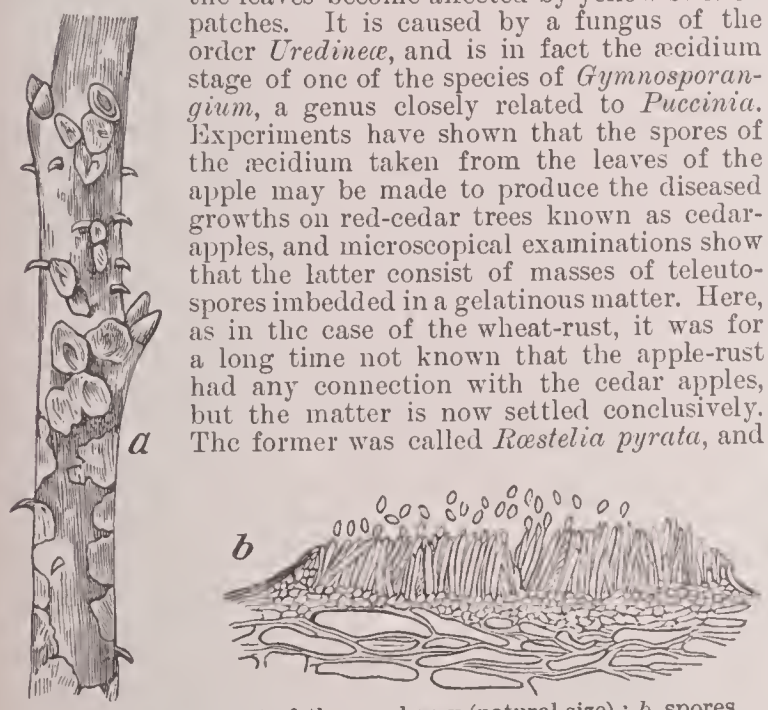

FIG. 3.—*a*, cane-rust of the raspberry (natural size); *b*, spores (highly magnified).

the latter *Gymnosporangium macropus*, which name both stages now bear.

The early collection and destruction of every cedar-apple will eradicate the apple-rust.

The *white rusts* differ greatly from the foregoing *Uredineæ*, and are near relatives of the MILDEWS (*q. v.*), with which they agree in mode of sexual reproduction. A common example is the white rust of the cabbage (*Cystopus cubicus*), in which the parasite grows in the interior of the leaves of the host, eventually producing myriads of spores (*conidia*) which burst through the epidermis in white pustule-like patches. These spores are blown to other leaves, which they infect, and thus spread the disease. Later the interior threads produce large, thick-walled resting-spores, which germinate in the following spring, and these start the disease again.

This species attacks many other kinds of cruciferous plants, as radish, mustard, pepper-grass, shepherd's-purse, etc. Other species attack various *Compositæ*, *Portulaca*, *Amaranthus*, etc.

The *cane-rust* of the raspberry and blackberry (otherwise called the raspberry anthracnose) is a troublesome disease, producing white patches upon the stems and eventually causing their death (Fig. 3, *a*). It is due to a minute parasite belonging to the so-called Imperfect Fungi, and is known as *Glœosporium venetum*. Its threads penetrate the tissues of the bark, and its spores are borne upon very minute erect threads in the white patches (Fig. 3, *b*). The early removal and destruction of the affected stems, and the application of a strong solution of copper sulphate before the buds open in the spring, will reduce the disease.

CHARLES E. BESSEY.

Rutaba'ga: the Swedish turnip, a highly important root crop, believed to be an artificial variety of *Brassica campestris*. It has many sub-varieties, some of which are among the most valued of the turnips. See TURNIP.

Ruta'ceæ [Mod. Lat., named from *Ruta*, one of the genera, from *ru'ta*, rue]: a family of dicotyledonous trees, shrubs, and herbs. Rue, buchu, and the prickly ash (*Xanthoxylum*) are representative plants. Botanists have recently attached the *Aurantiaceæ* (orange, lemon, citron, etc.) to this family, which numbers nearly 800 species.

Revised by CHARLES E. BESSEY.

Rutebeuf, rüt'böf': one of the most original French poets of the thirteenth century. Little is known about his life except that he was a poor minstrel, lived at Paris, was twice married, made but a precarious living, kept bad company, and died about 1280. His *Miracle de Théophile*, his two *Vies de Saints*, and his *Complaintes funèbres* are rather perfunctory performances, but in his lyric poems and *fabliaux* he shows great sincerity, power of realistic observation, and keen satire, especially against the clergy. Jubinal has given an edition of his *Œuvres* (3 vols., Paris, 1874–75); see also L. Clédat, *Rutebeuf* (Paris, 1891). A. G. CANFIELD.

Rutgers, HENRY: soldier and philanthropist; b. in New York, Oct. 7, 1745; graduated at Columbia College 1766; was a captain during the war of the Revolution, and subsequently a colonel of militia. He was a wealthy citizen of New York, a prominent member of the Reformed Dutch Church, and an active politician; was several times a member of the New York Assembly and a regent of the University of New York from 1802 to 1826. D. in New York, Feb. 17, 1830. Rutgers (originally Queen's) College took his name in consequence of a donation of $5,000, and several important charities in New York were recipients of his bounty.

Rutgers College: an institution at New Brunswick, N. J. In 1766 Gov. William Franklin of New Jersey granted a charter for a college to be called Queen's College, which was to be primarily an institution for the education of young men for the ministry in the Reformed Dutch denomination, and secondarily to instruct all who might resort to it in all the branches of a collegiate education. An amended charter was granted in 1770, under which the college went into active operation. The first president was the Rev. Jacob R. Hardenbergh, D. D. His successors have been Rev. John H. Livingston, D. D., Rev. Philip Milledoler, D. D., Hon. A. Bruyn Hasbrouck, LL. D., Hon. Theodore Frelinghuysen, LL. D., Rev. William H. Campbell, D. D., LL. D., Merrill E. Gates, Ph. D., LL. D., Austin Scott, Ph. D., LL. D. The president is required by the charter to be a communicant in the Reformed (Dutch) Church in America, but no sectarian religious instruction is given, and students of all denominations have always been found in this college. Its history for a long time is that of a struggle with various difficulties, especially pov-

erty, and for a time its exercises were suspended. In 1825 it was revived under the name of Rutgers, in honor of its benefactor, Col. Henry Rutgers, of New York. Since then its work has been carried on uninterruptedly and successfully, its resources and facilities having been greatly increased. In 1863 Rutgers Scientific School was organized, and in 1864 was designated by the State as the New Jersey State College "for the benefit of agriculture and the mechanic arts," with which, as a department, the college experiment station is connected. In 1900 the number of students in the classical and scientific departments was 200, and of professors and instructors, 28. AUSTIN SCOTT.

Ruth, Book of [*Ruth* is from Heb., liter., appearance, beauty]: a canonical book of the Old Testament. It is a beautiful pastoral story, relating the love of Ruth, a young Moabitess, the widow of a Hebrew, for her mother-in-law, Naomi, and the subsequent marriage of Ruth to Boaz, a rich husbandman of Bethlehem-Judah. It is a picture of domestic virtue and happiness amid the troubled times of the Judges, when might was right. Ruth was the great-grandmother of King David. The date and authorship of the book must be inferred solely from its contents and from its position in the canon. It has an Aramaic tinge, and in the Hebrew Bibles is classified as one of the five little rolls of the Hagiographa; and from these facts some have inferred its post-exilian origin. English Bibles, however, following the Septuagint, place it as one of the five consecutive stories of the times of the Judges (Jud. xiii. 2–xvi.; xvii.–xviii.; xix.–xxi.; Ruth; 1. Sam. i.–iv. 1, first clause), and such testimony as that of Josephus and Origen shows that this is the more ancient classification. There is no reason for dating any of these stories later than the reign of David. David's conquests over Damascus-Syria and other Aramæan peoples doubtless had an Aramaizing effect in Israel, equally with the later events of the times of the exile. See Stephen H. Tyng, *The Rich Kinsman* (1856); C. H. H. Wright, *The Book of Ruth in Hebrew and Chaldee* (London, 1864); R. W. Bush, *Popular Introduction to the Book of Ruth* (London, 1883); Paulus Cassel in the Schaff-Lange *Commentary*; James Morison in the *Pulpit Commentary*; J. Glentworth Butler's *Bible Work*, vol. iii., 1889. Goethe pronounces the book of Ruth "the loveliest thing in the shape of an epic or idyl which has come down to us."
Revised by W. J. BEECHER.

Ruthe'nian Rite: a branch of the Roman Catholic Church, consisting of the United Grecks of Austria, Hungary, and Poland, who, as a rule, speak the Russniak language, a Slavic tongue resembling the Polish. They have in Austria an archbishopric (Lemberg, with two united sees of Sanok and Sambor) and two bishoprics (Przemysl and Stanislawów). Their number is 2,653,567. They have 2,376 priests, who care for 1,535 parishes. In 1830, by an act of fraud and violence, the Ruthenians dwelling on the soil of Russian Poland were separated from the Roman Church. See EASTERN RITE, and *Annales Ecclesiæ Rutheuæ*, etc., Leopoli (1862); Pelesz, *Geschichte der Union der ruthenischen Kirche mit Rom von den ältesten Zeiten* (1881); Jordan, *Schematismus der gesammten Katholischen Kirche Oesterreich-Ungarns* (1887); Werner, S. J., *Orbis Terrarum Catholicus* (Freiburg, 1890). J. J. KEANE.

Ruthenians, or **Russniaks**, sometimes called **Red Russians**: the Russian inhabitants of Austria-Hungary, some 3,500,000 in number, who are usually classed with the Little Russians, from whom they are distinguished by a few slight differences of dialect. Most of them are found in Western Galicia and the Bukovina, but about 400,000 are settled on the other side of the Carpathians, in Northern Hungary. Owing to their long subjection to Poland they are chiefly a nation of peasants, as the aristocracy is Polish or Polonized. They are intelligent, quiet, and peaceful, but backward in civilization, poor, and addicted to drunkenness. The centuries of political and religious subjection that they underwent at the hands of their masters have engendered bitter hatreds, which have shown themselves by cruel massacres of the nobles during Polish revolts in the nineteenth century. Despite their numbers they have succeeded in electing but few members to the Austrian Reichsrath, though they are beginning to gain ground. As a rule they belong to the United Greek Church, but their political sympathies are apt to be with their brethren in Russia. Their literature, like the Little Russian, of which it forms a part, is particularly rich in folk-lore and songs. For specimens see Vaclav, *Piesni Polski i Ruskie* (1833). They translated the Bible in 1581. They have a theater and several schools and newspapers. Those in Hungary have made less progress, owing to the crushing policy of Magyarization of the Government at Budapest. A German grammar of the language was published by Levicki in 1833, and a catalogue of Ruthenian literature by Kotula (Lemberg, 1878). See also Bidermann, *Die ungarischen Ruthenen* (2 vols., Innsbruck, 1863–68); Szujski, *Die Polen und Ruthenen in Galizien* (Teschen, 1882); Kupczanko, *Die Schicksale der Ruthenen* (Leipzig, 1887). See RUSSIAN LANGUAGE. A. C. COOLIDGE.

Ruthe'nium [Mod. Lat., named from Ruthenia, a name of Russia, where it was first found]: a metal discovered in association with native platinum by Claus in 1846. It occurs chiefly in the hard grains of iridosmine in small proportion, not above 6 per cent. Its extraction is difficult and tedious. The metal is obtained as a white spongy mass, density 8·6, by calcining the ammonio-chloride. Next to osmium it is the most infusible known metal, but Deville and Debray fused it, and found a density of 11·4. It is scarcely attacked by aqua regia, but easily oxidized by fusion with hydrate of potash, more easily with saltpeter. Chlorine attacks it at incandescence. It forms three chlorides, $RuCl_2$, $RuCl_3$, and $RuCl_4$; six oxides, RuO, Ru_2O_3, RuO_2, RuO_3, Ru_2O_7, and RuO_4; and two sulphides, Ru_2S_3 and RuS_2. Its fumes are not poisonous. Revised by IRA REMSEN.

Rutherford: borough; Bergen co., N. J.; near the Passaic river, on the N. Y., Lake Erie and W. Railroad; 7 miles S. E. of Paterson, 8 miles N. by W. of Jersey City (for location, see map of New Jersey, ref. 2–E). It is an attractive residential place, built up chiefly by New York business men, and contains several churches, public schools, school-district library, and three weekly newspapers. Pop. (1880) 2,299; (1890) 2,293; (1900) 4,411.

Rutherford, SAMUEL: theologian and controversialist; b. at Nisbet, Roxburghshire, Scotland, about 1600; graduated M. A. from the University of Edinburgh 1621; became minister of Anwoth 1627; was deprived by the high commission court of Galloway 1630, and silenced for preaching against the Articles of Perth and banished to Aberdeen 1636; was restored to Anwoth in 1638; was a delegate to the General Assembly Nov., 1638; Professor of Divinity in New College, St. Andrews, Oct., 1639; principal of that college 1647, and rector of the university; was commissioner to the Westminster Assembly 1643–47, but was deprived of his posts 1660, and cited to appear before the next Parliament on the charge of high treason. During the four years of his service on the commission he wrote *The Due Right of Presbyteries* (1644); *Lex Rex* (1645), which was burned under his windows at St. Andrews in 1661; *The Trial and Triumph of Faith* (1645); and *Christ Dying and Drawing Sinners to Himself* (1647). D. in Edinburgh, Mar. 29, 1661. He was prominent among the Presbyterian divines of his time, and author of a large number of theological treatises, which were highly esteemed; among them were a reply to Rev. Thomas Hooker's *Summe of Church Discipline*; *Coveuant of Life* (1655); *Civil Policy* (1657); *Life of Grace* (1659), etc. There have been reissued *Twelve Communion Sermons* (1876) and *Quaint Sermons* (edited by A. A. Bonar, 1885). See A. A. Bonar, *Letters of Rev. Samuel Rutherford*, with a sketch of his life (1851; new and revised ed. London, 1894); another ed. of his *Letters* (New York, 1891), and the *Life* by Andrew Thomson (London, 1884; 2d ed. 1891).
Revised by S. M. JACKSON.

Rutherfurd, LEWIS MORRIS: astronomer; b. at Morrisania, N. Y., Nov. 25, 1816; gradnated at Williams College in 1834; admitted to the bar in 1837; retired from practice in 1849 to devote himself to travel and study, especially of astronomy. He was the first to apply photography to accurate celestial measurements. In 1864 he had a large telescope especially constructed for photographic purposes, and his pictures of celestial objects taken with this instrument have not yet been surpassed. In 1883 he retired from active astronomical work, and presented his instruments to Columbia College. D. at Tranquillity, N. J., May 30, 1892.
S. NEWCOMB.

Rutherglen, rŭg'len: town of Lanarkshire, Scotland; on the Clyde, 3 miles S. E. of Glasgow (see map of Scotland, ref. 12–G). It was formerly a place of great importance, but is now dependent on its connections with Glasgow for both its trade and its manufactures. Pop. (1891) 13,361.

Rutile [from Lat. *ru'tilus*, red, golden red]: a native oxide of titanium used to color porcelains and artificial teeth

yellow. It is widely distributed, but only in small amount. It often penetrates quartz in blade-like or needle-like crystals, and is then called Venus's-hair stone, sagenite, or *flèches d'amour*. When compact it can be cut into a gem, with a luster and color like cut black diamond. G. F. K.

Rü'timeyer, Ludwig: zoölogist; b. at Biglen, Switzerland, in 1825; studied first theology at Bern, afterward medicine and natural science in Paris under Élic de Beaumont and in London under Owen, and in Leyden, and was in 1855 appointed Professor of Comparative Anatomy and Zoölogy at Basel. The most important of his works refer to geology and palæontology: *Untersuchungen der Thierreste aus den Pfahlbauten in der Schweiz* (Zurich, 1860); *Die Fauna der Pfahlbauten in der Schweiz* (Basel, 1861); *Beiträge zur Kenntniss der fossilen Pferde* (Basel, 1863); (in connection with W. His) *Crania helvetica. Sammlung schweiz. Schädelformen* (Basel, 1864); *Versuch einer natürlichen Geschichte des Rindes in seinen Beziehungen zu den Wiederkäuern im allgemeinen* (2 parts, Zurich, 1866–67); *Die fossilen Schildkröten von Solothurn* (2 vols., Zurich, 1866–73); *Die Veränderungen der Thierwelt in der Schweiz seit Anwesenheit des Menschen* (Berlin, 1875); *Beiträge zu einer natürlichen Geschichte der Hirsche* (3 parts, Geneva, 1880–84), etc. H. S. Williams.

Rutland: an inland county of England, bounded by the counties of Leicester, Lincoln, and Northampton. Area, 150 sq. miles. Rutland is divided into two portions by the Wash; the northern is level, and the southern consists of low hills separated by a number of valleys. The soil is rich and well cultivated. Rearing of cattle is the chief branch of industry. Rutland returns one member to Parliament. Pop. (1901) 19,708. Principal towns, Oakham and Uppingham.

Rutland: city (incorporated 1892); capital of Rutland co., Vt.; on the East and Otter creeks, and on the Rutland Division of the Central Vermont Railway, and the Bennington and Rutland and Rutland and Washington and Saratoga Divisions of the Delaware and Hudson Railway; 55 miles S. S. W. of Montpelier, the State capital, and midway between Burlington and Bellows Falls (see map of Vermont, ref. 7–B). The original town was chartered by New Hampshire in 1761, and settled in 1770. The old boundaries lay between the Green Mountains on the E. and the Taconic Range on the W., and had an area of 26,000 acres. Present area about 8¼ sq. miles. It is in a rich mineral region, and has become widely known through the extent and value of its marble deposit, which was early discovered, and has been successfully quarried since 1830. In 1886 a division of the town was made, and the new towns of West Rutland and Proctor were erected and set off. By this action and by the subsequent creation of the city in 1892 four separate municipalities were formed. As a result of these changes the marble quarries all came within the boundaries of the new towns, but the manufacture of marble and of quarrying and channeling machines is still carried on in the city to a considerable extent. There are also lumber and brick yards, manufactures of machinery, engines, and boilers, dairy and cheese factory apparatus, sugar-evaporators, doors, sashes, blinds, and (Howe's) scales. There is a fine water-system, the supply being taken from East creek, a pure mountain stream, at a point 3 miles distant from the storage reservoir; a paid fire department (the first in Vermont), gas and electric plants, and an electric street-railway. The public buildings include the U. S. court-house, the post-office, the county court-house, the city-hall, Memorial Hall (cost over $60,000, besides the expense of material contributed by the quarry companies), in memory of the soldiers of Rutland who fell in the civil war, Baxter Memorial Hall, House of Correction, an opera-house, and many handsome business blocks. The city has 7 churches, graded and high schools, Roman Catholic parochial school, a convent school, and the Rutland English and Classical Institute. It has 5 national and 2 savings banks and 2 trust companies. During the Revolution Rutland was a fortified post on the Great Northern Military road, two forts having been erected within its borders. It was made the chief town of the county in 1781, and from 1784 to 1804 was one of the capitals of the State. Pop. of original town (1880) 12,149; of the three divisions (1890), Rutland 11,760, West Rutland 3,680, Proctor 1,758; city of Rutland (1900) 11,499. Henry F. Field.

Rutledge, Edward: signer of the Declaration of Independence; b. at Charleston, S. C., Nov. 23, 1749; studied law in the office of his brother John and in the Temple in London; began practice in Charleston 1773; was elected a member of the first Continental Congress 1774; was one of the signers of the Declaration of Independence, a member of the first board of war (June, 1776), of the committee appointed to draft Gen. Washington's commission (1775), and to draw up the first Articles of Confederation; also of that sent to confer with Lord Howe on Staten Island; commanded a company of artillery during the siege of Charleston, where he was taken prisoner 1780; was eleven months a prisoner at St. Augustine; sat in the Legislature 1791, when he drew up the act for the abolition of the rights of primogeniture; became U. S. Senator 1794; Governor of South Carolina 1798. D. at Charleston, Jan. 23, 1800.

Rutledge, John: brother of Edward Rutledge; b. at Charleston, S. C., in 1739; studied law in the Temple, London; began practice at Charleston 1761; was a member of the Stamp Act congress at New York in 1765, of the South Carolina convention of 1774, and of the Continental Congress 1774–75; sat in the South Carolina convention of 1776, and was chairman of the committee which drew up the State constitution; was president of the new government and commander-in-chief of the State; resigned, through dissatisfaction with the new State constitution, 1778; was chosen Governor with extensive powers 1779; took the field at the head of the militia against the invaders; retired to North Carolina on the fall of Charleston May, 1780; accompanied the army of Greene until 1782, when he summoned the Assembly of North Carolina and afterward retired from the governorship and was elected to Congress; became chancellor of South Carolina Mar., 1784; was a member of the convention which framed the Federal Constitution, where he favored assumption of State debts by the Federal Government, and opposed the abolition of the slave-trade; was appointed a justice of the U. S. Supreme Court Sept., 1789; resigned that office 1791 to accept the chief justiceship of South Carolina; was appointed by Washington chief justice of the Supreme Court of the U. S. July, 1795, and presided at the August term, but as he lost his reason shortly after, the Senate declined to confirm the appointment. D. at Charleston, July 23, 1800. Revised by F. Sturges Allen.

Rütli: See Grütli.

Ru'tuli: a people of ancient Italy, inhabiting the coast of Latium, where they built the city of Ardea. They figure very conspicuously in the legendary fictions about Æneas, etc., but they were subdued by the Romans before the overthrow of the monarchy, and they are not mentioned in history after that time, with the exception of a curious notice found in the list given by Cato of the cities that took part in the foundation of the celebrated temple of Diana at Aricia. Revised by G. L. Hendrickson.

Ruvo di Puglia, roo'vō-dee-pool'yaă (anc. *Rubi*): town of Italy, province of Bari delle Puglie; 22 miles W. of Bari (see map of Italy, ref. 6–G). It is surrounded by a wall, outside of which are extensive suburbs, and it is entered by four gates. It is celebrated for the great number of beautiful antique vases found in the necropolises of the vicinity. The adjacent country is productive, grain, vegetables, and choice fruit being abundant. Pop. 17,728. M. W. H.

Ruysbroek, rois'brook, John: the patriarch of the Dutch and German Mystics; b. about 1293, taking his name from the place of his nativity, a village near Brussels. About 1316 he became vicar of a church in Brussels; about 1352 joined the Augustinian monastery of Groenendael, near Waterloo, and rose to the position of prior 1381. D. in the monastery Dec. 2, 1381. He advocated oneness with God and assimilation to him, to be achieved by contemplation. He avoided the antinomianism of the pantheistic Mystics, and had the spirit of a reformer. He drew much from pseudo-Dionysius and Eckhart. He wrote in Latin and Flemish, and his works were published in Latin translation by Surius (Cologne, 1552), and in German by Arnold (Offenbach, 1701). The original Flemish appeared at Ghent, 1858, 5 vols. (incomplete). See J. G. v. Engelhardt's *Richard v. St. Victor u. Joh. Ruysbroek* (1838) and C. Ullmann's *Reformers before the Reformation* (1841; Eng. trans. 1855, vol. ii., pp. 36–55). Revised by S. M. Jackson.

Ruysdael, Jacob: See Ruisdael, J. V.

Ruyter, roi'ter, Michael Adriaanszoon, van: admiral; b. at Flushing, Zealand, Mar. 24, 1607, of humble parentage; went to sea as a cabin-boy in 1618; was made a captain in the Dutch navy in 1635, and a rear-admiral in 1645. In the war between Spain and Portugal he sunk in 1647 an Alge-

rine piratical squadron off the port of Salé, and subsequently distinguished himself still more in the war between Holland and England, 1652, and in the Danish service. In 1667 he sailed up the Thames, destroyed the shipping at Sheerness, and burned a number of English men-of-war; in 1672 he attacked the English and French fleets, and compelled England to conclude the Peace of Breda. In the war with France he commanded in the Mediterranean, but was defeated off the eastern coast of Sicily by Admiral du Quesne. He succeeded in conducting his fleet safely into the harbor of Syracuse, where he died next day, Apr. 29, 1676.

Ryan, Harris Joseph, M. E.: electrical engineer; b. at Powell's Valley, Pa., Jan. 8, 1866; educated at Baltimore City College, Lebanon Valley College, and Cornell University, graduating at the last named in 1887; instructor in physics, Cornell University, 1888–89; appointed Associate professor of Electrical Engineering, Cornell University, 1889. Prof. Ryan is the author of various papers on electrical machinery read before the American Institute of Electrical Engineers, of which he is a member, and is a contributor to *The Electrical World*, *The Electrical Engineer*, *The Sibley Journal of Engineering*, and numerous other U. S. and European electrical journals. C. H. T.

Ryan, Stephen Vincent, D. D.: bishop; b. near Almonet, Upper Canada, Jan. 1, 1825; was taken when a child to Pennsylvania; was educated at St. Charles's Seminary, Philadelphia, Pa.; completed his theological studies at St. Mary's Seminary, Barrens, Mo.; was ordained priest June 24, 1849, in St. Louis, Mo.; was prefect and professor for some years at St. Mary's Seminary, and afterward at St. Vincent's College, Cape Girardeau, Mo., of which institution he became president about the year 1856; was named provincial visitor of the Congregation of the Mission in 1857; appointed by the Holy See second Bishop of Buffalo Mar. 3, 1868, and was consecrated Nov. 8 of the same year. D. Apr. 10, 1896.

Ryazan: See Riazan.

Rybinsk': town of Russia, government of Yaroslav; on the Volga; 48 miles N. W. of Yaroslav (see map of Russia, ref. 6–E). It is one of the most important centers of internal commerce in the empire, and is at the head of the Mariinskaia and Tikhvinskaia Canals which unite the basins of the Volga and the Neva and Dwina, and thus the Caspian with the Baltic. It has a large transit trade in cereals, flax and hemp and their seeds, lard, spirits, metals, cloths, and other manufactures, and the Volga is open on an average 219 days per year. The town is an ancient one, first mentioned in history in 1137; became important in the middle of the eighteenth century, when the canals were finished. Pop. (1890) 32,111. Mark W. Harrington.

Rydberg, rid'bärch, Abraham Victor: author; b. at Jönköping, Sweden, Dec. 18, 1829; educated in the Latin school of Wexiö, studied at the University of Lund, and was for many years editor of *Göteborgs Handels- och Sjöfartstidning*, one of the most influential papers of Scandinavia. He has published several translations (Goethe's *Faust*) and novels, among which *Den siste Athenaren* (The Last of the Athenians, 1859), a picture of the last contests between Greek paganism and Christianity, was translated into German and English; several poems characterized by finish and originality; a number of æsthetical and historical studies, *Venus från Milo* (1874), *Romerska dagar* (1875–77), etc.; and a series of works belonging to the philosophy of religion—*Bibelns lära om Kristus* (The Teaching of the Bible about Christ, 1862), *Medeltidens magi* (Magic of the Middle Ages, 1864), *Romerska sagnar om Apostlarin Paulus och Petrus* (Romish Legends about the Apostles Peter and Paul, 1871), *Urpatriarkernes tafla i Genesis* (The Primitive Patriarchs' Tables in Genesis, 1873), etc. His *Undersökningar i germanisk Mythologi* (1886: Eng. trans. 1889, under the title *Teutonic Mythology*) is a brilliant but wholly unscientific work. D. in Stockholm, Sept. 21, 1895. D. K. Dodge.

Ryde: town of England; on the northeast coast of the Isle of Wight, opposite Portsmouth, at the other side of the Spithead roadstead (see map of England, ref. 14–I). It is a fashionable watering-place; it consists of Upper and Lower Ryde—the former being on the site of an ancient village (La Rye or La Riehe), while the latter is of recent construction. Pop. (1891) 10,952.

Rydqvist, rid'kwist, Johan Erik: scholar; b. at Gothenburg, Sweden, Oct. 20, 1800; was editor of a literary journal, *Heimdal* (1828–32); became a royal librarian; was elected a member of the Swedish Academy. His *Svenska språkets lagar* (Principles of the Swedish Language, 5 vols., 1850–74) is still, in spite of the many changes in linguistics, the authoritative work on that subject. He was also the author of a study of the early Scandinavian drama *Nordens äldsta skådespel*, and the translator of a number of Moore's poems. D. at Stockholm, 1878. D. K. Dodge.

Rye: a cereal plant (*Secale cereale*), native of the country about the Caspian Sea. It is largely cultivated in Central and Northern Europe, where the grain is the chief breadstuff and the straw is largely used for thatching. Rye grows well in a cold climate, and will thrive on poor sandy soils better than wheat. Rye is not so nutritious as wheat, and makes an inferior and darker-colored bread. An average analysis of rye grown in the U. S. gives: Water, 11·6; ash, 1·9; protein, 10·6; fiber, 1·7; carbohydrates, 72·5; fat, 1·7. Fertilizer analyses give for grain a percentage of 1·76 nitrogen, 0·82 phosphoric acid, 0·54 potash; and for straw a percentage of 3·25 ash, 0·46 nitrogen, 0·28 phosphoric acid, 0·79 potash.

In the U. S. about 30,000,000 bush. are produced annually. In the eastern States the straw is often of as much value as the grain. Machinery has been devised for threshing the grain without breaking the straw, which is used largely for matting, mattresses, and saddlery. Whisky is extensively distilled from rye in the U. S., gin in Holland, and a liquor called kvass in Russia. George C. Watson.

Rye-grass: the *Lolium perenne*, a European grass naturalized in the U. S. In Europe it is highly esteemed both for hay and pasture, and is the most important of all forage plants, but in the U. S. it is not very highly valued. The Italian rye-grass (*L. italicum*) is also greatly valued in Great Britain. For the *Lolium temulentum* see Darnel.

Rye House Plot: a scheme devised by some English Whigs to kill King Charles II. while on his way from Newmarket, and to give the crown to the Duke of Monmouth. It was so called from the Rye House, a farm near Newmarket, where the murder of the king was to be undertaken. The plot was discovered, and many leading Whigs, including Algernon Sydney and Lord Russell, were sent to the block, and many others were severely punished.

Rylance, Joseph Hine: See the Appendix.

Ryleev, ril-ā'yef, Kondratiĭ Fedorovich: poet; b. in Russia, Sept. 18, 1796, the son of a retired officer. He was brought up in the first corps of cadets, was in the artillery during the campaign of 1814, and withdrew from the army four years later. In St. Petersburg, where he took up his residence, he served as a Government official and then as secretary of the Russian American Company. At the same time he was active in literature and politics. He published poems in different papers, and with his friend A. Bestuzhev was editor of the *Severnaĭa Zvesda* (North Star), an organ of the romantic school. He was one of the chiefs of the band of conspirators who brought about the futile military rising at the accession of the Emperor Nicholas I., although convinced that success was impossible, and was hanged with four of his comrades July 26, 1826. His character seems to have been exceedingly pure, and his patriotism of the highest kind. His complete works were published at St. Petersburg, 1872. See *The Poems of K. F. Relaieff*, translated by F. Hart-Davies (London, 1887). A. C. Coolidge.

Rymer, or **Rymour**, Thomas: historiographer; b. at Northallerton, Yorkshire, England, about 1641; educated at Sidney-Sussex College, Cambridge; studied law at Gray's Inn; became historiographer to William III. in 1692; now chiefly remembered for the vast Latin collection of English historical and diplomatic documents known as *Rymer's Fœdera* (20 vols. folio, 1704–35, of which 15 were edited by himself and the remainder by Robert Sanderson). D. in London, Dec. 14, 1713. Rymer left 58 MS. vols. of important historical documents, now in the British Museum. A *Syllabus* (in English) of the *Fœdera* was published by Sir Thomas Duffus Hardy (3 vols., 1869–86).

Rymour, Thomas: See Rhymer, Thomas.

Ryswick, riz'wik: small town of the Netherlands, province of South Holland; 2 miles S. E. of The Hague (see map of Holland and Belgium, ref. 6–E). It is famous for the treaty of peace between France and the allies, Germany, Holland, England, and Spain, signed here Sept. 20, 1697.

Rzhef: See Rshef.

S

: the nineteenth letter of the English alphabet.

Form.—The form of the letter is derived through the Latin alphabet from the Greek *sigma*, which appears in the oldest inscriptions in the following various forms: Three-stroke ϟ, ≷, rounded Ϛ, four-stroke ξ, ϟ, rounded ξ Ϛ. It represents the twenty-first letter of the Phœnician alphabet, *shin*, ש.

Name.—The English name *ĕs* comes through the Old French from the Latin phonetic name *es*; cf. *ef*, *el*, *em*, *en*, *er*. The Greek name *sigma* does not correspond to the Semitic name (*shin*) of its letter, but is probably a corruption of *samekh* or *samka*, the name of the fifteenth Phœnician letter, for which, with its new value, the Greeks had devised the new name *ksei* (ξεῖ, later ξῖ). *Samka* was changed to *sigma* probably under the influence of σίζω (σιγμός), hiss, i. e. the hissing sound. The Semitic name *shin*, tooth, was, like the other Semitic names, applied both because of the fancied resemblance in the form of the letter, and because of the sound initial in the name.

Sound.—The sound commonly denoted by *s* is the voiceless dental sibilant, formed by forcing voiceless breath through a narrow channel between the blade of the tongue and the alveolar terrace against the teeth. This sound appears, e. g., in English *sakes*, *set*, *base*. It is also denoted by *c*, e. g., in *cell*, *place*; and by *sc*, e. g., in *scene*, *descend*. The letter *s* has also the value of (1) *z* in, c. g., *easy*, *lives*, *his*; (2) *sh* (š), e. g., in *sure*, *sugar*, *sensual*; (3) *zh* (ž), e. g., in *usual*, *pleasure*.

Sources.—The main sources of the English *s*-sound are: (1) Teutonic *s* < Indo-Europ. *s*, as in *seven*: Lat. *septem*: Sanskr. *saptá*; *sister*: Lat. *soror*: Sanskr. *svásar-*; (2) the Indo-Europ. combination dental + *t*, as in *wise*: Lat. *vīsus* < Indo-Europ. *vid-to-s*; (3) Lat. *s*, viâ O. Fr., as in *state* < Lat. *status*; *feast* < Lat. *festa*; *case* < Lat. *casus*; (4) Lat. *c* before *e*, *i* (viâ Fr.), as in *city* (pron. *sĭtĭ*) < Lat. *civitas*; *cent* < Lat. *centum*; *voice* < Lat. *vox*, *vocem*; *peace* < Lat. *pax*, *pacem*; (5) Lat. *ti* (viâ Fr.), as in *ransom* < Lat. *redemptio'nem*; *grace* < Lat. *gratiam*.

Symbolism.—S (in chemistry) = sulphur; in £ *s. d.* = Lat. *solidus* for *shilling*; S. = Saturday or Sunday, south, southern. See Abbreviations.

Benj. Ide Wheeler.

Saadya ben Joseph (known in Arabic literature as Saïd ibn Ya'kūb al Fayyūmī): Jewish writer; b. at Fayyūm (Pithom), Egypt, in 892. He was called in 928 to be rector of the Talmudic school in Sura (Babylon) with the title of Gāōn (highness). He died in 942. He was the first among the Jews to attempt an exposition of philosophy and theology from the standpoint of rabbinical Judaism. His principal work is called *Book of Religions and Dogmas*. The original Arabic text has been published by S. Landauer (Leyden, 1880). The Hebrew translation was made by Judah ibn Tibbon in 1186. A German translation by Julius Fürst appeared at Leipzig, 1845, but it is not reliable. (See Guttmann, *Die Religionsphilosophie des Saadya*, Göttingen, 1882.) Saadya was the first to translate parts of the Bible into Arabic. He also wrote commentaries on nearly the whole of the Bible. (See Munk, *Notice sur R. Saadiah Gaon* (Paris, 1838); Graetz, *Hist. of Jews*, iii., chap. vii.; Friedlander, *Life and Works of Saadia* in *The Jewish Quarterly Review*, v., p. 177.) In honor of the thousandth anniversary of his birth, J. Derenberg has begun a critical edition of Saadya's works (vol. i., *Version arabe du Pentateuque*, Paris, 1893).

Richard Gottheil.

Saa'le: the name of several German rivers. The most important is the Saxon or Thuringian Saale, which rises in the Fichtelgebirge, flows in a northern direction through the Prussian province of Saxony, where it becomes navigable, and falls into the Elbe after a course of about 200 miles.

Saalfeld, zaal'felt: town; in the duchy of Saxe-Meiningen, Germany; on the Saale; 31 miles by rail S. S. W. of Jena (see map of German Empire, ref. 5–F). It has a fine ducal palace, a magnificent church, several good educational institutions, and manufactures of chemicals, vinegar, etc. On Oct. 10, 1806, the Prussians were defeated here by the French. Pop. (1895) 9,960.

Saarbrücken, zaar'brü-ken: town of Rhenish Prussia, on the left bank of the Saar; connected by a floating bridge with the suburb of St. Johann on the right bank (see map of German Empire, ref. 6–C). It was the theater of the opening of the Franco-German war of 1870–71. On Aug. 2, 1870, Napoleon III., at the head of a whole army-corps and accompanied by his son, attacked the town, which was feebly garrisoned by the Germans, compelled the garrison to retreat, and marched into the town. Next day the French evacuated the place, and on Aug. 6 a violent encounter took place in the vicinity, the German army attacking the French position on the hills of Spichern to the S. W. of the town. The French were defeated and forced to retreat across Eslingen to Blittersdorf, leaving many prisoners, their camp equipage, pontoons, and provisions. Pop. (1895) 17,081.

Saardam: See Zaandam.

Saavedra, saă-vā'-drăă, Angel, de, Duque de Rivas: statesman and poet; b. at Cordova, Spain, Mar. 1, 1791; entered the royal guards 1807; fought gallantly in the war of independence. He took part in the revolution of 1820, and was elected to the Cortes, of which he became secretary in 1821; lived in exile (England, Malta, and France) 1823–34, soon after which he inherited his dukedom; became secretary of the chamber of peers 1835; Minister of the Interior in the cabinet of Isturiz May, 1836; in exile again 1837–43; ambassador at Naples 1843–48, and later for a short time at Paris. D. in Madrid, June 26, 1865. He wrote *Ensayos Poéticos* (2 vols., 1813); *Florinda* (1824–25), an epic on the Moorish conquest of Spain; *El Moro Expósito* (1834), a national epic; many dramas; and histories of Masaniello (1860) and of the Neapolitan revolution (2 vols., 1848; new ed. 1881).

Saba, saa'bă: a small island of the Lesser Antilles, West Indies, crossed by lat. 17° 39′ N. It is high and rocky; the inhabitants are of Scotch descent, but the island belongs to the Dutch, and is a dependency of Curaçoa. Pop. (1890) 1,883.

H. H. S.

Sabadell': town; in the province of Barcelona, Spain; on the Ripoll; 14 miles by rail N. W. of Barcelona (see map of Spain, ref. 14–K). It is a prosperous manufacturing town, with a number of woolen and cotton spinning and weaving factories. Pop. (1887) 19,645.

Sabadilla, Cebadilla (or **Cevadilla**): See Asagræa.

Sabæ'ans: the tribe of Saba, anciently inhabiting Yemen, the southwest corner of the Arabian peninsula. About 1100 B. C. they became of importance, and about 900 B. C. their princes, who took the title of Kings of Saba, supplanted the Minæans, the dominant tribe of Arabia. During the period 400 B. C.–300 A. D. the Sabæan rulers subdued the Himyarites and Abyssinians, and drove the latter to Africa. In the period 300–600 A. D. the title of King of Saba, Dhū-Raidān, Hadramaut, and Yemen was borne by the monarchs. The Abyssinians made two attempts to reoccupy Saba, but were finally driven out toward the end of the sixth century by the Persians, who had been contending with Rome for possession of Arabia. The appearance of Mohammed put an end to the quarrels, and for a time united the whole peninsula. About 1,600 Minæo-Sabæan inscriptions have been found. They are written in a dialect akin to the Arabic and Ethiopic, and in a script which is the parent of the Ethiopic. See Halévy, *Études Sabéennes* (Paris, 1873); Müller, *Süd-Arabische Studien* (Vienna, 1877). The name Sabæans is also given to certain religious sects of Western Asia. See Sabism and Mandæans.

Richard Gottheil.

Sab'aka: an Ethiopian who invaded Egypt, defeated and burned Bocchoris, the sole king of the twenty-fourth dynasty, and himself became the first king of the twenty-fifth dynasty. He is supposed to have been the *So* or *Seveh* of the Bible and the *Shabe* of the Assyrian monuments. His approximate date was 700 B. C., but the length of his reign is uncertain (twelve years according to the monuments; fifty

years according to Herodotus, ii., 137). His reign in Egypt was mild, and he left monumental remains in Thebes. Hoshea of Israel (2 Kings xvii. 4) asked his aid against Shalmaneser of Assyria in vain, and later other Syrian princes made alliance with him against Assyria. Sargon, who defeated Sabaka at Raphia, S. of Gaza, and afterward exacted tribute of him, calls him a "prince," and his cartouche, found at Nineveh, shows him wearing the crown of Lower Egypt. Stade considers him to have been simply a petty local ruler. CHARLES R. GILLETT.

Sabal Palmetto: See PALMETTO.

Sabanilla, sä̆a-bä̆a-neel'yä̆a, or **Savanilla**: seaport of the department of Bolivar, Colombia; on a bay 7 miles W. of the delta of the river Magdalena (see map of South America, ref. 1–B). It is connected by railway with Barranquilla, on the river, and is the maritime port of that place, and consequently of the greater part of the republic. The bay is shallow, and vessels anchor in a roadstead several miles below. The population is small. H. H. S.

Sabbath [from Heb. *shabbāth*, rest, sabbath, deriv. of *shabāth*, rest from labor]: the weekly day of religious rest. The observance of a weekly rest-day is very widely held to have a natural basis in the constitution of man. The persistency with which such an institution has been maintained for many ages among Jews, Christians, Mohammedans, and even some pagan nations, supports this view. Inquiries instituted by a commission of the British Parliament in 1832, the testimony of 641 medical men of London in a petition to Parliament in 1853, and of a great number of medical societies, physicians, physiologists, political economists, and managers of industrial establishments, go to prove that in the case of men engaged in ordinary bodily or mental labor the rest of the night does not fully restore the waste of energies during the day, and that to maintain a condition of vigor a supplementary rest of about one day in seven is needed. This view is confirmed by the experience of France during the Revolution, when the decade was substituted for the week, and each tenth day devoted to rest—a proportion of time which was found to be insufficient. The need of a weekly respite from daily toil appears also in the social nature and relations of man as a member of the family and of the state. These aspects of the weekly rest have been ably illustrated by Pierre Proudhon, the French radical philosopher, in his essay *La Célébration du Dimanche*, and more fully in papers presented at the Sunday Rest Congress in connection with the Paris Exposition of 1889; and in papers read at the Chicago Sunday Rest Congress in 1893, published as *The Sunday Problem* (New York, 1894).

The week of seven days may be traced to the dawn of human history, and it is probable that wherever the week existed it was marked by the observance of sabbath or rest-days. A weekly Sabbath was known to the Semitic Assyrians and Babylonians, and it is claimed that the name *Sabattu* is found in the inscriptions, where it is defined as "a day of rest for the heart." It seems also to have been known to the Accado-Sumerians, the aboriginal inhabitants of Chaldea, and their equivalent term for Sabbath is explained to mean "a day of completion of labor." (Sayce, *Hibbert Lectures for 1887* and *Social Life among the Assyrians*, 1893.) The Assyrian Sabbath differed widely from that of the Hebrews, and the connection between the two is as yet uncertain. See Francis Brown's *Assyriology* and J. D. Davis's *Genesis and Semitic Tradition*.

The first mention in the Bible of such an institution is in Gen. ii. 2, 3—a passage which forms the close of the earliest of the records of which the Mosaic history, according to the theory of many biblical scholars, is composed. The seventh day is consecrated by the Creator, who, having finished the creative work of six days, or periods, blessed and hallowed the seventh because he rested therein. The natural meaning of the passage is the establishment of a holy rest-day after every six days of labor for the race just created. The natural law of periodic rest was thus lifted out of the sphere of mere physical necessities into that of intellectual and spiritual privilege and enjoyment, as befitting a creature made in the image of the Creator and capable of holding fellowship with him. Its connection with the Creation shows that, with the family constitution, it was intended to lie at the basis of the development of all human life, inclusive of all human conditions, and not merely for any sect or age. As to the observance of the Sabbath in the patriarchal period, the Mosaic narrative, which is very brief and meager, gives us no knowledge save what may be inferred from the occasional intimations of the division of time by weeks (Gen. xxix. 27; viii. 10, 12; iv. 10, etc.).

The first mention of the Sabbath by name occurs in Ex. xvi. 23, *seq.*, where its observance is not introduced with the formalities with which an institution of such importance would be inaugurated for the first time, but in language which seems to imply that it was not wholly unknown to the people. It next appears among the Ten Commandments, which were distinguished from the rest of the Jewish law by the circumstances of peculiar solemnity under which they were spoken on Mt. Sinai and given to Moses engraved on stone tablets by the hand of God (Ex. xx. 8). Its observance was enforced by gratitude for deliverance from bondage (Deut. v. 15), and was constituted a sign of covenant between God and the Jews. Like other of these great commands, the law of the Sabbath reappears in the Jewish municipal and ceremonial code with special prescriptions and penalties, all of which show the importance attached to its observance and the great care taken—as by the prohibition of servile work, gathering of sticks, kindling fires, etc.—that all alike, servants as well as masters, strangers as well as members of the congregation, should enjoy its benefits. A single instance is recorded of the punishment of death being inflicted upon a presumptuous transgressor (Num. xv. 30, *seq.*). Connected with the weekly Sabbath there was ordained in the Jewish municipal and ceremonial law a system of sabbatical years of local and national significance and use (Lev. xxv.). The Sabbath also, in its leisure and opportunity for social intercourse and holy convocation (Lev. xxiii. 3), sustained an important relation to the free republican institutions of the Jews. In later periods of the Jewish history, Isaiah (lviii. 13) and Jeremiah (xvii. 21, *seq.*) enforced its observance with threatenings and promises; Ezekiel (xx. 12, *seq.*) put its violation foremost among the national sins; Nehemiah (x. 31; xiii. 15) narrates the public efforts at reformation after the return from the Babylonish captivity. Henceforward the Sabbath was kept with scrupulous care, and gradually to the time of Christ became burdened with self-enforced severities and ridiculous prohibitions.

Christ, while observing the Sabbath, sought by his example and teachings to rescue it from the puerile superstitions by which it had come to be degraded. He performed miracles of healing, and with his disciples gathered ears of grain for food as he passed through the fields on the Sabbath, and justified his conduct by showing that such works of necessity and mercy were not violations of its true law. He taught that the Sabbath was made for man, for his benefit, and not man for the Sabbath, and that He, the Son of man, the one in whom all humanity is represented in its perfection, was so the Lord of the Sabbath as rightfully to define and prescribe its true obligation and use (Mark ii. 27, 28).

The resurrection of Christ and his subsequent appearances to his disciples till his ascension, and the miraculous descent of the Holy Spirit on the first day of the week, led to that day being set apart for the special religious assemblies of the Christians and for the simple services of their faith. For a time the Jewish converts observed both the seventh day, to which the name Sabbath continued to be given exclusively, and the first day, which came to be called the Lord's Day. St. Paul sought to relieve the consciences of the Gentile Christians from the obligation of keeping the Jewish Sabbath, and warned them that such observance might even be an evidence of backsliding (Col. ii. 16; Gal. iv. 10). Within a century after the death of the last of the apostles we find the observance of the first day of the week, under the name of the Lord's Day, established as a universal custom of the Church, according to the testimony of the *Didache*, and of Barnabas, Ignatius, Pliny, Justin Martyr, and Tertullian. It was regarded not as a continuation of the Jewish Sabbath—which was denounced, together with circumcision and other Jewish and anti-Christian practices (*Apology of Aristides*, A. D. 125)—but rather as a substitute for it; and naturally its observance was based on the resurrection of Christ rather than on the Creation rest-day or the Sabbath of the Decalogue. Tertullian (about 200), in saying that Sunday was given to joy, and enjoining abstinence from secular care and labor on it, makes it evident that the Lord's Day was regarded as taking the true place of the original seventh-day Sabbath. But the position of the early Church, struggling into existence, exposed to persecution, and with many of its members slaves of heathen masters, would prevent unbroken regularity of worship and a general cessation of labor, until in the time of

Constantine (321) the observance of Sunday as the weekly rest-day was protected by law. Later in the history of the Church the connection between the Lord's Day and the original Sabbath became explicitly recognized. The second Council of Macon (585), in forbidding secular work on that day, and enjoining that it be occupied with the hymns and praise of God, says, "For this is the day of perpetual rest; this is shadowed out to us by the seventh day in the Law and the Prophets." At the Reformation, Luther, Zwingli, Calvin, and Bucer at first favored the abolition of all holy days but the Lord's Day; but their antagonism to what they considered the Judaizing legalism of Rome, and their zeal for evangelical freedom, led them at times to deny the scriptural obligation of a weekly rest-day. They were not, however, always consistent with themselves. Luther says of the Sabbath, "Keep it holy for its use's sake both to body and soul, but if anywhere the day is made holy for the mere day's sake, if anywhere any one sets up its observance upon a Jewish foundation, then I order you to work on it, to ride on it, to dance on it, to feast on it, to do anything that shall reprove this encroachment on the Christian spirit and liberty." Elsewhere he represents the observance of Sunday as "good and necessary," and defends the Ten Commandments as still binding on Christians. Upon the Continent, since the Reformation, both among Roman Catholics and Protestants, the observance of the Sabbath was until later years commonly based upon ecclesiastical authority. A different view early obtained in Great Britain, and there and in the U. S. the prevalent doctrine recognizes the weekly rest-day as founded in the nature of man, consecrated by the example of God at the Creation, authoritatively promulgated in the Fourth Commandment, confirmed by Christ, and, while transferred from the seventh to the first day of the week and invested with new significance, perpetuated in the Lord's Day of the Christian Church. See Robt. Cox, *Literature of the Sabbath Question* (1865); Hessey, *Bampton Lectures* (1860); Oehler, *Theol. of Old Test.*; P. J. Proudhon, *La Célébration du Dimanche*; Philip Schaff, *Hist. of the Apostolic Age* and *Church Hist.*; Tayler Lewis, Excursus in his trans. of Lange's *Com. on Genesis*, ch. i.; N. Y. Sabb. Com., *Doc. 26*; *Eight Studies of the Lord's Day*; *The Sunday Problem, its Present-day Aspects.* See Lord's Day and Sunday.

W. W. Atterbury.

Sabbathai' Lewi', or **Shabbatai Tsevi**: See Jews (*In Turkey and the Levant*).

Sabbatical Festivals: four festivals enjoined by the laws of Moses. These were: (1) The Sabbath day. (2) The Sabbath month, which was Tisri, the seventh in the Hebrew year, corresponding with our October. It opened with the Feast of Trumpets, contained the Day of Atonement (10th), and the Feast of Tabernacles (15th to 22d). (3) The Sabbath year, which in Exodus (xxiii. 10, 11) has an agricultural aspect (the land is to rest from culture); in Deuteronomy (xv. 1, 2) has a commercial aspect (debts were either to be relinquished or held in abeyance); and in Leviticus (xxv. 3–7) a religious aspect ("for the Lord"). Every seventh year was thus interdicted to secular and selfish uses; but before the Babylonian captivity the ordinance appears not to have been well observed, as may be gathered from Jer. xxv. 11, 12, compared with 2 Chron. xxxvi. 21. After the Captivity it was different. Alexander, who conquered Syria 332 B. C., remitted the tribute of the Jews every seventh year, "that they might enjoy the laws of their forefathers" (Josephus, *Ant.*, xi., 8, 5). Julius Cæsar afterward did the same (*Ant.*, xiv., 10, 6). According to Jewish reckoning, the year from Oct., 1888, to Oct., 1889, was a sabbatical year. (4) The Year of Jubilee, which was not, as some say, every forty-ninth, but every fiftieth year, so that there were then two successive years of rest. In that year every Hebrew servant was to regain his freedom, and landed property to revert to the representatives of its original proprietors.

Revised by S. M. Jackson.

Sabellan Languages: See Italic Languages.

Sabel'lius: ecclesiastic; b. in Africa about 180 A. D.; was active in Rome until his excommunication by Pope Calixtus about 217 A. D. He turns up later in Egypt, and was again excommunicated by Bishop Dionysius of Alexandria (260). The heresy which bears his name, called Sabellianism, is essentially the same as that styled Patripassianism in the Western Church. It teaches that the Trinity of the Godhead is not a trinity of persons, but of manifestations and periods in the history of revelation. God is strictly one in person, but reveals himself in a threefold aspect as Father, Son, and Holy Spirit in the works of creation, redemption, and sanctification. For his few remains see M. J. Routh, *Reliquiæ Sacræ*.

Revised by S. M. Jackson.

Sabine, săb'in, Sir Edward, D. C. L., F. R. S.: physicist; b. in Dublin, Ireland, Oct. 14, 1788; entered the British army as second lieutenant of artillery 1803; became captain 1813; took part in the campaign on the Niagara frontier, commanding the batteries at the siege of Fort Erie, 1814; accompanied the Arctic expedition of Ross and Parry 1818, and that of Parry 1819–20, when he made important researches in terrestrial magnetism, which were communicated to the Royal Society; aided in the preparation of the *Natural History* of Parry's first expedition (1824); made a series of voyages, ranging from the equator to the Arctic Circle (1821–25), in quest of data concerning the variations of the magnetic needle, the figure of the earth, and other problems in meteorology and terrestrial physics; published *An Account of Experiments to determine the Figure of the Earth* (1825); and *The Variability of the Intensity of Magnetism upon Many Parts of the Globe* (1838); edited the records of magnetic observations made at Cape Town, Toronto, St. Helena, Hobarton, and other colonial observatories in several large volumes (1843–60), and contributed numerous memoirs to the Royal Society; was made a Knight of the Bath 1869. D. at Richmond, Surrey, June 26, 1883.

Sa'bine Dialect: See Italic Languages.

Sabine (să-been') **Pass**: the mouth of Sabine river and lake; it has a muddy bar, with shoal water and a narrow channel. Dredging and jetty-building have been undertaken to improve this pass. There is a brick lighthouse on Brant Point, the east side, lat. 29° 43′ 55″ N., lon. 93° 50′ 19″ W., with a flashing dioptric light of the third order. The Southern Pacific Railroad (Sabine and East Texas Division) extends to the harbor, which is from 25 to 40 feet deep.

Sabine River: a stream which rises in Hunt co., Tex., flows S. E. to the western boundary of Louisiana, and then turns southward, forming throughout the rest of its course the boundary between Texas and Louisiana for 250 miles. It is 500 miles long, is navigable in its lower course, and after traversing Sabine Lake enters the Gulf of Mexico through Sabine Pass, its mouth.

Sabines (Lat. *Sabini*): the ancient inhabitants of a tract of Central Italy lying E. and N. of Rome. They were a confederation of communities, of which Cures maintained a sort of headship, the most important other places being Reate (birthplace of Varro) and Amiternum. These municipalities were, however, of no commercial importance, and were indeed little more than peasant villages. As a people the Sabines were engaged in agriculture and grazing, and, from the simplicity of their life and their physical prowess, they obtained a reputation like that of the Spartans for severity of discipline and sturdiness of character. The narrow limits of the Sabine territory made emigration necessary, and probably in this way they came in contact with the growing power of Rome, to which the story of the joint rule of Romulus and Titus Tatius points, and the fact that Numa was of Sabine origin. They were not finally subdued by Rome until 290 B. C., and some twenty years later they were admitted to citizenship.

G. L. Hendrickson.

Sabi'nus, Masurius: a famous jurist of the reign of Tiberius, pupil of Capito, and founder of the school of Sabiniani. He was the author of several works, the most important being *Libri iii. Juris Civitis*, which was much used and commented upon by later jurists, but is not extant. See Huschke, *Jurisprudentia Antejustiniana* (5th ed. Leipzig, 1886, pp. 123–128).

M. W.

Sabism, or **Zabism**: the religious system of the Sābiün (Baptists), a Christian sect in Mesopotamia and North Arabia who adhered to much of their original nature-worship, but were known chiefly for their frequent washings. For this reason they have been wrongly identified with the Mandæans (*q. v.*), with other sects in South Babylonia, with the Jewish Μασβώθεοι, and with a certain Samaritan sect. They are, perhaps, the same as the Elkasaïtes. Mohammed and his first followers were called Sābians by the heathen Arabs. Mohammed had only a vague idea who they were, but in the Koran mentions them favorably together with Jews and Christians. Under Al-Ma'mūn 830 A. D., the inhabitants of Harrān, whose religion was a fusion of heathenism and Neoplatonic ideas, but who still worshiped stars and offered sacrifices, shielded themselves by declaring that they were the

Sābians mentioned in the Koran. They even asserted that they were descendants of one Sābī, son of Seth or Adam. See Chwoson, *Die Ssabier* (St. Petersburg, 1856); Wellhausen, *Skizzen*, iii., p. 206; Dozy, *Nouveaux documents pour l'étude de la religion des Harraniens* in *Actes du sixième congrès des Orientalistes* (Leyden, 1885, ii., 1, p. 281).
RICHARD GOTTHEIL.

Sable [from O. Fr. *sable*; cf. Fr. *zibeline*, *soble*, Ital. *zibellino*, Germ. *zobel*; loan-word from Russ. *sobolj*]: a name given to species of the family *Mustelidæ* and genus *Mustela*. The animals in external appearance resemble the weasel, but they are considerably larger and their bodies are not so elongated. In summer the color is reddish or brownish yellow, clouded with black, and becoming lighter toward the head; in winter it is dark. The length of the body in well-grown sables does not vary much from 17 inches from the snout to the tail, while the tail is from 7 to 10 inches long. The Old World form (*Mustela zibellina*) inhabits Northern Europe and Asia. The sable furs are chiefly obtained in Siberia. This Siberian form in winter often has the whole body covered with lustrous blackish-brown or sometimes quite black hairs, but with these are generally intermingled white ones. The posterior tubercular grinder of the upper jaw is oblong, and nearly twice as long on the inner as on the outer side. The American sable (*Mustela americana*) is most abundant in British America, and the furs in the markets are chiefly obtained by the Hudson Bay Company. It is distinguished from the Siberian species by the posterior tubercular grinder of the upper jaw being quadrate, and rather longer on the inner than on the outer side. The furs of both species are held in high esteem. Revised by F. A. LUCAS.

Sable, Cape: See CAPE SABLE.

Sable Island [Fr. *sable*, sand]: an island 104 miles S. E. of Cape Canso, in Nova Scotia. It is a dependency of Nova Scotia, and is an arc 34 miles long, convex to the S., and from 1¼ to 5 miles in breadth. It is composed of grass-covered sand-hills, inclosing a lake 11 miles long with a maximum depth of 12 feet. Lat. of east point, 43° 59′ N., lon. 59° 47′ W.; lat. of west point, 43° 57′ N., lon. 60° 8′ W. Many ponies are bred here. The island has a life-saving station, it being surrounded by extensive and very dangerous shoals. It is in the regular course of ships from Europe to Southern Nova Scotia and New Brunswick. It is said to be slowly growing smaller. It was colonized in 1598 by forty French convicts, but five years later only twelve survived, and the colony was broken up. The island should not be confounded with Cape Sable island. See CAPE SABLE. Revised by M. W. HARRINGTON.

Sables, or **Les Sables d'Olonne**, lā′saab′l′dō′lōn′: town; in the department of Vendée, France; on the Bay of Biscay; 50 miles S. by W. of Nantes (see map of France, ref. 5–C). It was founded by Louis XI., who built its harbor and constructed its fortifications. It is a favorite watering-place, and carries on extensive fisheries and a large export trade in grain, wine, wood, salt, and fish. Pop. (1896) 11,826.

Sabri'na: a celebrated temporary volcanic islet of the Azores, a short distance S. W. of Cape Ferraria, the western point of San Miguel island. It appeared in 1811, and the process was watched by the crew of the British frigate Sabrina, from which its name is derived. Sixteen days after the eruption the cone attained its greatest dimensions —215 feet in height and 6,000 in circumference. It was composed of ashes and scoria without cohesion, and was gradually washed away until in 1850 the lead showed a depth of 15 fathoms where it had formerly stood. M. W. H.

Sacaline: a forage plant (*Polygonum sachalinense*) from the island of Saghalin, on the Russian shore of the Pacific, introduced in the U. S. in 1894. It is a perennial woody herb, growing 6 to 12 feet high. It is said to be relished by live stock, and the shoots and leaves are recommended as a kitchen vegetable. The plant is supposed to resist severe drouth. L. H. B.

Saccar'do, PIETRO ANDREA, Ph. D.: botanist; b. at Treviso, Italy, Apr. 23, 1845; Professor of Botany in the University of Padua, and author of many works on the fungi, the most important of which are *Fungi Italici* (1877–86) and the *Sylloge Fungorum Omnium huc usque Cognitorum* (10 vols., 1882–92), containing descriptions of 39,663 species. He has made a distribution of specimens under the title of *Mycotheca Veneta*. C. E. B.

Saccas: See AMMONIUS.

Saccharim'etry [Lat. *sac'charum*, sugar + Gr. *μέτρον*, measure]: the process of ascertaining the proportion of sugar dissolved in a liquid. This can be effected by using the hydrometers of Brix or Balling, sometimes called saccharimeters, which are specially constructed so as to indicate the percentage of sugar in an aqueous solution. (See HYDROMETER.) But the means generally adopted is by utilizing the optical properties of sugar. All sugars and their solutions have the power of rotating the plane of polarization of light; some, such as cane-sugar and grape-sugar, rotate the plane to the right, while lævulose rotates the plane to the left. (See OPTICS and POLARIZATION.) If θ is the angle of rotation, l the length of solution traversed, and p the number of units of weight of dry sugar present in a certain volume of solution, $\theta = lp\alpha$, where α is positive or negative according to the species of sugar, and has a determinate value for a given temperature. The latter quantity, which is the angle of rotation for $l = 1$, $p = 1$, is called the specific rotatory power. Hence l being assigned, and θ and α being obtained by experiment, the value of p. giving the percentage of sugar, is calculated. The experiments are carried out by means of a saccharimeter, an instrument of which there is a considerable number of varieties. These are divided into two classes. One measures the angle of rotation directly, while the other determines the rotation by the contrary rotation caused by a thin plate of quartz. The latter are called shadow saccharimeters, from the principle involved. The original instrument of this kind was due to Prof. Jellett, of Dublin, but it has been greatly improved upon by Duboscq and Cornu. Another somewhat different form, devised by Laurent, has been adopted by the French Government. The distinguishing feature is that for certain positions of the optical parts of the instrument the field, one half of which is covered with a half-wave plate of quartz or mica, appears divided into two half disks, one bright and the other dark, and in another position as a uniform shadow without a dividing line. In the latter case the instrument is adjusted for use. Then if the observation tube is filled with a solution of sugar and placed in the saccharimeter between two Nicol prisms, a polarizer and an analyzer, so that the light passes through it before reaching the latter prism, the equality of tone in the two half disks is annulled. The analyzer is then made to revolve in the proper direction until the inequality disappears. The angle of rotation is shown by a scale indicating angular degrees, while another scale gives the corresponding percentage of sugar. R. A. ROBERTS.

Saccharomy'ces: a genus of fungi, including the yeast-plant. See FERMENTATION.

Sacchini, saăk-kee′nĕe, ANTONIO MARIA GASPARO: composer; b. at Pozzuoli, near Naples, July 23, 1734; was educated in the conservatory of Sant' Onofrio at Naples; achieved a great success at Rome in 1762 by his opera *Semiramide*, and at Venice in 1768 by his *Alessandro nell' Indie*; after composing about fifty operas for Italian theaters, went to Germany in 1771; repaired next year to London, where he was very successful with his operas, but whence he at last was compelled to flee in 1782 on account of debt; found employment in Paris, but only one of his operas, *Œdipe à Colone*, performed after his death, made any great impression. D. in Paris, Oct. 7, 1786.

Sac City: city: capital of Sac co., Ia.; on the north fork of the Raccoon river, and the Chicago and N. W. Railway; 45 miles W. by S. of Fort Dodge (for location, see map of Iowa, ref. 4–E). It is in an agricultural and dairying region, is an important trading and shipping point, and derives good power for manufacturing from the river. There are 6 churches, graded public schools, Sac City Institute (Baptist, founded in 1894), a national bank with capital of $50,000, a State bank with capital of $75,000, a monthly and 2 weekly periodicals, flour-mill, and windmill and lightning-rod factories. Pop. (1880) 595; (1890) 1,249; (1900) 2,079. EDITOR OF "SUN."

Saccomy'idæ [Mod. Lat., named from *Sac'comys*, the typical genus; Gr. *σάκκος*, sack + *μῦς*, mouse]: a family of mouse-like rodents peculiar to North America; distinguished by the hind limbs being much longer than the fore, and hence adapted for leaping; the presence of large external cheek-pouches not connected with the mouth, and lined with fur within; and the development of a long tail. The skull is thin, with the interorbital space rather broad; the tympanics inflated and vestibular; the petrosals approximated; the squamosals more or less restricted to the orbit; the mastoids roofing over in part the cerebral cavity; the nasals

are produced forward beyond the line of the incisors; the zygomatic arches are very slender; and no special anteorbital foramen is developed. In the dental series the molars are $\frac{4}{4}(\times 2)$. The species are confined to the western and southern portions of the U. S. and Middle America. They vary in size, some being smaller than the ordinary house-mouse, while others are nearly as large as a rat. They progress chiefly by long leaps, in the fashion of the kangaroo or ordinary jumping-mice. Revised by D. S. Jordan.

Saccopharyn'gidæ [Mod. Lat., named from *Saccopharynx*, the typical genus; Gr. *σάκκος*, sack + *φάρυγξ*, throat]: a family of fishes supposed to be related to the eels. The caudal portion of the body is extremely elongated, band-like, and tapers into an attenuated thread-like extremity; the skin is lax and destitute of scales; the head is very large; the snout short, pointed, flexible, and like an appendage overlapping the gape; the eye situated far forward; the mouth is fissured far backward; the teeth slender, curved, with points directed inward; dorsal and anal fins rudimentary, the former more so than the latter, and indicated by a groove bordered by a whitish line on each side; pectoral fins small. The skeleton has thin soft bones, deficient in inorganic matter, and connected by a lax, easily torn fibrous tissue; the stomach is distensible in an extraordinary degree, so that these fishes can swallow larger ones, and when full has a bag-like form, which is alluded to in the name. The family has been instituted for the reception of two or three species of deep-sea fishes, of which the body is so soft that a comparative study of the species is difficult. The order *Lyomeri* has been framed by Dr. Gill for the reception of these species. Its place is probably near the eels, but this is uncertain. Revised by D. S. Jordan.

Sacculi'na [Mod. Lat., from Lat. *Sacculus*, a little sac]: a genus of root-barnacles (see Cirripedia) often mentioned as an instance of Degeneration (*q. v.*).

Sacer'dos, Marius Plotius: a Roman grammarian of the third century, whose three books treating of grammar and meter are printed in Keil's *Grammatici Latini*, vol. vi., pp. 427–546.

Sac-fungi: See Ascomycetes.

Sachau, sää'*k*how, Karl Eduard: Orientalist; b. at Neumünster, Holstein, July 20, 1845; studied at Kiel and Leipzig; Professor extraordinary of Semitic Languages at the University of Vienna 1869; ordinary professor 1872; Professor of Semitic Languages in the University of Berlin 1876; member of the Royal Prussian Academy of Sciences June 30, 1887. He is the founder and director of the Seminary for (living) Oriental Languages. (See *Bericht über die Eröffnung des Seminars*, Berlin, 1888.) Among his numerous works are *Inedita Syriaca* (Vienna, 1870); *Chronologie Orientalischer Völker von Albêrûnî* (Leipzig, 1878); *Kurzes Verzeichniss Syrischer Handschriften* (Berlin, 1885); *Alberuni's India* (London, 1887–88); *Indo-Arabische Studien* (Berlin, 1888); and *Die Inschrift des Königs Panammu von Sam'al* (Berlin, 1893). Richard Gottheil.

Sacher-Masoch, sää'*k*her-maa'so*k*h, Leopold: novelist; b. at Lemberg, Galicia, Jan. 27, 1835; studied at Prague; was for some time a teacher of history at Gratz, and settled in Vienna, devoting himself entirely to literature. He published a great number of novels, of which especially the series *Cain's Inheritance* (*Die Liebe*, *Das Eigenthum*, etc.) attracted much attention. His more recent publications added little to his reputation. D. at Lindenheim, Mar. 9, 1895. Revised by Julius Goebel.

Sache'verell, Henry, D. D.: pulpit orator; b. at Marlborough, Wiltshire, England, about 1672; educated at Magdalen College, Oxford, where he became a fellow; took orders in the Church of England; received the living of Cannock, Staffordshire; appointed preacher at St. Saviour's, Southwark, 1705; preached a sermon at Derby assizes Aug. 15, and another before the lord mayor of London at St. Paul's Nov. 5, 1709, in both of which he denounced toleration of Dissenters, attacked Low Churchmen, inculcated the tenet of passive obedience, and declared that the Church was in danger; was impeached for these discourses by the House of Commons Feb. 27, 1710, found guilty of a misdemeanor Mar. 23, and sentenced to three years' suspension from preaching, the offending sermons being burned by the common hangman. Great excitement prevailed throughout England during this trial, and large numbers of pamphlets were printed on both sides, the Tories favoring the publicity of Sacheverell's sermons, of which at least 40,000 copies were sold, while 30,000 copies of the record of the trial (1710) were circulated. Sacheverell profited by this easy martyrdom; he was invited by the new (Tory) House of Commons to preach before them on the day his sentence expired, and was presented by Queen Anne to the rectory of St. Andrew's, Holborn. D. in London, June 5, 1724. The eloquent defense he pronounced at the bar of the Lords was written by Francis Atterbury. Revised by S. M. Jackson.

Sachs, Bernard, A. B., M. D.: neurologist and alienist; b. in Baltimore, Md., Jan. 2, 1858; educated in New York schools and at Harvard University, whence he graduated A. B. in 1878; studied medicine at Strassburg University, graduating M. D. in 1882; studied his specialty in Vienna, Berlin, and London; returned to New York to practice in 1883; appointed Professor of Nervous Diseases New York Polyclinic 1888; appointed neurologist to Montefiore Home in 1890, and to Mt. Sinai Hospital in 1893. He has made original investigations in the nervous diseases of childhood, publishing many papers on the subject. He was president of the American Neurological Association 1894. Among his published works are monographs on *Cerebral Hæmorrhage, Embolism, and Thrombosis* in Keating's *Cyclopædia of Diseases of Children* (1890); *Chorea*, in Hare's *System of Therapeutics* (1892); *Criminal Insanity*, in Hamilton's *System of Medical Jurisprudence* (1894); *Die Hirnlähmungen der Kinder* in *Samlung Klinischer Vorträge* (1892); *Nervous and Mental Diseases of Childhood* (New York, 1894). Editor *Journal of Nervous and Mental Diseases* (1887 and 1888), and of *The Polyclinic* (1893).
S. T. Armstrong.

Sachs, za*k*hs, Hans: poet and mastersinger; b. at Nuremberg, Germany, Nov. 5, 1494; attended one of the Latin schools of his native city until he was fifteen years of age, when he was apprenticed to a shoemaker, receiving at the same time instruction in the art of the mastersong; traveled all over Germany, working at his trade and practicing his poetic art wherever he found schools of mastersong; finally settled in Nuremberg; was married twice; d. Jan. 20, 1576. He began his literary career as a mastersinger, producing his first attempts at poetry according to the precepts of the school of mastersong. Later he became an enthusiastic admirer of Luther, and an ardent advocate of the cause of Reformation. He then broke through the narrow formalism of the mastersong, and in numerous poems, farces, and dramas he proclaimed the fundamental truths of the Reform doctrine. But he does not confine himself to the Bible for the subject-matter of his poetry. Among his sources we also find the German hero-legend, Boccaccio, Herodotus, Plutarch, Livy, and other writers of classical antiquity, which, through the efforts of the Humanists, had been translated into German. While comparatively few of his many lyric poems, which for the most part retain the traditional forms of the mastersong, have become popular, his short-rhymed narratives (*Schwänke*) still charm the reader, on account of their delightful humor and their sound but unobtrusive moral tone. Hans Sachs is the greatest representative of the German popular drama of the sixteenth century. Though he was not a dramatist of original power, and knew very little about the true dramatic art, he nevertheless exerted a great influence upon his contemporaries by his carnival plays (*Fastnachtspiele*), comedies, and tragedies, of which he wrote more than 200. The coarse carnival-play of the fifteenth century he raised into a higher and purer sphere, and in all of his plays he appears as a wise and good-natured teacher of his people. There was little room for pure æsthetic culture in Germany during the century of religious, social, and mental revolution, and we would be disappointed if we looked for absolute æsthetic beauty in Sachs; but his works will always remain a valuable source for our knowledge of the life and thought of his times, and his language ranks in force of expression and idiomatic beauty second to that of Luther. His memory was revived by Goethe in his poem *Hans Sachsens poetische Sendung*, after the great mastersinger had been slandered and forgotten for a long time. A complete collection of Sachs's poetic works, of which he himself in 1567 enumerates over 6,000 pieces, has not been published. See the editions by A. Keller and E. Götze, Goedeke and Tittmann; also M. S. Ranisch, *Hans Sachs* (1765); I. L. Hoffmann, *Hans Sachs* (1847); Ch. Schweitzer, *Un poète allemand au XVI^e^ siècle* (Paris, 1887); Kawerau, *Hans Sachs und die Reformation* (1889); E. Götze, *Hans Sachs* (1891); Drescher, *Studien zu Hans Sachs* (1891). Julius Goebel.

Sachs, Julius, von, Ph. D.: botanist; b. at Breslau, Silesia, Oct. 2, 1832; studied at the university at Prague, and in 1859 became assistant in physiological botany in the laboratory of agricultural chemistry at Tharandt; in 1861 Professor of Botany at Bonn; in 1867 Professor of Botany in the University at Freiburg, and in 1868 at Würzburg, where there has been established under his guidance a great institute for the study of plant-physiology. He has published many botanical works, among which the best known are *Handbuch der Experimental-Physiologie der Pflanzen* (1865); *Lehrbuch der Botanik* (1868; 4th ed. 1874; the 3d and 4th editions were translated into English in 1875 and 1892, under the title *Text-book of Botany, Morphological and Physiological*); *Geschichte der Botanik* (1875; trans. into English 1890); *Vorlesungen über Pflanzen-Physiologie* (1882; trans. into English 1887); *Abhandlungen über Pflanzen-Physiologie* (1892). The influence of Sachs upon botany has been greater than that of any other botanist of recent times.

Charles E. Bessey.

Sac Indians: See Algonquian Indians.

Sackbut [from O. Fr. *saqueboute*, Fr. *saquebute*: Span. *sacabuche*, originally a hooked lance by which foot-soldiers drew or pushed riders from their horses; O. F. *sachier*, draw out < Lat. *sacca're* + O. F. *boter* (> Fr. *bouter*): Ital. *bottare*, push, from Teuton. *bōtan*, O. Eng. *bēatan*]: a wind instrument somewhat resembling the trumpet, having a slide like the modern trombone. It is mentioned in the book of Daniel, but the translation is probably wrong, the English sackbut being a very different instrument, derived from a model found at Pompeii.

Sackett's Harbor: village; Jefferson co., N. Y.; on Black River Bay (an inlet of Lake Ontario), and the Rome, Watertown and Ogdensburg Railroad; 8 miles E. of Lake Ontario, 170 miles W. N. W. of Albany (for location, see map of New York, ref. 2–G). It has an excellent inner harbor, with sufficient depth of water to accommodate the largest vessels, good water-power for manufacturing, and agricultural surroundings. Its banking is done at Watertown. The Oneida, the first U. S. war-vessel ever launched on Lake Ontario, was built at Sackett's Harbor in 1809. In the war with Great Britain (1812–15) the village was an important naval station. Two war-vessels, the frigate Superior and the Madison, were built here in eighty and forty-five days respectively from the time the timber was cut. A third war-ship, partially completed when peace was declared, remained on the stocks, and was for many years an object of local pride. The U. S. Government has a military station here, known as Madison barracks. Pop. (1880) 885; (1890) 787; (1900) 1,266.

Sackville: town of Westmoreland County, New Brunswick; at the head of the Bay of Fundy and on the Intercolonial Railway, terminus of a branch railway extending 37 miles to Cape Tormentine, on Northumberland Strait; 129 miles N. E. of St. John (see map of Quebec, etc., ref. 5–I). It has a good harbor, a brisk trade, foundries, factories, and a steam-tannery, and is the seat of a considerable ship-building industry. It is the seat of Mt. Allison College (Wesleyan) and of Wesleyan male and female seminaries. Pop. (1891) 1,500.

Revised by M. W. Harrington.

Sackville, George Germain, Viscount, better known as Lord George Germain, third son of the first Duke of Dorset; soldier; b. in England, Jan. 26, 1716; educated at Westminster School and at Trinity College, Dublin; served with credit at the battles of Dettingen (1743) and Fontenoy (1745), and under the Duke of Cumberland against the Pretender in Scotland; became a privy councilor; was secretary for Ireland 1751; made lieutenant-general 1758; commanded the allied cavalry at the battle of Minden, Aug. 1, 1759, when he failed to execute the orders of the commander-in-chief, Prince Ferdinand of Brunswick, to charge upon the French infantry; was tried by court martial and cashiered early in 1760, but was restored to favor at the accession of George III. (Oct., 1760); entered Parliament 1761; was restored to the privy council 1766; entered the cabinet of Lord North as Secretary of State for the Colonies Oct., 1775; retained that post throughout the war of the American Revolution, distinguishing himself by his bitterness against the Americans, and resigned Feb., 1782, on which occasion he was created Viscount Sackville. D. Aug. 26, 1785. He is one of the persons whose claims to the authorship of the letters of Junius have been advocated. See Junius, The Letters of.

Sackville, Lionel Sackville West, Baron: diplomatist; b. at Bourn Hall, Cambridgeshire, England, July 19, 1827; educated at home; entered diplomatic service 1847; minister to Argentine Republic 1873; to Spain 1878; to the U. S. 1881; represented Great Britain in the Washington conference on Samoan affairs 1887; negotiated Fisheries Treaty of Washington 1888; having become a *persona non grata* on account of a letter written by him to a Mr. Murchison in advocacy of the re-election of President Cleveland in 1888 (on the ground that it would be to the advantage of Great Britain), he received his passports from the U. S. Government and returned to England.

Sackville, Thomas: See Dorset, Thomas Sackville.

Saco: city; York co., Me.; on the Saco river, and the Boston and Maine Railroad; 14 miles W. S. W. of Portland, 100 miles E. of Boston (for location, see map of Maine, ref. 11–A). The river, which is here navigable for vessels of 9 feet draught during nine months of the year, provides excellent power for manufacturing by a fall of 40 feet, and is crossed by four bridges. The city is surrounded by an agricultural region; contains a public high school, 14 public-school buildings, Thornton Academy, 2 libraries (York Institute, founded 1866, and Dyer, founded 1881) containing over 10,000 volumes, 2 national banks, and 2 savings-banks; and has manufactories of cotton goods, cotton-machinery, boots and shoes, lumber, brushes, belting, and other articles. There is considerable coasting trade. About 3½ miles from the city is Old Orchard beach, a popular summer resort, with commodious hotels, and the grounds of Methodist Episcopal national and district camp-meetings. Pop. (1880) 6,389; (1890) 6,075; (1900) 6,122.

Saco River: a stream which rises in the White Mountains, New Hampshire, and flows S. E. 160 miles through New Hampshire and Maine to the Atlantic; has several considerable falls, one of which, Great Falls, is 72 feet in height, and furnishes water-power, which is utilized at many places for manufactories.

Sacrament [from Lat. *sacramen'tum*, oath, sacred thing, mystery, deriv. of *sacra're*, make sacred, declare sacred, deriv. of *sa'cer*, sacred]: a term used in the Church since Tertullian (about 200), in a loose sense, of sacred doctrines and ceremonies (like the Gr. μυστήριον), and then, more particularly, of baptism, the Eucharist, and a few other solemn rites connected with Christian worship. St. Augustine defines sacrament in the narrower sense to be the visible sign of an invisible grace (*signum visibile gratiæ invisibilis*). To this was afterward added by Protestants, as a third mark, that it must be instituted by Christ and enjoined upon his followers. Sacraments are also called signs, seals, and means of grace. Their number is by Protestants confined to two —viz., baptism and the Lord's Supper—on the ground that these alone are instituted by Christ and expressly commanded to be observed to the end of time. The Roman Catholic and the Greek Churches add to them five others—viz., confirmation, penance, extreme unction, ordination, and matrimony. The Council of Trent anathematizes those who deny that there are more or less than seven sacraments (*esse plura vel pauciora quam septem sacramenta*). In the Greek Church they are called "mysteries." As to the efficacy of the sacraments, Protestants require faith as a subjective condition, while the Roman Catholic Church teaches that the sacraments work *ex opere operato*—i. e. by the inherent power God has imparted to the institution or by the performance of the act. The Roman Catholic Church curses any one that "saith that, in the three sacraments, to wit, baptism, confirmation, and order [ordination], there is not imprinted in the soul a character, that is, a certain spiritual and indelible mark, on account of which they can not be repeated." (*Canons and Decrees of the Council of Trent*, ses. vii., canon ix.; Schaff, *Creeds*, ii., 121.) There has been much controversy about the sacraments, especially the Lord's Supper, which is sometimes emphatically called *the* sacrament, between Protestants and Roman Catholics, and also between Luther, Zwingli, and Calvin, and their followers. The Quakers reject the sacraments as external ceremonies, and hold only to internal baptism or regeneration of the Spirit, and internal communion with Christ. See articles on the several sacraments, especially Eucharist.

Revised by S. M. Jackson.

Sacramentarians: the opprobrious epithet applied to the followers of Zwingli by the Lutherans in Reformation times because the former denied the presence of the body

and blood of Christ in the Eucharist, and affirmed that the consecrated elements were mere symbols. The Calvinists later came in for the same designation, although approaching much nearer the old Church doctrine. See TETRAPOLITAN CONFESSION. S. M. J.

Sacramen'to: city; capital of the State of California and of Sacramento County; on the east bank of the Sacramento river at its junction with the American river, and on the Southern Pacific Railroad; lat. 38° 31′ N., lon. 121° 20′ W. from Greenwich; 50 miles N. of Stockton, 90 miles N. E. of San Francisco (for location, see map of California, ref. 6-C). It is at the head of navigation for large steamers, although vessels ply between points 100 miles N.

Plan and Appearance.—The city has an area of about 2½ sq. miles, is built on a plain 30 feet above sea-level, and is laid out in rectangular blocks. It is protected from overflow by levees, which were erected at a cost of about $300,000. The climate is semi-tropical, tempered by cool southerly breezes in summer. Water for domestic and other uses is supplied from the river. The streets are lighted with electricity, are wide and commodious and well paved, and conform to the cardinal points of the compass. Those running N. and S. are designated by numerals; those running E. and W. by letters. Capitol Park (20 acres) is maintained in excellent order by the State, and there are other city and two private parks. The electric street railways have a total length of 20 miles.

Notable Buildings.—The State Capitol, built of granite, brick, and iron at a cost of $2,500,000, is the most conspicuous. Others are the Roman Catholic Cathedral, E. B. Crocker Art Gallery—owned by the city, presented to it by Mrs. Margaret E. Crocker, and administered by the California Museum Association—California State Bank, County Court-house, new U. S. Government building (cost $303,000), and Sutter's Fort, rebuilt and cared for by a State commission as an object of historic interest.

State Capitol, Sacramento, Cal.

Churches, Schools, etc.—There are 6 Methodist Episcopal churches, 5 Baptist, 2 Presbyterian, 1 Congregational, 2 Protestant Episcopal, 3 Lutheran, 3 Roman Catholic, a United Brethren, a Unitarian, a Christian, and a Jewish, besides 10 meeting-places of miscellaneous sects, including the Salvation Army. The public schools consist of a high school, 3 grammar and 6 primary schools, an ungraded school, a night school, and 6 kindergartens. In 1901 they had 134 teachers, average attendance of more than 4,500 pupils, and property valued at $330,000. There are 6 private schools (including a business college), and several libraries and reading-rooms, including the Free Public Library and the State Library. The latter is quartered in the Capitol, and contains more than 100,000 volumes. The publications comprise 2 daily and 6 weekly newspapers. The charitable institutions include the Marguerite Home for old ladies (founded in 1884 by Margaret E. Crocker), Protestant Orphan Asylum, Mater Misericordiæ Home, and the Stanford-Lathrop Home for friendless children; City Dispensary, Southern Pacific Hospital for railway employees, Women's Christian Temperance Union Mission, Sacramento Foundling Home, and the Children's Day Home. The only penal institutions are the city and county jails. There are 79 fraternal, charitable, and protective lodges and unions, and 5 clubs. There are two private hospitals, "The Sisters" and the "Wentworth-Igo," and a semi-hospital and refuge, "The Rescue Home," under charge of the Peniel Mission.

Business Interests.—Sacramento has a number of manufactories and several large canneries and packing-works. The chief industrial plant comprises the shops of the Southern Pacific Railroad Company, employing from 2,000 to 3,000 men in car and machinery construction and repairing. There are two commercial and three savings-banks, and their combined capital in 1901 was $1,525,500. Two large electrical companies supply the city with light and power; in one case the current is generated in the mountains 34 miles distant, in the other in the foothills 22 miles away—both from water-power. Sacramento has cheaper electrical rates than any city of the coast. The city is the largest and chief fruit-shipping center of the State. The dryness of the atmosphere, centrality of location, seven lines railway, and river transportation advantages make it a commercial center for the whole great valleys region, which it supplies to better advantage than San Francisco.

Finances.—In 1900 the city receipts were $711,426.68; disbursements, $699,727.39; assessed valuation, $16,511,800.

History.—Sacramento was first known as a small trading-post called New Helvetia. The settlement was made and controlled by Capt. John A. Sutter, who in 1839 secured a grant from the Mexican Government for land in and adjacent to the present city. The discovery of gold by James W. Marshall while digging a mill-race on American river at Coloma, 60 miles away, brought 100,000 immigrants to the city in a single year. The first building was erected in 1849, and the city became the State capital in 1854. The city has suffered severely—twice by fire and twice by flood. After the inundation of 1860 the principal streets were raised 8 feet and the levees strengthened. Pop. (1890) 26,386; (1900) 29,282. J. A. WOODSON.

Sacramento River: a stream which rises in Northern California, flows southward, and empties into an arm of San Francisco Bay. It drains the northern portion of the great valley of California, lying between the Sierra Nevada and Coast Range. The only outlet for the waters of this vast basin is through the Golden Gate. S. of Mt. Shasta the Sacramento joins Pitt river, which is the longer and larger stream, and should properly bear the name of the main trunk. The length of the Sacramento is about 400 miles. From the source of Pitt river in the extreme northeast corner of the State to the mouth of the Sacramento is approximately 600 miles. The Sacramento is navigable to Red Bluff, 275 miles, but in recent years steamboats have not gone above McIntosh landing, 45 miles below. Feather river joins the main stream 16 miles above the capital, and is navigable for 30 miles. Placer mining on many of the tributaries of the Sacramento has caused vast quantities of *débris* to be deposited in it. This and natural obstacles have necessitated the expenditure of large sums in improving navigation. Sacramento valley is exceedingly fertile, and yields a large wheat harvest. ISRAEL C. RUSSELL.

Sacred Heart, Ladies of the: an order of nuns founded in 1800 in France by J. D. Varin, a Jesuit, and Magdalen Sophie Louise Barat; approved by the pope in 1826. In 1818 it was established in the U. S., where there are now many houses. There is also an order of Sisters of the Sacred Agonizing Heart of Jesus, with a few houses in the U. S.

Sacred Hearts of Jesus and Mary, Brothers of the: a Roman Catholic community founded at Lyons, France, by M. Coindre, a priest, in 1822. They were first established in the U. S. in 1847. Their work is educational.

Sacrifice [viâ O. Fr. from Lat. *sacrifi'cium*; *sa'cra*, sacred rites, or victims (neut. plur. of *sa'cer*, sacred) + *facere*, make, do]: an offering to the Deity, as an expression of thanksgiving, penitence, or consecration. The origin of sacrifices has been much debated, but is lost in the dimness of antiquity. The earliest records, whether sacred or profane, show sacrifice as an existing institution, and in the former as receiving the Divine approbation. The object was everywhere the same—to provide a means whereby man might approach God. The theory of their efficacy seems to have been very different among the heathen and among the Israelites. In the former sacrifices were looked upon as in some sort a compensation to the gods, and their efficacy therefore depended somewhat upon their value, so that in extreme cases even human sacrifices were offered, as among rude nations in modern times; among the chosen people different views prevailed, or at least were distinctly embodied in their law and taught by their prophets. Here the fact was recognized that the disturbed communion with God could be restored only on the basis of holiness, and the primeval promise that in the long struggle with evil the "seed of the woman"

should obtain the final victory was always the central point of their national existence. Meantime, sacrifices in great variety were provided, but those especially appointed as "sin-offerings" were always of the same character and value. A more valuable sacrifice was indeed required as the sin-offering of the high priest or of the collective congregation, and also one slightly more valuable from a "prince," for obvious reasons; but there was no gradation in the value of the victim in proportion to the aggravation of the offense. Their efficacy was thus made to depend simply upon the Divine appointment.

The chief kinds of Hebrew sacrifices were the whole burnt-offering, which was wholly consumed upon the altar, and with which an oblation of fine flour and oil, with incense, and a drink-offering of wine were offered; the sin-offering, of which only the fat and kidneys were burned upon the altar, the flesh being either "burned without the camp" in case the blood had been sprinkled within the sanctuary, or eaten by the priests alone in case the blood had been only sprinkled upon the brazen altar; and the trespass-offering, which is distinguished clearly from the last, although the ground of the distinction is not entirely clear. These were all propitiatory offerings, and with them the priest was required "to make atonement" for the people. Besides these were the peace-offerings, perhaps the most common of all, which might be offered in any number and of any sacrificial animal. Of these, the same parts were burned on the altar, a portion given to the priests to be eaten by them and their families, and the rest of the flesh eaten by the offerer and his friends in a holy feast before the Lord. There were other important sacrifices required. Such were the Passover lamb offered in memory of the deliverance from Egypt and as a special type of Christ by each head of a family on the fourteenth of the month Nisan in each year, and eaten in their homes on the following night; the two goats on the great day of atonement in each year, of which one was sacrificed at the altar, the other sent as a "scape-goat" into the wilderness; the red heifer, burned without the camp and its ashes used in purifications; and a great variety of sacrifices for individuals on special occasions. The original comprehensive offering, from which all the others were specialized, appears to have been the burnt-offering.

Under the Levitical law the essential point of the sacrifice was the blood, the treatment of which always formed the culminating point in the sacrificial ritual. A burnt-offering of a lamb for the whole people was regularly offered every morning and evening, with its accompanying oblation or "meat-offering." In regard to the sin-offering, in order to bring it within the reach of all it was provided that for the required animal might be substituted by the poor a pair of doves, or even in case of extreme poverty an offering of flour. The symbolical character and significance of the sacrifices are set forth at some length in the Epistle to the Hebrews. See G. F. Oehler, *Theology of the Old Testament*, Eng. trans., ed. G. E. Day (New York, 1883); A. Cave, *The Scriptural Doctrine of Sacrifice* (2d ed. Edinburgh, 1890); and W. Robertson Smith, *Religion of the Semites* (2d ed. 1894). Revised by S. M. Jackson.

Sacrobos'co, Joannes, de: Latinized name of John Hollywood, an English mathematician of the thirteenth century. Little is known of him, except that he entered the University of Paris 1221, became professor there, and died in 1244 or 1256. He was the author of a treatise *De Sphæra Mundi*, a paraphrase of a part of Ptolemy's *Almagest*, which he had employed in Arabic. It was first printed in 1472, and was reprinted with commentaries about sixty times until the end of the seventeenth century.

Sacrum [Mod. Lat. (sc. *os*, bone), the sacred bone, neut. of Lat. *sa'cer*, sacred]: in the vertebrate skeleton, a bone situated below or behind the lumbar and above or before the coccygeal vertebræ. In man it is formed of five (rarely four or six) united vertebræ. It is large, roughly triangular, and is penetrated by foramina for the passage of nerves. It is developed from thirty-five centers of ossification. The rabbins called it *luz*, and said that it never decays, but forms the germ of the new body at the resurrection; the Arabs say that the judgment angel sits upon it and judges the soul of the departed.

Sacy, săă'see', Antoine Isaac, Baron Silvestre, de: Orientalist; b. in Paris, France, Sept. 21, 1758; studied law and Oriental languages; elected to the Académie des Inscriptions 1785; overseer in the mint 1791–92; Professor of Arabic at the École des Langues orientales; called to the Institute (section of literature and fine arts) 1795, but did not take his place till 1803; Professor of Persian at the Collège de France 1805; represented Paris in the Corps Législatif 1805–15; created baron by the emperor 1813; administrator of the Collège de France and the École des Langues orientales 1822; entered the Chamber of Peers 1832; conservator of the Oriental MSS. of the Bibliothèque Nationale and perpetual secretary of the Académie des Inscriptions 1833. D. in Paris, Feb. 21, 1838. A few of his principal works are: *Grammaire Arabe* (1810; 2d ed. 1831); *Chrestomathie Arabe* (1806; 2d ed. 1826); *Principes de la Grammaire générale* (1799; 8th ed. 1852); *Relation de l'Égypte par Abd-allatiph* (1810); *Mémoire d'histoire et de littérature orientales* (1818); *Les Séances de Hariri* (1822; 2d ed. 1847); and *Exposé de la religion des Druses* (1838). See Reinaud, *Notice historique et littéraire sur Silvestre de Sacy* (Paris, 1838). Richard Gottheil.

Sacy, Samuel Ustazade Silvestre, de: journalist; son of Baron de Sacy; b. in Paris, Oct. 17, 1801; appointed on the staff of the *Journal des Débats* 1828, which position he held for more than thirty years; member of the Academy May 18, 1854; keeper of the Mazarin Library 1836; its administrator 1848; member of the council of public education 1864. He published essays, *Variétés littéraires* (1858); edited *Bibliothèque Spirituelle* and *Lettres de Madame de Sévigné* (1861–64). D. Feb. 14, 1879. R. G.

Saddle: a contrivance designed to rest on the back of an animal and serve as a seat for a rider or as a support for other weights. It thus includes the pack-saddle and the part of a single harness that supports the weight of the shafts; for four-wheeled vehicles this is merely a broad padded strap buckled around the animal's body, but for a heavy two-wheeled cart, since part of the weight of the load rests on the shafts, the saddle is large and more heavily padded than a riding-saddle. The pack-saddle varies much in form, but that most used in the transportation of goods consists of crossed stieks, like a common saw-horse, securely fastened to saddle-bars of long bearing.

The use of riding-saddles is of ancient origin. Pancirollus relates that Constantine the younger was killed in the year 340 by falling from his saddle, and the Emperor Theodosius, in the year 385, forbade the use on post-horses of saddles weighing over 60 lb. Riding-saddles may be classed under two types, Hungarian and Moorish. The original of the former consisted of wide parallel bars, joined at the ends by heavy bows, to which were secured parallel strips of hide. There were no stirrups. The Hungarian saddle of the present closely resembles the primitive one, while the English saddle is the most highly developed form of the type in Europe, and the McClellan saddle (named after Gen. George B. McClellan) the best in the U. S. These two saddles, though from the same source, are quite different in construction. The tree of the English saddle is a skeleton on which the saddle is made. As completed, the seat and bearings are all padded, with scarcely anything of the original outline showing, except at the edges. Probably in point of style it is the most perfect saddle made, but one who is in the saddle all day is glad to exchange it for something easier. The McClellan tree forms the saddle itself. The tree-bows are shaped to fit the animal's back, and padding is dispensed with, even for the seat. It is covered with rawhide, and all but necessary strapping is eliminated. The fender of the McClellan is borrowed from the Mexican saddle, and is improved in the modification of the McClellan saddle known as the Whitman, after its inventor, Col. Whitman, U. S. army. The trade nomenclature of saddles of the Hungarian type includes also the Shaftoe, Somerset, Kilgore, and Morgan. A later form is a pneumatic saddle, in which a rubber bag, filled with air, is placed under the leather covering of the seat. The object is to increase the comfort of the rider, and lessen the concussion of his weight on the animal's back. It has been most successful as applied to racing-saddles.

The so-called Moorish type probably originated in Persia. In the primitive form a number of skins were superimposed on the animal's back, with a front and back wooden cantle, the whole confined by straps completely surrounding the animal. In the construction of its various forms the finest fabrics have been employed, and it has always been the most expensive saddle made. Mexican, Texas, and California saddles are derived from this type, retaining the main features of the original. The Moorish saddle has heavy, long

bars, a high and broad arch, and a large knob or horn, which was originally in the shape of a box in which to carry knives and other articles, the shape being much like the "muley" of the present time. The horn in its present shape is a Mexican addition, serving to hold a lariat or lasso, and as a writing-desk. It is in some cases 10 inches in diameter. The Texas and California models are stronger in construction and lighter than the Mexican. A characteristic feature is the hang of the stirrup-leathers, which are suspended centrally under the body of the rider, whereas in the English saddle they are hung in front of the leg. The girthing is also different; straps and buckles are replaced by hair cinches, fastened securely by withes.

Ladies' saddles originated with the pillion, which was nothing but a well-stuffed cushion or pad, with dependent strap foot-rest and an iron back, to which the rider was fastened by a strap encircling the waist. The Icelandic saddle was an improvement on this, and partook more of the nature of a chair, the pad being built on bars, something like a man's saddle. The pommel and cantle were added to the saddle in England in early times. The present type of side-saddle seems to have come into vogue about 1680. Some authorities say Anne of Bohemia introduced the saddle into England in 1380. The third pommel, or leaping-horn, appeared about 1830, and by the firmer grip given at once eliminated much of the danger in woman's riding. At present the off-side pommel is merely a slight projection.

Riding and pack saddles for animals other than horses are numerous. The camel riding-saddle is like a hollowed-out wooden footstool, square, with semicircular niches on two sides for the legs, and a kind of fence front and back to hold in the rider. The elephant howdah is made with bars and placed on the back, or it is made to depend from the sides. The Chilian *montura* is a close approach to the original Moorish saddle of skins and straps. The tilting-saddle used in jousts in the fourteenth century was covered with hide and canvas, and gaily decorated. The rider's seat was 10 inches above the tree-bars, being merely two wooden rings through which he put his legs, the limbs being protected by an apron of wood. Probably it was the clumsiest saddle ever made. C. H. E. Redding.

Sad'ducees: one of the two great parties in Judæa in New Testament times; uniformly represented as dividing public attention with the Pharisees, who were much more numerous and much more respected. The party was essentially aristocratic. Its founder was Zadok, high priest under David (2 Sam. xx. 25), who succeeded Abiathar, became high priest alone under Solomon (1 Kings, ii. 27, 35), and established the high-priestly line which extended to the time of Jesus. Thus through all the Jewish Bible history the party of the high priest were Zadokites or Sadducees. During the subsequent Persian and Greek periods the priestly aristocracy controlled the political fortunes of their people. This fact explains their worldly-mindedness. They practically rejected the distinctive spiritual claims of the Jewish people. In theology they seem, however, to have maintained the primitive faith as taught in the Pentateuch, which knew nothing of the resurrection of the body, future retribution, or even of personal immortality. They rejected the elaborations of the Pharisaic party, which had made the commandments of God vain by their traditions, and maintained that only the written law was binding, not the oral. They accepted, like the Pharisees, the entire Scriptures, but they interpreted them differently. In New Testament times their religious teaching embraced a denial of angels and spirits, and of divine co-operation in human affairs, maintaining that good and evil are at the choice of man, who can do the one or the other at his discretion. The Zadokites were then ruling priestly families, for Annas and Caiaphas were Sadducees. They joined the Pharisees in condemning Jesus, whose religious zeal and Messianic claim had stirred their liveliest opposition. When Jerusalem fell (A. D. 70) the Sadducees fell likewise; and as they were linked with the Jewish state, when that state disappeared they disappeared. Soon they were completely forgotten, so that the Talmud scarcely mentions them. Were it not for the New Testament and Josephus it might almost be questioned whether they ever existed. See Schürer, *Jewish People*, Eng. trans., second division, vol. ii., pp. 29–43.

Samuel Macauley Jackson.

Sa'dī, sä'dee: poet and moralist; b., according to best authority, about A. D. 1184 (A. H. 580), at Shīrāz, Persia, whence his common designation Muṣliḥ ad-dīn Shīrāzī, though his name is more correctly given as Musharrif ad-dīn ben Muṣliḥ ad-dīn. Upon the death of his father, who appears to have held office with favor under the Atābeg rulers of Fars, the youth received the patronage of the Atābeg Sa'd ben Zengī (A. D. 1195–1223), who for nearly thirty years gave material encouragement to the zealous scholar in pursuing his studies and perfecting his education at Nizāmiah College in Baghdād. In honor of his royal patron he assumed the name Sa'dī. His early literary productions gave promise of reflecting renown upon the learned masters how had been his college teachers, although his two great works were not produced until very old age. More than thirty years of his middle life were spent in travel or residence in Syria, India, Abyssinia, Egypt, and other countries, and he was over seventy years of age when he returned to his old home at Shīrāz under the favor of the son of his old patron, and the rest of his long life, of more than five score years, he enjoyed there, and died in 1292, or, according to another statement, in 1291 (A. H. 690). The place of his tomb is still shown at Shīrāz.

The works on which Sa'dī's fame rests are the *Būstān*, or Garden of Perfumes (A. D. 1257, Ethé), and the *Gulistān* (A. D. 1258, Ethé); both of them were written when, advanced in years and after his return to his early home. The *Būstān* is composed entirely in verse and comprises ten chapters; the *Gulistān* is written in prose with verses intermingled, and comprises eight chapters. Both these productions have a moral and didactic tendency; the *Gulistān* abounds in charmingly told anecdotes and bright illustrations. Perhaps not inferior to these masterpieces is Sa'dī's *Dīvān*, a collection of short lyrical poems, besides which he wrote a considerable number of miscellaneous pieces composed in Arabic and Hindūstānī as well as in his native Persian.

Bibliography.—On Sa'dī's life and works, see W. Bacher, *Sa'dī, Aphorismen und Sinngedichte, herausgegeben und übersetzt mit Biographie* (Strassburg, 1879); Rieu, *Catalogue of the Persian Manuscripts in the British Museum*, ii., p. 506; also Sir Gore Ouseley, *Biographical Notices of Persian Poets* (London, 1846); and for a special study of the poetical and philosophical character of Sa'dī, consult H. Ethé, *Der Sūfismus und seine drei Hauptvertreter*, in *Morgenländische Studien* (Leipzig, 1870). There is an English translation of the *Būstān*, by W. Clarke (London, 1879). Selections have been rendered by F. Falconer (London, 1838), Schlechta-Wssehrd (Vienna, 1852), and Strong (Simla, 1872). There is an edition of a *Būstān* manuscript prepared by photographic process, and collated, by Platts and Rogers (London, 1891); in the same year appeared *A Commentary on the Bostān, by Fek Chand Bahar* (Lucknow, 1891). The chief modern editions of the *Gulistān* are by Sprenger (Calcutta, 1851), F. Johnson (London, 1863), Platts (London, 1874), and likewise a lithographed edition of the text (Lucknow, 1882). Among translations of the *Gulistān* may be mentioned those by Dumoulin (Calcutta, 1807), Gladwin (London, 1822), J. Ross (London, 1823), Lee (London, 1827), and especially the translation and introduction by Eastwick, *Gulistān*, in Trübner's Oriental Series (London, 1880). Also see among the literary remains of F. Rückert, *Politische Gedichte übersetzt mit Einleitung über Saadi's Leben und Werke*, von E. A. Bayer (Berlin, 1894).

A. V. Williams Jackson.

Sadler, or **Sadleir**, Sir Ralph: b. at Hackney, England, in 1507; was a *protégé* of Thomas Cromwell; employed by Henry VIII. in effecting the dissolution of the religious houses, and shared in their spoil 1535–37; was ambassador to Scotland in 1537, and again in 1540 and 1541–43; negotiated a treaty for a marriage between Prince Edward and Mary, the infant Queen of Scots, July 1, which was, however, declared null by the Scots Dec. 11, 1543; distinguished himself in the ensuing war with Scotland, being made knight-banneret upon the battle-field of Pinkie Sept. 10, 1547; was made privy councilor by the will of Henry VIII. and master of the wardrobe soon afterward; bore a prominent part in the administration under Edward VI.; lived in retirement during the reign of Mary; was recalled to the privy council on the accession of Elizabeth, and again sent on a mission to Scotland 1558; was one of the commissioners in the conferences at York respecting the charges made against Mary Queen of Scots, Oct. 4, 1568; was her keeper when imprisoned at Tutbury Castle 1562, and was again envoy to Scotland about 1586. D. at Standon, Mar. 30, 1587. His interesting *Letters and Negotiations*, first printed in 1720, were

edited by Arthur Clifford, with a memoir and notes by Sir Walter Scott, under the title *State Papers and Letters of Sir R. Sadler* (2 vols., 1809).

Sadlier, Anna Theresa: See the Appendix.

Sadlier, Mary A. (*Madden*): See the Appendix.

Sado, saa'dō: an island in the sea of Japan; about 30 miles from the Japanese mainland; between 138° and 139° E. lon. and 37½° and 38½° N. lat. It forms part of the prefecture of Niigata, and has a population of about 103,000; it possesses gold and silver mines, but their output has not of late years much more than covered expenses of working. The island, which is chiefly of limestone formation, is very hilly, with one plain between two mountain groups.

Sadoleto, saă-dō-lā'tō, Jacopo: cardinal; b. at Modena, Italy, July 14, 1477; was ordained priest in Rome in 1502; appointed secretary to Leo X. in 1513; made Bishop of Carpentras, in France, in 1517, and cardinal in 1536. D. in Rome, Oct. 18, 1547. He made a favorable impression even on the most zealous Reformers by his conciliatory spirit, and he was often employed in the diplomatic negotiations between Charles V., Francis I., and the popes. His writings, *Philosophiæ Consolationes* (1502); *De Liberis recte instituendis* (1533); *Phædrus sive de Laudibus Philosophiæ* (1538), etc., and his *Letters* were published in a collected edition at Verona (4 vols., 1737) and at Rome (5 vols., 1759). See Joly, *Étude sur Sadolet* (Caen, 1857).

Sadowa, saă'dō-vaă: village of Bohemia: on the Bistritz; 9 miles N. W. of Königgrätz (see map of Austria-Hungary, ref. 3–E). This is the name given by the Austrians to the battle of Königgrätz (*q. v.*), in which, on July 3, 1866, 240,000 Prussians defeated 220,000 Austrians and Saxons. The Prussian loss was 9,000 men, while the Austrians lost over 40,000 men in killed, wounded, and prisoners.

Sa'fed [= Arab.; Heb. *Tsephath*, liter., watch-tower]: town in Palestine, in the ancient province of Galilee (altitude, 2,749 feet), with splendid view of Jebel Zebūt, Jebel Jermak, Tabor, and Carmel; thought by some to be mentioned in Matt. v. 14. A fortress was built there by Fulke 1140, defended by the Templars; taken by the Sultan of Damascus 1220; reconstructed by the Templars 1240; taken definitely by the Moslems 1266, and made capital of a province. In 1799 it was occupied by a French garrison. Jews settled there in large numbers in the sixteenth century, expecting that the Messiah would make it his capital. Its bazaar is of little importance. See Neubauer, *Géogr. d. Talmud* (1868, p. 227); Baedecker, *Palest. und Syria* (2d ed. 1894, p. 258); Tristram, *Land of Israel* (London, 1865, p. 576). Richard Gottheil.

Safes: structures designed to protect papers, money, or other contents from loss either by theft or by fire. For the latter see Fire-proof Safes. Those supposed to be proof against burglarious attacks, directed either upon the inclosing walls or merely against the lock (see Lock) securing the door, should successfully resist for twelve hours at least any attempts to open them; but such is the perfection of the mechanical and chemical means used that probably there are none of the so-called burglar-proof safes the contents of which could not be abstracted by an undisturbed burglar in very much less time.

Burglar-proof safes are of two distinct constructions: 1. Those which have walls cast in one mass of iron or steel or of some alloy of these metals. 2. Those having their walls built up of bars or plates of iron or steel secured together by bolts or rivets. The first class may be subdivided as follows, viz.: *a*. Safes in which the resistance to attack depends upon their form, and the extreme hardness and toughness of the cast metal used. Such are the spherical safes made from an alloy of iron and chromium. *b*. Safes having the cast metal of their walls re-enforced by a network of wrought-iron or steel rods, about which the molten iron or steel is poured, and which is solidly inclosed by the cast metal when it cools. The second class may also be divided in the following way, viz.: *c*. Safes made of bars or plates of homogeneous wrought iron or steel. *d*. Safes in which the bars or plates are composed of layers of iron and steel welded together. *e*. Safes made of layers of bars or plates of wrought iron or steel, between which are interposed one or more layers of bars of hard cast iron.

For most burglar-proof safes of recent construction great pains have been taken to conceal the heads of the bolts or rivets, and in some cases these have been made so short as to simply fasten each layer of plates to those adjacent, but in no instance extending through the whole thickness of the walls. The doors have also been fitted with the greatest accuracy in order to prevent the introduction of explosives.

Apertures through the doors of safes for the passage of spindles for operating bolts and locks have been found a source of insecurity, and therefore doors for burglar-proof safes have been contrived so that when shut they are fastened by bolts operated automatically, and they are provided with clockwork which can be so adjusted before the door is closed that at a certain hour the bolts are drawn by the release and action of powerful springs. W. F. Durfee.

Safety-lamp: a lamp so constructed as to be safely employed in an atmosphere so contaminated with fire-damp as to explode when a naked flame is exposed to it. Freshly exposed coal underground often gives forth one or more kinds of gas, such as carbon dioxide (CO_2), oxygen, nitrogen, and fire-damp (CH_4). To the latter other names applied are carburetted hydrogen, methane, and Marsh-gas (*q. v.*). From a single ton of anthracite coal more than 600 cubic feet of gas have been emitted, of which 93 per cent. was fire-damp. Bituminous coal, being softer and more porous, parts with its gas more easily, though the total amount per ton is not so large. If the atmosphere contain from 6 to 17 per cent. of fire-damp the mixture is dangerously explosive. Outside of these two limits it is still inflammable. It is of the utmost importance therefore that the ventilation of a coal mine shall be good enough to prevent contamination of the air with fire-damp. Since perfect ventilation is impossible, the miner needs a lamp for illuminating purposes that may be used in a slightly contaminated atmosphere, and the inspector needs the means of detecting such contamination, however slight.

Between 1812 and 1816 several forms of safety-lamp were devised, that of Sir Humphry Davy being the one which has remained most extensively in use. For any given fuel the temperature at which ignition begins is lower than that developed by the subsequent process of combustion; for example, the ignition-point of phosphorus is below the boiling-point of water, while the temperature due to its combustion exceeds that of red-hot iron. Davy discovered that in a quiet atmosphere a mere partition of wire gauze is enough to prevent the transmission of flame, the gauze absorbing and radiating enough heat to reduce the temperature below the ignition-point. To a small, cylindrical oil-lamp he attached a cylinder of iron-wire gauze about 6 inches long and less than 2 inches in diameter, which inclosed the flame. It was supported in a framework of small metal rods fitted into terminal flat brass rings. One of these enclosed the body of the lamp, while the other was covered with gauze and served for attachment of a handle. The meshes of the gauze permitted free access of air to the flame and transmission of part of its light. The standard adopted as a limit of safety was iron gauze with 784 meshes per square inch, the wire being about $\frac{1}{50}$ inch in thickness. When such a lamp is carried into an atmosphere contaminated with from 3 to 6 per cent. of fire-damp the flame becomes elongated and smoky, being surrounded by a zone of mixed gases less rich in oxygen than air is, and containing carbon and hydrogen, both of which are combustible. The flame therefore occupies an appreciably larger volume, and indicates the approach of danger before an actually explosive atmosphere is reached. Within a dangerous atmosphere the entire space within the cylinder of gauze becomes occupied with flame, but this may for some time fail to be transmitted through the gauze. Such transmission may occur after the gauze becomes red-hot, or if the lamp is exposed to a draught. The indication of danger should be sufficient to cause the withdrawal of the miner from such surroundings. Modifications of the Davy lamp have come into use, chiefly with a view to surrounding the flame with glass so as to increase the effective radiation of light; but in each case access and egress of air are effected through one or more thicknesses of wire gauze. Muesseler's lamp is extensively employed in continental Europe; besides the glass chimney it has a conical metallic chimney above the flame to increase the draught of feed-air.

Of late years electricity has been extensively applied in mining operations, and the most obvious application would naturally seem to be the substitution of the incandescent electric lamp for the miner's wire-gauze safety-lamp, since the former, if carefully handled, is quite safe in any atmosphere whatever. The difficulty attendant upon the attainment of effective insulation, suitable wiring, and the pre-

vention of rough usage by miners have thus far (1895) made the use of electricity for this purpose uneconomical, although large underground cavities have been satisfactorily illuminated with the arc-lamp.

Recent improvements in the safety-lamp have all been directed with a view to its use as a fire-damp indicator. Portable indicators have been based upon the heating of a platinum wire in contact with an atmosphere containing fire-damp when the wire is traversed by an electric current; but the transportation of the source of current is inconvenient. Better success has been attained in increasing the sensitiveness of the flame in the safety-lamp. Not only does the flame lengthen in an atmosphere containing fire-damp, but it is capped with an almost non-luminous aureole, the length of which indicates quite accurately the percentage of contamination. To measure its height best the luminous part of the oil-flame must be hidden or suppressed. Mallard and Le Chatelier, in 1881, showed that aureoles much larger and more easily visible are given by flames of alcohol and of hydrogen. Pieler, an Austrian engineer, soon afterward constructed a Davy lamp supplied with alcohol instead of oil, and furnished with a shade surrounding the flame. Any elongation of this is seen above the edge of the shade, and by this means as little as 0·25 per cent. of contamination becomes perceptible. Pieler's lamp is widely in use in Germany, but is unsafe. In 1892 important improvements were independently made by Chesneau in France and Clowes in England. In Chesneau's lamp methylic alcohol is used, with a small admixture of copper chloride ($CuCl_2$), which colors the flame green and the aureole takes a greenish blue. The construction of the lamp is more complicated than that of Pieler's, but it is quite safe, and the indications are delicate enough to reveal 0·10 per cent. of contamination. Clowes's invention consists in the attachment of a small steel cylinder of compressed hydrogen to a special but simple form of safety-lamp containing oil. On opening a valve a small quantity of the gas is discharged through a narrow copper tube which traverses the oil-reservoir and terminates at the side of the wick. The issuing jet of hydrogen is ignited, and the oil-flame is then turned down to extinction. The height of the aureole in the suspected atmosphere is then noted, and the corresponding percentage of fire-damp read from a scale. The sensitiveness of this indicator is nearly if not quite equal to that of Chesneau's, and it has the advantage of greater simplicity, in addition to the fact that it may be used for illuminating purposes and for the rough estimation of fire-damp with the luminous oil-flame before applying the more delicate test with the non-luminous hydrogen flame. The method is applied with equal success to the measurement of contamination with coal-gas, water-gas, and petroleum vapor, and is therefore useful in many other places besides coal mines.

W. Le Conte Stevens.

Safety-valve: See Steam-boiler.

Safflor: See Cobalt.

Safflower, or **Carthamus** [*safflower* is from O. Fr. *safleur* (by analogy of O. Fr. *fleur*, flower, and *safran*, saffron), from Arab. *usfūr*, safflower, deriv. of *safrā*, yellow]: the

The safflower.

flower of the *Carthamus tinctorius*, of the thistle tribe, indigenous to Egypt and the Levant, but now cultivated in France, Spain, Germany, Italy, Hungary, the southern Asiatic provinces of Russia, the East Indies, and South America. It was formerly used very extensively for producing pinks, reds, scarlets, and lilacs on cotton, flax, and silk, especially for dyeing red tape and for preparing pink saucers. It is still used in Lancashire for certain shades of pink for the Eastern market, though aniline colors have displaced it in many cases. Safflower contains two coloring-matters—one, yellow, is an acid, bitter, soluble in water, and useless; the other, *carthamine* or *carthamic acid*, red, insoluble in water, but soluble in alcohol and in alkalies, and valuable as a dye. The safflower colors on fabrics are very fleeting; light destroys the color rapidly, and goods dyed with it must be dried in the shade. Age is nearly as injurious as light, especially when the goods are damp. Sulphuretted hydrogen converts carthamic acid into colorless carthamous acid; hence this gas acts injuriously on goods dyed with safflower. The extract of safflower consists of the carthamic acid in suspension in water. The *rouge* used for the toilet is a mixture of carthamic acid with fine burned talc (French chalk). Pink saucers are coated with carthamic acid. See Calvert's *Dyeing and Calico-printing* (1876); Ure's *Dictionary*; Muspratt's *Chemistry*; Schützenberger, *Die Farbstoffe*. See also Saffranine.

Revised by Ira Remsen.

Safford, James Merrill, Ph. D., M. D.: geologist; b. at Zanesville, O., Aug. 13, 1822; graduated at Ohio University, and continued his studies at Yale; Professor of Chemistry, Natural History, and Geology in Cumberland University, Tenn., 1848–53; was elected to the chair of Chemistry in the medical department of the University of Nashville 1873; to the same position in Vanderbilt University 1874; and to the chair of Mineralogy, Botany, and Economic Geology in Vanderbilt University 1875. He became State geologist of Tennessee in 1854. His general report published in 1869 is the standard treatise on the geology of the State, as well as an important contribution to the geology of the U. S.

Revised by G. K. Gilbert.

Safford, Truman Henry: astronomer; b. at Royalton, Vt., Jan. 6, 1836; obtained in early boyhood celebrity for his wonderful mathematical powers; prepared an almanac at the age of nine years; calculated in 1850 the elliptic elements of the first comet of 1849; improved methods of astronomical calculation; graduated at Harvard 1854; was some years engaged in astronomical studies; became in 1863 adjunct observer in the Cambridge Observatory, acting director Feb., 1865, and director of the Chicago Observatory Dec. 28, 1865. His work at the Chicago Observatory included discovery of many new nebulæ, and the beginning of a zone for the international survey now nearly completed, but was cut short by the consequences of the Chicago fire. He then took part in Capt. Wheeler's surveys of the far West, and other astronomical work for different bureaus in Washington. In 1876 he was appointed Professor of Astronomy at Williams College; there completed vol. iv. of the annals of Harvard College Observatory, and a star-catalogue for the U. S. engineers; built a meridian observatory, mounted the instruments, and published a catalogue of polar right ascensions from his Williamstown observations, besides contributing frequently to astronomical and educational journals; and has earnestly labored for more modern ideas of instruction in mathematics.

Saffranine, Safranine, Aniline Pink, or **New Rose** [*safranine* is from Fr. *safran*, saffron]: a dye, which has to a large extent superseded safflower for dyeing silk and cotton, obtained by treating a mixture of toluylene diamine, $C_6H_3(CH_3)(NH_2)_2$, and toluidine, $C_6H_4(CH_3)(NH_2)$, with an oxidizing agent. $C_6H_3.CH_3(NH_2)_2 + 2C_6H_4.CH_3.NH_2 + 4O = C_{21}H_{20}N_4 + 4H_2O$. Saffranine has the composition $C_{21}H_{20}N_4$, and appears to be nearly related to Perkin's mauveine. For dyeing, the saffranine is dissolved in boiling water and carefully filtered, and a very little sodium carbonate added before it is put in the dye-beck. To dye wool a rose pink, proceed exactly as with the Aniline Colors (*q. v.*). To dye silk, add the solution of the color to the bath, in which some castile soap has been previously dissolved; keep the bath lukewarm. To dye cotton, it is a good plan first to soak, in a cold bath containing sodium hyposulphite, ¾ oz. to the pound of cotton, to destroy the last traces of chloride of calcium. For a rose pink, mordant the cotton in either of the following ways: (1) Soak cotton half an hour in the clear solution of acetate of aluminium, obtained by dissolving 2 lb. of alum and 1 lb. of acetate of lead in 2 quarts of water;

dry; soak half an hour in a cold fat-soap bath; dry; then dye lukewarm in the solution of saffranine. (2) Soak the cotton from four to six hours in a lukewarm bath to which the extract from ½ lb. of nutgalls has been added; wring; soak one hour in a cold bath containing for every pound of cotton ⅛ to ⅜ oz. of perchloride of tin crystals; wash; dye in a lukewarm bath to which the color is added in three or four installments to secure an even color. For a dark-rose or cherry color use the second method, doubling the quantity of nut-galls and increasing slightly the quantity of perchloride of tin. For ponceau and scarlet, first give the cotton, after treatment with hyposulphite, a bottom of turmeric (hot), then continue by the second method. To darken the shades, let the cotton soak in the gall-bath over night. Tannin may be used in place of nutgalls, ¾ oz. to the pound of cotton. Lastly, pass all cotton dyed with saffranine through a cold bath slightly acidulated with acetic acid.

Revised by IRA REMSEN.

Saffron [from O. Fr. *safran* (whence Germ. *safran*), from Arab. *za'farān*, saffron, deriv. of *safrā*, yellow]: a yellow substance, consisting of the stigmas, with part of the styles, of the saffron-crocus (*Crocus sativus*), a plant indigenous in Greece and Asia Minor, and extensively cultivated in Austria, France, and Spain, and formerly in England. Spanish saffron is the best. It is said that 100,000 flowers are necessary to produce 1 lb. of saffron. This dye is often adulterated with safflower, marigold, pomegranate, and other flowers. The stigmas of the true saffron are from 1 inch to 1½ inches long, narrow and roundish where they are attached to the style, but spreading and club-shaped near the extremity, which is truncated. They have an orange or brownish-red color, yellow in the narrower part, an agreeable aromatic, almost intoxicating, odor, and an aromatic bitter taste, and impart a yellow color to the saliva and to water, alcohol, and oils. Strong sulphuric acid colors them blue, then red, and finally brown. Saffron was formerly a favorite dye, but is now rarely used as such. It is employed in medicine for coloring tinctures and for liqueurs, varnishes, confectionery, and especially cakes in the west of England. The coloring-matter of saffron is a glucoside, to which the names saffranine, saffron-yellow, polychroite, and crocine have been given. Revised by IRA REMSEN.

Saffron of Mars: See IRON (*Medicinal Uses of Iron*).

Sa'fi: an Atlantic port of Morocco, Africa, well fortified, with a fair harbor (see map of Africa, ref. 1–B). It is visited occasionally by Hamburg and other steamers, but its former considerable trade has been largely captured by Mogador, S. of it. Pop. 9,000, one-third Jews.

Sa'gan: town and railway center in the province of Silesia, Prussia; on the Bober (see map of German Empire, ref. 4–H). It has a fine palace with a beautiful park, and extensive manufactures of woolen and cotton cloth. Pop. (1895) 13,183.

Sagar, saa-gŭr', or **Saugor**: an island in the delta of the Ganges, at the mouth of the Hugli; 23 miles long N. and S., and 2½ to 8 miles broad. It is celebrated for its disasters, and as a station for Hindu pilgrims. Its misfortunes are due to the storm-waves that sometimes sweep over it. According to the Calcutta *Review* 200,000 people were destroyed by the storm-wave of 1688. Before the cyclone of 1864 it had 5,625 inhabitants, of whom only 1,488 survived. It has few permanent inhabitants, but is visited annually, in January, by from 100,000 to 200,000 pilgrims. The celebration attended by them lasts only three days, but a certain proportion remain for weeks to take baths. The island contains a meteorological observatory, a lighthouse, and telegraph station. It is infertile, covered with jungles, and infested by wild beasts. MARK W. HARRINGTON.

Sagar, or **Saugor**: city of the Central Provinces, British India, and capital of a district of Sagar; lat. 23° 50′ N., long. 78° 49′ E.; on the border of the artificial lake Sagar (see map of N. India, ref. 7–E). The lake is about 4 miles in circumference, and is surrounded by temples with platforms for baths. The city is picturesque, well built, with wide streets. Near by is a large and old fort commanding the town, a prison, and a cantonment. Its chief commerce is in salt. Pop. (1891), 44,674.—SAGAR is also the name of a town in Mysore, and of one in Haidarabad. M. W. H.

Sagas: See ICELANDIC LITERATURE and SCANDINAVIAN LITERATURE.

Sagas'ta, PRÁXEDES MATEO: statesman; b. at Torrecilla de Cameros, Spain, July 21, 1827; studied at the School of Engineers in Madrid; was elected to the Constituent Cortes 1854; took part in the insurrection of 1856 and fled to France; returned to Spain on the proclamation of the amnesty and became professor in the School of Engineers in Madrid, and editor of *La Iberia*, the principal organ of the progressist party; after the unsuccessful insurrection of June, 1866, he again fled to France, but returned after the fall of Queen Isabella II.; member of Gen. Prim's first cabinet; Minister of State Jan., 1870; declared for the monarchy; Minister of State in the first cabinet of King Amadeus; successively Minister of Foreign Affairs, Minister of the Interior, and president of council, 1874, under Marshal Serrano; gave in his adherence to Alfonso XII. 1875; joined the new liberal party, 1880; came into power at the head of a coalition in 1881, which was superseded in 1883 by a cabinet formed from the dynastic left. On the death of Alfonso XII., Nov. 23, 1885, he again took charge of the Government at the request of the queen regent; but in 1890 the conservatives returned to power under Cánovas. Sagasta was in power 1893–95, being once more succeeded by Cánovas; and in Oct., 1897, two months after the death of Cánovas, he again took charge of the Government. C. H. T.

Sage [Fr. *sauge*]: a plant of the genus *Salvia* of the mint family (*Labiatæ*). *S. officinalis* is a familiar garden-herb. Its leaves are employed in flavoring meats and other dishes, and sage-tea, a decoction of its leaves, is a useful domestic remedy, having aromatic, stimulant, and tonic powers.

Sage, ALAIN RENÉ, le: See LESAGE.

Sage-brush: the popular name of species of bitter shrubs of the genus *Artemisia* (family *Compositæ*) growing upon the Great Plains and in the Rocky Mountains of North America. *A. tridentata* is from 3 to 6 or even 10 to 12 feet in height, and is the common large sage-brush of Idaho, Montana, Wyoming, and Colorado, extending also eastward to the plains. Among other common species are *A. cana* and *A. filifolia*. CHARLES E. BESSEY.

Sage-cock, or **Cock of the Plains**: a kind of grouse, the *Centrocercus urophasianus*. It is characterized, among the tetraonine forms which are feathered to the toes but with the toes themselves bare, by the tail being much elongated and cuneate, and the constituent feathers narrow and attenuated, and the shafts of the feathers on the lower part of the throat very spinous. The color above is brownish yellow, with blackish areas on the inner fields of the feathers; the wing has light-colored shafts to the feathers of the coverts; the lower portions of the breast are whitish, the abdomen marked with a broad black area. The male bird has very large, dilatable, naked, and yellow air-sacs on each side of the neck, bordered by stiff, scale-like feathers. The species is the largest American representative of the family, the male having an average length of over 30 inches, and the female about 21 or 22; but these dimensions are frequently much exceeded. It is confined to the arid plains of the western parts of the U. S., ranging from the Black Hills in the E. to California and Oregon in the W., and from British America in the N. to Arizona in the S. In those plains the sage-brush (*Artemisia*) grows in abundance, and the sage-cock feeds upon that plant, whereby a bitter flavor is imparted to the flesh; but it is said that if the bird is eviscerated at once after being killed this taint is not so marked. There is a simple muscular membranous bag, contrasting with the peculiarly developed gizzard of the ordinary species.

Revised by F. A. LUCAS.

Sag'enite: See QUARTZ.

Saghalien, săă-găă-leen', or **Sakhalin**, known as KARAFUTO by the Japanese and as TARAIKO by the natives: a long and narrow island off the east coast of Asia, stretching directly S. from the mouth of the Amur river, between lat. 45° 54′ and 54° 24′ N. Its length is 670 miles, breadth from 15 to 80 miles, its area 29,336 sq. miles, and it is traversed by parallel mountain chains, thickly wooded, the highest peak being Ktönspal (La Martinière), near the center of the island, 4,860 feet high. The chief productions are coal of good quality, furs, and timber; the climate and soil do not favor agriculture. At Dui on the west coast, and Mauka Cove farther S. are Government penal stations; the last is also a fishing center. Since 1875, when Japan ceded her rights over the southern portion of the island (see KURILES), Saghalien has been altogether Russian. Pop. (1897) 25,495. The natives, mostly of Ainu stock, number 3,200; a dictionary of their tongue was compiled by M. M. Dobrotvorski, and completed and published in 1876 by his brother Ivan. J. M. DIXON.

Sag Harbor: village; Suffolk co. (Long Island), N. Y.; on Gardiner's Bay (an inlet of the Atlantic Ocean), and the Long Island Railroad; 10 miles S. of Greenport, 100 miles E. by N. of New York (for location, see map of New York, ref. 8–G). It has a good harbor, considerable trade by rail and water, regular steamboat communication with New York, cotton and flour mills, and manufactories of leather, cigars, watch-cases, and tools. Many New York business men have costly summer residences here. There are a union school with high-school department, the Academy of the Sacred Heart of Mercy (Roman Catholic, opened in 1877), a State bank with capital of $25,000, a savings-bank, a private bank, and two weekly newspapers. Pop. (1880) 1,996; (1890) not separately reported; (1900) 1,969.

Sag'inaw: city; capital of Saginaw co., Mich.; on the Saginaw river, and Grand Trunk, the Père Marq., and the Mich. Cent. railways; 64 miles N. E. of Lansing, the State capital, 100 miles N. W. of Detroit (for location, see map of Michigan, ref. 6–J). It occupies a site about 30 feet above the river, which is navigable from Saginaw Bay on Lake Huron to this point, and is here crossed by several bridges, and is surrounded by a rich agricultural region. The city is provided with gas and electric light plants, sewerage, water-works, and street-railways, and contains 42 churches, 2 high schools, 22 public-school buildings, public-school property valued at over $450,000, 4 public libraries, 2 national banks with combined capital of $300,000, 2 State banks with capital of $250,000, 3 savings-banks with capital of $250,000, 1 private bank, and 2 daily and 8 weekly periodicals. Lumber, salt, and coal are the principal industries; soft coal in inexhaustible quantities have recently been discovered and is now being developed. Plate-glass and beet-sugar manufacture are recent industries. Malt-liquor plants are in operation, and another is being constructed. It has 98 incorporated business companies, with an aggregate capital of $21,727,000. The chief manufactures are wood, iron, and steel, 247 manufacturing establishments in 1890 employing 5,019 persons, paying $2,324,015 for wages and $6,260,849 for materials, and turning out products valued at $10,396,966. The wood and lumber output was valued at $5,431,555, and the foundry product at $814,098. There are 2 telephone companies and one street-railway system, with two suburban lines projected and one in operation. In 1900 the city had an assessed valuation of $20,000,000, and a net debt of $1,162,500. The present city of Saginaw was created by act of the legislature of March 3, 1890, which consolidated the former cities of Saginaw City and East Saginaw, on opposite sides of the river. Both cities had the Holly system of water-works, gas-plants, sewerage, street-railways, and excellent public schools. East Saginaw was the more important of the two cities, was located in 1847, was laid out by New York capitalists in 1849, and was chartered as a city in 1859. The development of the cities was rapid because of their superior railway and lake shipping facilities. Pop. (1880) Saginaw City, 10,525; East Saginaw, 19,016. The present city covers an area of nearly 13 sq. miles. Pop. (1890) 46,322; (1900) 42,345.

E. D. Cowles, editor of "Courier-Herald."

Saginaw River: a river in Michigan, formed by the junction of the Flint and Shiawassee rivers. It flows N. 30 miles to Saginaw Bay, and is navigable for 24 miles by steamers drawing 10 feet.

Sagit'ta: a genus of Chætognatha (*q. v.*).

Sagitta'rius [=Lat., archer, deriv. of *sagit'ta*, arrow]: the sign of the zodiac into which the sun enters about Nov. 22. There is also a constellation Sagittarius, corresponding to the sign Capricornus.

Sago [from Malay *sāgu*]: a variety of starch obtained from the medullary matter or pith of the stem of *Metroxylon rumphii*, *M. læve*, and various other palms. *M. rumphii* grows in low lands in the East Indies. It is a low tree, with a thick trunk, of which the woody part is but an inch or two in thickness, the whole cavity being filled, at a certain stage of its growth, with the farinaceous pith. This is mixed with water, which is passed through sieves, and the starchy matter is allowed to settle. There are several varieties: common sago, which is, like other varieties of starch, insoluble in cold water, but swells to a transparent jelly on boiling; and pearl-sago, which has been granulated and subjected to some process, probably involving heat, which causes it to be somewhat soluble, even in cold water. If potato-starch be mixed with sago for purposes of adulteration, the microscope will detect its granules, as they are larger and more regular.

Sago-cheese: a corrupt name given in the U. S. to Schabzieger cheese. See Cheese.

Sago-palm: a palm that yields sago; also, a cycad that yields a kind of sago. See Cycads and Palm Family.

Sagoyewatha: See Red Jacket.

Saguenay (săg-*e*-nā') **River**: one of the six great tributaries of the St. Lawrence, carrying the surplus waters of Lake St. John a distance of over 130 miles to the parent stream at Tadousac. For the first 36 miles of this distance its channel is narrow, and runs through an extensive forest region over waterfalls and rapids to the tidal limit near Chicoutimi. Besides the waters from Lake St. John (see St. John, Lake) the Saguenay river receives on the left bank the Shipshaw, the Bras du Canot, and the Marguerite, and on the right the Chicoutimi (which drains Lake Kenogami, fed by the waters of the river Upikauba) and the Mars. The whole region is famous for its bold and striking scenery, especially below the inlet of the Rivière à Mars, which widens out into the beautiful Ha Ha Bay. For 50 miles the river passes within the rugged highlands of the Laurentides, between banks that descend precipitously for 1,500 feet to the surface of the water, with here and there a more striking promontory rising even higher. Here the water is deep and flows slowly, the depth in some places being over 2,000 feet, the river being navigable for the largest vessels as far as Ha Ha Bay. The river and its tributaries are famous for their fisherics of salmon and trout. J. M. Harper.

Sagun'tum [= Lat. Cf. Gr. Ζάκυνθος]: an ancient town of Spain; in Hispania Tarraconensis; founded by Greek colonists from Zacynthus (modern Zante). It prospered and became very wealthy. In 219 B. C. it was besieged by Hannibal. After a year of energetic resistance against an army of 150,000 men the Saguntines, pressed by famine, set fire to their city, and while all the women and children perished in the flames, the men issued forth to battle and were killed. This conquest by Hannibal occasioned the second Punic war. The Romans afterward rebuilt the city and called it *Muri veteres* (the old walls), whence the name of the city, Murviedro, which occupies the site. A theater and a temple of Bacchus are still left of the ancient city, the former in comparatively good condition.

Sahagun', Bernardino, de: historian; b. at Sahagun, Spain, about 1499. He studied at Salamanca, joined the Franciscans, and from 1529 was a missionary in Mexico. Besides works on the Indian languages he wrote a *Historia universal de la Nueva España*, which was long used in manuscript by historians, but was first published at Mexico 1829–30, and by Kingsborough in 1830. The portion relating to Aztec history has been criticised as unreliable; the description of the conquest is valuable. D., probably at the convent of Tlaltelolco, Feb. 5, 1590. H. H. S.

Sahaptin Indians: See Shahaptian Indians.

Saha'ra [from Arab. *sahrā*, desert plain]: the great desert of Northern Africa, the largest on the earth and the principal member of the series of deserts which extends from Cape Verde through Africa, Arabia, Persia, and Turkestan, and ends in the great Shamo or Desert of Gobi in Mongolia. The Sahara extends on the N. to the Atlas and Algerian Mountains and in Tripolis to the Mediterranean Sea. On the W. it extends to the Atlantic, and on the S. it is limited by the margin of forest growth in the Sudan. The eastern boundary is artificial, but is usually taken to be the western margin of the basin of the Nile. Thus limited it has an area of 4,000,000 sq. miles. If the grassy southern versant of the northern mountains, the comparatively fertile oases, and the extensive pastoral steppes on the southern border are excluded, thus limiting the desert only to that part incapable of ordinary agriculture and grazing, the area is reduced to 2,400,000 sq. miles. Of this the area covered by dunes or moving sands is only 500,000 sq. miles—about one-eighth of the Sahara as a whole and one-fifth of the desert proper. These estimates are subject to the uncertainty due to incomplete knowledge of the desert. Two considerable areas are yet unknown—one to the N. of Lake Chad, the other the southern part of the Libyan desert.

Surface.—The Sahara is not a level plain, as usually imagined, but is much diversified. Its average elevation above the sea is estimated at 1,200 feet by Saint-Martin and at 1,500 feet by Chavanne. Only two small areas are known to be below the level of the sea. The first is a series of shotts in Southeastern Algeria and Central Tunis, W. of the Lesser Syrtis. Water could be admitted into this area from the

Mediterranean, but the resulting seas combined would not be as large as Lake Tanganyika or Lake Nyassa. The other depressed area is in the northern part of the Libyan desert (the oases of Araj and Siwah), nearly W. of Fayoum and 150 miles from the Mediterranean, from which it is separated by an elevated plateau.

A mountainous region stretches through the desert S. E. and N. W., extending from S. of Algeria to Darfur, dividing the eastern or Libyan desert from the Central and Western Sahara, and having its backbone in the Tassili and Tibesti Mountains. They make a nearly unbroken range 1,100 miles long, culminating in Mt. Tarso of Tibesti, about 8,000 feet high. To the W. of this range and connected with it are the mountain complexes of Ahaggar and Azjer, which occupy the geographic center of the Sahara, with elevations of from 4,000 to 5,000 feet. These, with areas of lower mountains to the N. and S., make an elevated band which crosses the Sahara nearly centrally from the Syrtis on the N. to Sokoto on the S.

The remainder is much diversified by plains, hills, and valleys, and is furrowed by the beds of streams, generally dry, but having, nevertheless, as well-defined basins as in other parts of the world. The surface is sometimes a shingly, denuded, arid plateau (*hamada* of the Arabs), drearily uniform, slightly undulating, but little intersected, from the surface of which the wind sweeps every particle small enough to be carried away. This may be succeeded by a region of ravines and valleys (*wadies*) which are sometimes simple coulées, sometimes extensive, with a full series of ramifications. With these are associated sharp escarpments, which are the edges of the higher plateaus, and sometimes isolated buttes (*gara*, plural *gour*, of the Arabs). Not rarely the wady ends in a closed basin (*sebkha*), which may be always dry or occasionally filled with water, making a temporary lagoon. The latter when dry are covered with a layer of saline efflorescence which, under favorable conditions, forms a veritable crust. Elsewhere are plains of sands heaped into dunes. The latter are grouped irregularly, and reach sometimes a height of 300 or 400 feet, but are not so subject to shifting by the wind as is sometimes represented. They remain fairly permanent from generation to generation, and, although heavy wind-storms may carry considerable quantities of sand, the trails are not generally obliterated nor the wells covered. These seas of sand have the name of *erg*, and of these four large ones are known (two in the Libyan desert and two at the W. and parallel to the Atlantic coast). Besides these there is a series of smaller ones from Southern Algeria to Fezzan, and some other isolated ones of small size.

A few of the rivers of the Sahara debouch into the Atlantic, the principal ones being the Draa and the Sakiet-el-Hamra, near the northwestern angle of the Sahara, the former with water, the latter without. Many smaller valleys debouch into the Syrtes of the Mediterranean. The Libyan desert has few of the wadies. The richest part of the Sahara for these stream-beds is the central elevated region of Ahaggar, Azjer, and Tassili. From this region radiate innumerable stream-beds, some of which are lost in the sand at lower levels, while others can be traced to the Mediterranean or to the basin of the Niger. Lake Chad has a similar but less extensive system. The existence of these stream-beds suggests that formerly the Sahara may have been a well-watered region. If so it was probably in late geological, certainly before historical, times. Perhaps they are due to the occasional filling which they undergo, which is due to the intense local storms (cloud-bursts), in which the rain comes when it comes at all. The stream is then filled with a torrent which advances with impetuous force and continues until lost in a lagoon, in the sand, or in some regular outlet, as Lake Chad. Such streams exert powerful erosive action, doing in a few hours the work which it would take a tamer stream years to perform. To such streams is probably also due the subterranean water which forms permanent or temporary wells, and whose existence renders possible commerce across the Sahara.

Geology.—The Sahara is geologically as diversified as other regions. The core of the elevated center about Ahaggar is formed of the early prefossiliferous crystalline rocks. About this core, with prolongations to the Atlas on the one side and Tibesti on the other, is found an enormous area where Palæozoic rocks come to the surface. The next in the series is a large development of the Cretaceous, which extends from Tunis to the Nubian desert and Kordofan. The Eocene and Miocene cover a large area in the northern part of the Libyan desert, and the Pliocene and Quaternary occupy the southern and central part of the Western Sahara. Evidence of volcanic action is found in the Ahaggar and Tibesti Mountains and to the E. of Fezzan.

Climate.—The mean annual temperatures of the Sahara are about those of Northern Mexico, passing from 68° F. at the north to 86° at the south. The January means vary from 40° at the north to 72° at the south. In summer it is hottest in the center, the July mean temperatures over a large part of the interior being 95° or more and falling to 86° at the margins. The mean annual range varies from 20° at the margins to 40° within. The true features of the temperature only appear when the extremes and the daily range are consulted. The difference between day and night often runs to 50° or more. In the northern and central parts of the desert winter temperatures below freezing are common. In summer temperatures of about 120° are not rare over the Sahara, and Rohlfs once recorded 127° F. in the shade. This record has been surpassed in the Colorado desert of Southern California, where a record of 128° F. was made in July, 1887.

In winter the desert surface is occupied by a part of the high-pressure band which surrounds the earth. The winds then flow gently out in all directions, except in the N. W., where an inflowing current from the N. W. enters by crossing the Atlas Mountains. In the summer the surface is occupied by an area of relatively low pressure. The winds then generally flow into the desert, but there become dry because of the high temperatures.

The moisture of the air is generally very slight. In many cases records of only 2 per cent. of relative humidity have been made, and in a few cases the instrument has failed to find an appreciable amount, making a record of 0 per cent. Under such conditions the sky is intensely blue, except when the air is loaded with fine dust, and mirages are common in the heat of the day. Dew and hoar frost are almost unknown. Yet there is probably no part of the desert where rain does not fall occasionally, but sometimes years intervene between showers. Beginning at the south, the rainfall on the parallel of 10° N. lat. is about 50 inches, and the rainy season is in middle and late summer. This is gradually reduced northward until, on the parallel 20° N., the amount is only from 5 to 8 inches annually. North of this, regular mid and late summer rains occur in the mountainous regions, but elsewhere the rainfall becomes irregular and occasional only, giving, however, an annual average of 5 inches or more. This condition continues to the Atlas Mountains on the W. and to the Mediterranean on the E., except that in Algiers the Mediterranean regimen of rainfall (spring and late autumn, with dry September) obtains over a narrow strip on the edge of the desert.

The winds that come from the Sahara and blow out over the neighboring regions are of a peculiar and sometimes destructive character. They have received many names—harmattan, leste, leveche, sirocco (of Sicily), chamsin, simoom. They are characterized by heat, dryness, and dust. The heavy winds of the interior, carrying much sand, are generally from the S.

Cause of Aridity.—This desert has continued from the earliest known times without material change, except a possible progressive (but slight) increase in aridity. From what precedes it appears that it is not due to solar heat (as thought by the ancients), nor to recent elevation above the sea, nor character of surface, nor is it due to the northeast trade wind, to which it was attributed by Humboldt. The aridity is a purely atmospheric phenomenon, due to the outflow of wind in winter, and to the great heat when the inflow takes place in summer. The direction of the winds again is due to the distribution of atmospheric pressure. As the details of the last are due to the distribution of land and water, the Sahara must have been a desert ever since the continents took on their present form.

Flora and Fauna.—The flora, though poor, is interesting because peculiar, and not formed by an intermingling of that of the Sudan and Mediterranean coast. It is rarely entirely lacking; even in the sandy deserts and the oases (comprising about 75,000 sq. miles) are true islands of verdure. Here the chief plant is the date-palm. The fauna is even poorer than the flora. In the *erg* or *hamada* one can travel for days without seeing an animal. In the mountains are jackals, wolves, antelopes, and sometimes lions and tigers. The birds are very few in species and number. The reptiles are relatively abundant, and permanent waters are stocked with fish and other water animals.

Population.—The central part of Sahara, from Tunis and Tripoli to the Central Sudan, is occupied by the Tuaregs,

divided into the northern and southern tribes. Although occupying nearly half of the area, they number only about 75,000. The Tibbus occupy the eastern part, having Tibesti as a center. They are probably of Negro affinities, and are estimated at 28,000. The Western Sahara is occupied by Moors—people of mixed race—Arab, Berber, and Negro in varying proportions.

The Sahara is crossed in all directions by trade-routes, properly trails, along which a considerable commerce has been conducted from the earliest times. The trade is one of transportation, except for salt, which is collected in the desert in large quantities, and carried to the Sudan. About two-thirds of the Sahara is now in the French sphere of influence, and about half of the remainder under Turkish authority.

References.—Rohlfs, *Quer durch Afrika* (1874), *Drei Monate in der Libyschen Wüste* (1875), and *Kufra* (1881); Nachtigal, *Sahara und Sudan* (2 vols., 1879); Lenz, *Timbuktu: Reise durch Marokko*, etc. (2 vols., 1884); Mackenzie, *The Flooding of the Sahara* (1877); Roudaire, *Examen du projet de mer intérieure dans le sud de l'Algérie et de la Tunisie* (1882, Gov. Report); Schirmer, *Le Sahara* (1893); Reclus, *Nouvelle géographie universelle*, vol. xi.

Mark W. Harrington.

Saharanpur': a district and city of Meerut (*q. v.*), Northwest Provinces, British India. The district lies between 29° 35′ and 30° 21′ N. lat., and 77° 9′ and 78° 15′ E. lon., between the Ganges and the Jumna (see map of N. India, ref. 4–E). It is the northernmost portion of the Doab or alluvial plain, being bounded on the N. by the Siwalik range of hills. It is fertile, well watered, and devoted to cereals. Area, 2,221 sq. miles. Pop. about 1,000,000. The city is the administrative headquarters of the district; lat. 29° 58′ N., lon. 77° 35′ E.; 900 feet above sea-level. Among the buildings are an old Rohilla fort and a handsome Mohammedan mosque. The principal trade is in grain, sugar, molasses, and native cloth. Pop. (1891) 63,194. Mark W. Harrington.

Sahib, Tippoo: See Tippoo Sahib.

Saïda, saă-ĕĕ′da: town; in Syria, on the Mediterranean; 20 miles S. of Beyrout (see map of Palestine, ref. 3–D). Though its harbor is partly filled, it carries on an active trade in goatskins, oil, rags, silk, tobacco, and especially fruit, for which the adjacent country is noted. Its immense French Khan, formerly the main entrepôt of Syrian commerce, is a bazar, fortress, and city in one. Pop. 10,000, half of whom are Mussulmans. It occupies part of the site of ancient Sidon (*q. v.*). E. A. G.

Saïd Pasha, Viceroy of Egypt: See Egypt (*Modern*).

Saiga: See Saigidæ.

Saig′idæ, or **Saigi′næ** [Mod. Lat., named from *Saiga*, the typical genus, from Russ. *saĭga*, saiga]: a peculiar family of antelope-like ruminants, or perhaps a sub-family of the *Bovidæ*, distinguished by the peculiarly enlarged muzzle and the co-ordinated modifications of the nasal region of the skull. The form is that of the antelopes or sheep, and the horns are persistent, ringed, and somewhat lyriform. The olfactory organ is extremely expanded and inflated above, and the nasal bones are much shortened, directed upward, and entirely separated from the supramaxillaries, as well as the lachrymals, by the projection of the frontals between the lachrymals and the nasals; the supramaxillaries and intermaxillaries are reduced and attenuated forward; the posterior nasal cavity has its walls inflated outward. The form thus distinguished is represented by but a single species, the saiga (*Saiga tartarica*), which was made known by Pallas in 1777 under the name *Antilope saiga*. The saiga is an inhabitant of the plains of Northern Asia, especially in the region of Mt. Altai, but extends also into Eastern Europe as far as the Crimea. It is about the size of a small deer, and its body is yellowish above and whitish below. It associates in large herds. The flesh is very disagreeable, but is eaten in winter, although in summer it is rejected, because then there is found under the skin the larva of a gad-fly. See James Murie, *On the Saiga Antelope, Saiga tartarica*, in *Proc. Zoöl. Soc. London* for 1870, pp. 451–503.

Revised by F. A. Lucas.

Saigon, sī-gon′: capital of French Indo-China; situated in lat. 10° 47′ N., lon. 106° 42′ E., on the Saigon, a branch of the Donnai, 35 miles from its mouth in the China Sea (see map of East Indies, ref. 4–D). The Donnai, which here winds through a district of exuberant fertility, is navigable for large vessels at favorable tide, and forms at Saigon one of the finest harbors of the east coast of Asia, lined with stone quays and surrounded with dockyards, arsenals, and magazines, and various naval establishments. The town itself is well built, and carries on an active trade, exporting annually more than 8,000 tons of cotton, rice, sugar, indigo, and dyewoods. Pop., with suburbs, estimated at 65,000, of whom many are Chinese, who carry on the retail business of the place. See Cochin-China (*French*).

Revised by M. W. Harrington.

Sai′go, Takamo′ri or Kichinosuke, kĕĕ-chĕĕ-nos′ke: general and statesman; b. in Satsuma, Japan, in 1825; educated under the able lord of that province, who instilled into him imperialist notions and hatred of the Yedo shogunate, then in power. In 1857 he was placed under arrest as a political suspect, and spent several years in exile. His opportunity came in 1868, when the court, instigated by the southern clans, declared against the shogunate. As lieutenant-general in the imperial army, and later as its commander-in-chief, he was conspicuously associated with the complete triumph of his party. Accepting office in 1870 as councilor of state, he remained for a few years in co-operation with the new ministry. Growing dissatisfaction with the Europeanization of everything Japanese, and the desire for a more warlike policy in Korea, sent him into retirement, and the final result was the Satsuma rebellion. D. Sept. 24, 1877. In 1890 the ban of degradation was removed from his name, and posthumous honors were granted him. He is, to the Japanese mind the type of a brave warrior and thorough patriot. J. M. Dixon.

Saikio, sī′kyō [liter., Western capital = Chinese, *Si-king*]; the city of Japan usually known as Kioto (*q. v.*) and formerly known as Miaco (literally, "the capital").

Sail [O. Eng. *segel*: O. H. Germ. *segal* > Mod. Germ. *segel*, sail]: a sheet of canvas or other material used to propel a vessel through the water. The invention or origin of sails has not been determined, but their use is known to date from a very remote period. Sails are made by sewing cloths of canvas together with twine in a double seam, and binding the edges around with a *bolt-rope* to relieve the strain upon the canvas, the whole being so fitted as to present a flat surface to the wind. Bands of canvas are placed wherever additional strength is required or the sail is exposed to chafing, as the *reef-bands*, *buntline-cloths*, etc. Sails are in shape either quadrilateral or triangular. In all quadrilateral sails the upper edge is called the *head*, the lower edge the *foot*, and the sides *leeches*. When the head and foot are parallel, the upper corners are called the *head-earings*, and the lower ones *clews*. When the head and foot are not parallel, the foremost corner at the head is called the *throat* or *neck*, the after upper corner the *peak*, the forward lower corner the *tack*, and the after lower corner the *clew*. In triangular sails we find the head, tack, and clew. In all sails the foremost edge is called the *luff* or *fore-leech*, and the aftermost the *after-leech*. Sails are classed as *square sails* and *fore-and-aft sails*. The former, all quadrilateral, are those which make a large angle with the direction of the keel, and are spread by yards, as the principal sails of a ship, or by yards and booms, as the *studding-sails*. The latter, either quadrilateral or triangular, are those which make but a small angle with the line of the keel. The triangular are spread by a yard, as *lateen-sails*; by a stay, as *staysails*; or by a mast, as *shoulder-of-mutton sails*. The quadrilateral are extended by means of gaffs and booms, the head of the sail being attached to the gaff. In all fore-and-aft sails the luff is attached throughout its length to the yard, stay, or mast. The principal sails of a ship are *courses*, the lowest ones; *topsails*, next above the courses; *topgallant-sails*; *royals*; and, sometimes, *skysails*. These sails are attached by the head to their proper yards, and, excepting the courses, are spread by having their clews drawn out by ropes called *sheets* to sheaves in the ends of the yards below them. The clews of the courses are in like manner drawn to the *chesstrees* and *bumpkins* on deck. Studding-sails are set beyond the leeches of the foresail, foretopsails and maintopsails, and foretopgallant-sails and maintopgallant-sails, the head being extended by a studding-sail yard, and the foot by a boom run out beyond the end of the yard next below. Staysails are hoisted upon the stays between the masts, the foot being stretched out by a rope or whip called the *sheet*. All sails take their names from the mast, yard, or stay to which they are attached. Thus that upon the mainyard is called the mainsail, above which are the maintopsail, maintopgallant-sail, and mainroyal. Boats'

sails follow the rules given as to form and class, but have peculiar names. The most common are spritsails, standing lugs, dipping lugs, and sliding gunters.

Sailfish: any fish of the genus *Histiophorus*, having a remarkably long and high dorsal fin. The ventral fins are modified into elongated styliform appendages of two or three rays, and there are small persistent teeth. The species have an elongated sword, as in the swordfishes (*Xiphiidæ*), but are regarded as the type of a special family (*Histiophoridæ*), including also the spearfishes (*Tetrapturus*). They are inhabitants of warm seas, especially the Indo-Pacific, but *Histiophorus americanus* ranges N. to Cape Cod in summer. The dorsal fin, erected when the fish floats on the surface, has been likened to a sail. They are known also as banner-fishes and spikefishes.

Sailfish.

Sailing: See NAVIGATION and GREAT-CIRCLE SAILING.

Sainfoin [= Fr.; *sain* sound, wholesome (< Lat., *sanus*) + *foin*, hay (< Lat. *fœnum*)]: a perennial leguminous forage-plant, *Onobrychis sativa*, very valuable on dry, chalky lands, but not much raised in the U. S. It is prized as green forage, as hay, and as a crop to be plowed under.

Saint [viâ O. Fr. from Lat. *sanc'tus*, holy, sacred, (as noun) saint, transl. of Gr. ἅγιος, holy, saint]: in the New Testament a title of all Christians (Rom. i. 7; 1 Cor. i. 2; Eph. i. 1; Phil. i. 1, etc.), in the sense that they are called out of the world, regenerated by the Holy Spirit, and consecrated to God and to holiness. In the Apostles' Creed as now recited "the communion of saints" is one of the articles of faith, closely related to the preceding article on "the holy catholic Church," but the clause is not found in the earlier forms of that symbol. The oldest MS. copies of the Gospels bear simply the names of Matthew, Mark, Luke, and John, without "S." attached to them. After the fourth century the term began to be applied to particular persons of special eminence in piety and services to the Church, as the apostles, evangelists, and martyrs. It became the exclusive title of a spiritual nobility or aristocracy. Special honor was paid to their memory, which gradually assumed the character of a limited Christian hero-worship, called by the scholastic divines *doulia* or *veneratio* (as distinct from *latria* or *adoratio*, which is due to God alone, and *hyperdulia*, or a peculiar degree of veneration which is claimed for the Virgin Mary as the mother of our Lord and queen of saints). The Greek and Roman Churches, believing in the active intercession of the saints in heaven in behalf of the struggling Christians on earth, consider it proper and useful to pray to them; with this difference, that God is to be implored as the giver of all blessings, while the saints are to be implored as the friends of God, that through their advocacy may be obtained from him all necessaries of life (hence the form *Ora pro nobis*, Pray for us). Protestants reject the worship of saints, images, and relics as inconsistent with the first and second commandments and the exclusive worship of God, and hence they pray directly to God and to Christ.

Who are the saints was a question for a long time left to the public sentiment of the Christian people in the particular nation or province or monastic order to which the saint belonged. The voice of the people was regarded as the voice of God. But to prevent the immoderate increase of the number of saints, the popes since Alexander III. (A. D. 1170) have monopolized the right of canonization—i. e. of deciding and pronouncing a departed Christian to be a *saint*, and authorizing and prescribing his worship within the Roman Catholic Church. The act of canonization is preceded by a regular process of law, in which one acts as the accuser of the candidate, another as his advocate. The necessary qualifications for the honor are, besides the highest sanctity, the power of working miracles, either during their lifetime, or after their death through their pictures or relics or the invocation of their aid. An Italian proverb says it requires a miracle to prove a miracle. This is especially true after the lapse of several centuries, which usually intervene between the death of a saint and his canonization. In 1862 Pope Pius IX. solemnly canonized twenty-six Japanese missionaries and converts who died in a persecution in 1597, nearly 300 years before. See *Descrizione delle cerimonie che si celebrano nella Basilica Vaticana per le solenni Canonisazioni dei Santi* (Rome, 1862).

The Roman Catholic Church celebrates the memory of each canonized saint on the day of his death (which is regarded as his birthday in heaven). Its calendar of saints includes (1) the apostles, evangelists, and most eminent martyrs, fathers, schoolmen, and missionaries down to the Reformation, who are the general property of Christendom; (2) the specifically Roman saints who lived after the Reformation and zealously opposed Protestant doctrines (as Ignatius Loyola, Charles Borromeo); (3) a few popes. The last canonized pope was Pius V. (1566–72), who excommunicated Queen Elizabeth.

The biography of saints has given rise to an immense body of literature. The most learned and extensive work on the subject is the *Acta Sanctorum* of the Bollandists, begun in 1643, embracing 60 vols. fol., and not yet completed. A convenient abridgment is Alban Butler's *Lives of Saints* (in many editions, e. g. 12 vols., Dublin, 1866). Cf. Baring-Gould (Prot.), *Lives of the Saints* (17 vols., London, 1872–92); *Lives of the English Saints*, edited by Cardinal Newman (15 vols., 1844–45); R. M. Stanton (R. C.), *A Menology of England and Wales* (1888).

Revised by S. M. JACKSON.

St. Albans (anc. *Verulamium*): city; in Hertfordshire, England; on the Ver, a feeder of the Colne; 20 miles N. N. W. of London (see map of England, ref. 11–J). In commemoration of the martyrdom of St. Alban (303) Offa, King of Mercia, founded a Benedictine abbey here in 793, which obtained precedence over all other abbeys in England. The abbey-church was rebuilt by its abbot, Paul of Caen, after 1077, and consecrated in 1115. This, even after many alterations and additions, still remains the most important example of Norman architecture in England. It has been considerably restored by Sir Gilbert Scott and Sir Edmund Beckett (1871–85). Its extreme length outside is 548 feet, and the Gothic nave (284 feet) is the longest of its kind in the world. A feature of interest is the substructure of the shrine of St. Alban, pieced together from 9,000 fragments. The abbey gate-house, which alone remains of the monastic buildings, was converted from a jail in 1869 to the use of the grammar school. St. Albans is historically interesting from the two battles fought here during the wars of the Roses in 1455 and 1461. Straw-plaiting, boot-making, and silk-manufacture are carried on. Pop. (1891) 12,895. R. A. ROBERTS.

St. Albans: town (settled in 1763); capital of Franklin co., Vt.; on the Central Vt. Railroad; 3 miles E. of Lake Champlain, 32 miles N. of Burlington, 70 miles S. of Montreal (for location, see map of Vermont, ref. 2–B). It is picturesquely situated on a plain 375 feet above lake-level and 390 feet above sea-level, is surrounded by high hills, and is the center of a large agricultural and dairying region. It contains 8 churches, high school, public graded schools, academy, 2 convents, public library, hospital, a home for children, a national bank with capital of $100,000, a trust company with capital of $50,000, and a daily, a weekly, and a monthly periodical. The town is principally engaged in making butter and cheese, contains the headquarters of the Central Vermont Railroad, with offices, car and machine shops, and two roundhouses, and has manufactories of iron and steel bridges, viaducts, turn-tables, iron roofs, and marble and granite monuments. In 1864 the town was raided by a band of Confederates from Canada, and in 1866 was the rendezvous of Fenian invaders of Canada. Pop. (1890) 7,771; (1900) town, 1,715, city (organized since 1890) 6,239.

St. Andrews: town; in Fifeshire, Scotland; on a rocky plateau adjoining St. Andrews Bay; 42 miles N. N. E. of Edinburgh (see map of Scotland, ref. 10–I). The schools of St. Andrews were noted as early as 1120; and in 1411 the university, the first in Scotland, was founded. It has a museum, and a library with over 100,000 volumes. St. Andrews contains ruins of a cathedral (1160), a bishop's palace (1200), and many Celtic and prehistoric remains. It is a popular watering-place, and widely known as the headquarters of golf. Pop. (1891) 6,853. See *St. Andrews*, by Andrew Lang (London, 1893).

St. Andrews: a port of entry; capital of Charlotte County, New Brunswick; at the mouth of St. Croix river; on Passamaquoddy Bay; 66 miles by land W. of St. John; on the Canadian Pacific Railway (see map of Quebec, etc., ref. 6–G). It has a good harbor, a weekly newspaper, a marine hospital, a custom-house, a postal savings-bank, and various public buildings. It is an attractive place of summer resort. Pop. 1,800.

St. Anthony's Fire: See Erysipelas.

Saint-Aubain, săn'tō'băn', Andreas Nikolai, de (*Carl Bernhard*): novelist; b. in Copenhagen, Denmark, Nov. 10, 1798. He was a nephew of Fru Gyllembourg, and therefore a cousin of J. L. Heiberg (see Heiberg, Johan Ludvig), and in his writings shows the influence of the Heiberg school. In addition to a number of tales, written between 1836 and 1863, he was the author of several historical novels, of which the best is *Gamle Minder* (Old Memories, 2 vols., 1841), the scene of which is laid in the time of Struensee. Of no less interest are the close studies of later Copenhagen life contained in the tales. Among these one, *Et Löfte* (A Promise, 1839), is distinguished by a realistic force and modernity suggestive of Jacobsen. The others are simple, often sentimental stories of everyday life. D. Nov. 25, 1865. Complete works, 14 vols., Copenhagen, 1856–67. D. K. Dodge.

St. Augustine: city; capital of St. John's co., Fla.; on a narrow peninsula formed by the Matanzas and San Sebastian rivers, W. of the northern end of Anastasia island, and on the Jack., St. Aug. and Ind. Riv., and the St. Aug. and S. Beach railways; 38 miles S. E. of Jacksonville (for location, see map of Florida, ref. 3–K). The ancient city extended from the Franciscan convent (now St. Francis barracks) N. to the castle of San Marco (now Fort Marion), a distance of nearly a mile. From the castle W. to the San Sebastian river extended a moat and wall, which formed in that age a substantial defense against any encroachment from the mainland. The former may still be easily traced along Orange Street, but the only remaining evidence of the latter is the old city gateway—a most picturesque ruin—with 30 feet of the original wall on each side. The wall also extended S. along the San Sebastian river.

At an early period a sea-wall was built against the encroachments of the tide, extending from San Marco Castle to the Franciscan convent. It was rebuilt in a more substantial manner by the U. S. Government in 1837–43, and given a coping of granite 3 feet in width. This sea-wall has always been a popular promenade. As late as 1817 entrance to the city from the mainland was effected by means of a drawbridge. Midway between the fort and the barracks and commanding a view of the Matanzas river is the Plaza, a small public park. Fronting on this, to the W., is the custom-house and post-office, formerly the residence of the Spanish governors. The city extends about a mile N. and half a mile S. of its ancient limits. The principal streets run N. and S.; the cross-streets at right angles E. and W. St. George Street, the main thoroughfare, only 17 feet in width, runs through the center of the town to the city gateway. Beyond that point it is known as San Marco Avenue. Treasury Street, crossing St. George one block N. of the Plaza, narrows at the east end to only 7 feet in width. The hotels of St. Augustine are among the finest in the world. The Ponce de Leon, an edifice in the style of the Spanish Renaissance, is one of the most magnificent and interesting structures on the continent. The building and furnishings cost upward of $2,000,000. The mural decorations are most elaborate and significant, those of the loggia and dining-room furnishing a pictorial history of Florida and Spanish adventure in the New World.

A majority of the population are Roman Catholic, though the Episcopalians, Methodists, Presbyterians, and Baptists have churches. The Memorial Presbyterian church, of the Venetian Renaissance type, is the most remarkable building of the character in the city. There are two excellent graded schools, one for the white and one for the colored children. St. Joseph's Academy is a high-grade parochial school for young ladies, conducted by the Roman Catholic sisters. St. Augustine is also the seat of the Florida Institute for the Education of the Deaf and the Blind. The First National Bank of St. Augustine is the only bank. The manufacturing interest is confined to cigars, but this is considerable. There are 2 daily and 4 weekly periodicals.

St. Augustine is the oldest city in the U. S. Though Ponce de Leon in 1512 landed near its present site, the city was not founded till 1565, when Don Pedro Menendez de Avilés, with 1,500 followers, disembarked here and took possession in the name of Philip II. of Spain. The city acquired a population during the two centuries of Spanish rule of 3,000, besides a garrison of 2,500. At the time the British took possession, in 1763, there were about 900 houses of coquina (a natural concrete of broken shells cemented with shell-lime), a formation found on Anastasia island. The walls of the city, the fort, and sea-wall were also made of this material. The present Fort Marion is the most notable and best-preserved of the works of the Spanish reign, and is a fine specimen of the military engineering of that age. With the exception of a water-battery, which the U. S. Government added in 1842–43, and some few repairs, the fort is as completed in 1756. It was in course of construction over 100 years, and is said to have been built mainly by Indian prisoners and Mexican convicts. The old Roman Catholic Cathedral, begun in 1793, was burned in 1887; but the front wall remained almost intact, and in rebuilding it was carefully preserved and incorporated in the new structure. The old bell bearing the date 1682 was also preserved. In the Plaza is a shaft of marble erected in 1812–13 to commemorate the adoption of the Spanish liberal constitution of 1812. Upon its failure the inhabitants were ordered to destroy the monument, but the authorities were satisfied with the removal of the tablets denoting its object. These were later restored, and are still to be seen. Pop. (1880) 2,293; (1890) 4,742; (1900) 4,272. H. N. Felkel.

St. Barthol'omew, or **St. Bart**: an island of the Lesser Antilles, West Indies; crossed by lat. 17° 54′ 30″ N.; area, 8 sq. miles. It forms a part of the French colony of Guadeloupe. Pop. 2,835.

St. Bartholomew, Massacre of: See Bartholomew, St., Massacre of.

St. Bernard Dogs: See Dogs.

St. Bernard Pass: See Bernard, Great St.

St. Bernard, Little: a celebrated pass across the Graian Alps, on the frontier of Savoy and Piedmont, Italy, S. of Mont Blanc. It is 7,200 feet high, leads from the valley of the Isère into that of Dora Baltea, and has near the summit a convent for the relief of travelers, believed to have been founded by St. Bernard of Menthon. The pass is comparatively easy, and is supposed to have been the route taken by Hannibal in his invasion of Italy.

St. Boniface: town of Manitoba; suburb of Winnipeg, from which it is separated by the Red river (see map of Canada, ref. 9–H). It is a French-Canadian town as distinguished from Winnipeg, which is British, and is the headquarters for the Northwest of the Roman Catholic Church. It was originally known as *La Fourche*, because of the junction here of the Assiniboine and the Red rivers, but on the arrival of Bishop Provencher in 1818 the name was changed to St. Boniface. Here are schools for French-Canadians, and in the cemetery attached to the cathedral is the grave of Louis Riel, the half-breed rebel, looked on by his fellows as a martyr. Pop. 2,000. M. W. H.

St. Brendan, Brandan, or **Branda'nus**: an Irish monk famous for his sea-voyages, about which many legends have been handed down from the Middle Ages; flourished probably in the sixth century A. D. He was said to have gone on a nine years' voyage and visited unknown lands, which are described in the work *De fortunatis insulis*, published in the eleventh century in Latin and translated into French about 1120. Versions of his voyages appeared also in German, English, and Dutch. A popular tradition has identified the Fortunate islands of St. Brendan with America, and given to the Irish saint the credit that belongs to Columbus, but his claims have no historical foundation. See the versions of St. Brendan's travels by Wright (London, 1844), Schröder (Erlangen, 1871), Blommaert (in *Oudvlaemische gedichten*, Ghent, 1838–41), Michel (Paris, 1878). See also Jubinal, *La légende de Saint Brandaines* (Paris, 1836), and Briel, *Van Sinte Brandane* (Groningen, 1871).

St. Bride, or **St. Bridget**: See Bridget, Saint.

St.-Brieuc, săn'bri-ö': capital of the department of Côtes-du-Nord, France; on the Gouet; 93 miles E. of Brest (see map of France, ref. 3–B). It has an ancient cathedral, a lyceum with a library of 27,000 volumes, and a statue of Bertrand du Guesclin, and is engaged in the whale and cod fisheries. Pop. (1896) 21,665.

St. Catharines: city; capital of Lincoln County, Ontario, Canada; on the Grand Trunk and St. Catharines and Niagara railways; 12 miles N. of Niagara Falls (see map of Ontario, ref. 5–D). It is celebrated for its mineral artesian wells, which afford strongly saline waters with valuable tonic properties. There are several fine hotels, 3 daily and 3 weekly newspapers, a convent, a marine hospital, and important manufactures. The town is in a picturesque and fertile region. Pop. (1891) 9,170.

St.-Césaire, săn'sā'zăr' : town of Rouville County, Quebec, Canada; on Yamaska river; 33 miles E. of Montreal (see map of Quebec, etc., ref. 5–B). It has a large trade, a fine water-power, thriving manufactures, an astronomical observatory, a museum of mineralogy and zoölogy, and is the site of Ste. Croix College, a commercial school, and a Presentation convent. Pop. of parish, 5,200, almost all French-Canadians.

St.-Chamond, săn'shaă'mōn' : town ; in the department of Loire, France; at the confluence of the Gier and Ban; 7 miles by rail N. E. of St.-Étienne (see map of France, ref. 6–G). It has several silk-mills, iron-works, and manufactures of ribbons and lace. The vicinity contains rich coal mines. Pop. (1896) 14,463.

St. Charles : city; Kane co., Ill.; on the Fox river, and the Chi. and N. W. and the Chi. Gt. West. railways; 8 miles S. of Elgin, 38 miles W. of Chicago (for location, see map of Illinois, ref. 2–F). It is on both sides of the river, which furnishes good water-power, and contains foundries and machine-shops, malleable iron-works, manufactories of butter, cheese, flour and feed, and paper, a private bank, and a weekly newspaper. Pop. (1890) 1,690; (1900) 2,675.

St. Charles : city (settled in 1780, incorporated as a town in 1809, chartered as a city in 1849); capital of St. Charles co., Mo.; on the Missouri river, and the Burlington Route, the Mo., Kan. and Tex., and the Wabash railways; 20 miles N. W. of St. Louis (for location, see map of Missouri, ref. 4–J). The main business street extends along the river front, and the residence portion lies on and beyond a hill that rises a short distance back from the river. The river is here spanned by an iron railway and highway bridge 6,535 feet long, with approaches, completed in 1871, cost $1,750,000. St. Charles contains 9 churches, several public schools, Roman Catholic and Lutheran parochial schools, Lindenwood College for young ladies (Presbyterian, opened in 1830), Sacred Heart Academy (Roman Catholic, opened in 1818), St. Charles College (Methodist Episcopal, South, chartered in 1838), 4 libraries with about 11,000 volumes, a national bank with capital of $50,000, 2 savings-banks with combined capital of $100,000, and 2 daily and 5 weekly newspapers. There are 3 large flour-mills, a grain elevator with storage capacity of 50,000 bush., a tobacco-factory with annual capacity of 1,000,000 lb. of manufactured goods, 2 breweries, extensive car-works, brick-works, large corn-cob pipe factory, and other industrial plants. Pop. (1880) 5,014; (1890) 6,161; (1900) 7,982. J. H. ALEXANDER.

St. Christopher : See ST. KITTS.

St. Clair : city (settled in 1828); St. Clair co., Mich.; on the St. Clair river at the mouth of the Pine river, and on the Mich. Cent. Railroad; 12 miles S. of Port Huron, the county-seat, 45 miles N. E. of Detroit (for location, see map of Michigan, ref. 7–L). It is in an agricultural region, has ferry connection with Courtwright on the Canadian side of the river, and contains 6 churches, 3 public schools, Ladies' Library Association, Walker system of water-works, completed in 1886, a savings-bank with capital of $50,000, and a weekly newspaper. The manufactories include salt-works, brick-yards, breweries, iron-works, planing-mill, sash, door, and blind factory, foundry, tannery, and ship-yards. Pop. (1880) 1,923; (1890) 2,353; (1900) 2,543.

EDITOR OF "REPUBLICAN."

St. Clair : borough; Schuylkill co., Pa.; on Mill creek, and the Penn. and the Phil. and Reading railways; 3 miles N. of Pottsville (for location, see map of Pennsylvania, ref. 5–H). It has 10 churches, 4 public-school buildings, a parochial school, improved water-works, electric lights, electric railway to Pottsville, and 2 weekly newspapers, and is principally engaged in mining and shipping anthracite coal and manufacturing mining apparatus. Pop. (1880) 4,149; (1890) 3,680; (1900) 4,638. EDITOR OF "SPLINTERS."

St. Clair, ARTHUR : soldier; b. at Thurso, Caithness, Scotland, in 1734; was grandson of the Earl of Rosslyn; educated at the University of Edinburgh; entered the British army as an ensign May 13, 1757; served under Amherst at the taking of Louisburg July 26, 1758; became a lieutenant Apr. 17, 1759; was distinguished under Wolfe at Quebec; resigned his commission Apr. 16, 1762; settled in Ligonier Valley, Pa., 1764, erecting there a fine residence and several mills; was appointed colonel of the Second Pennsylvania Regiment Jan. 3, 1776; accompanied Sullivan in the expedition against Quebec; was appointed brigadier-general Aug. 9, 1776; joined Washington Nov., 1776; rendered valuable service in connection with the battle of Princeton Jan. 2, 1777; was for a short time adjutant-general; was appointed major-general Feb. 19, 1777; succeeded Gates in command at Ticonderoga Apr. 1; was forced to evacuate that post July 4, thereby incurring unpopularity and retirement from his command, but acted as a volunteer aide at the battle of Brandywine Sept. 11, 1777; was acquitted with honor by a court martial in 1778; was a member of the court martial on Maj. André; commanded at West Point from Oct. 1; distinguished himself in the Southern campaign which terminated at Yorktown, and subsequently in that under Greene; was a member of the Continental Congress 1785–87, being its president during most of the latter year; became first Governor of the Northwestern Territory in 1789 and retained the office till 1802; made the treaty of Fort Harmer with the Indian tribes 1789; became commander-in-chief of the U. S. army Mar. 4, 1791; made an expedition against the Indians of the Miami and the Wabash, and suffered a severe defeat near the Miami villages Nov. 4, 1791; was vindicated from blame by a committee of investigation appointed by Congress; resigned the command of the army May 5, 1792; was removed from the post of Governor by Jefferson Nov. 22, 1802, when he settled near Greensburg, Pa., where he passed his remaining years in poverty. D. near Greensburg, Aug. 31, 1818. He published a *Narrative of the Manner in which the Campaign against the Indians in the Year 1791 was conducted* (1812). See *The Life and Public Services of Arthur St. Clair* (Cincinnati, 1882).

St. Clair, Lake : the smallest of the Laurentian chain of lakes; receives the overflow of Lake Huron through St. Clair river, and discharges through Detroit river into Lake Erie. The lake is 30 miles in length from N. to S., 24 miles in maximum and 12 in mean breadth. Its area is 396 sq. miles, and its mean elevation above the sea 576 feet, or $5\frac{4}{10}$ feet lower than Lake Huron and 3 feet higher than Lake Erie. Its mean depth over a large central area is about 19 feet. Its bottom is of fine blue mud, covered in many places with a thin layer of sand and fine gravel, and is overgrown throughout with vegetation which supports an abundance of low forms of life. The northern part is exceedingly shallow, being filled with sediment from St. Clair river. See ST. LAWRENCE RIVER AND GULF. ISRAEL C. RUSSELL.

St. Clair River [originally named *Sinclair*, from Patrick Sinclair, a British officer, who purchased land along the river from the Indians in 1765] : the outlet of Lake Huron. It has a length of 41 miles, and a fall of $5\frac{4}{10}$ feet. The mean discharge is 225,000 cubic feet per second. The river has built a low-grade delta at its mouth, known as the St. Clair Flats, and divides into seven principal channels before reaching Lake St. Clair. In summer the delta has the appearance of a luxuriant prairie of grasses and rushes, which grow in a few inches of water. Several hotels and hundreds of summer cottages have been built on the flats, each house being supported on piles or on embankments formed by dredging neighboring canals. It is one of the most charming summer resorts in America. One of the branches into which the stream divides has been improved for navigation, and its course shortened by the dredging of a canal about $1\frac{1}{2}$ miles long, 300 feet wide, and with an original depth of 16 feet along a central area 200 feet broad. The embankments on either side are 40 feet wide, and 5 feet high above mean water-level. The available depth of water in the canal in 1893 was 18 feet, but contracts have been awarded by the U. S. Government for deepening it to 20 feet, this being one of the improvements necessary to complete the navigability of the route from Buffalo to Duluth for vessels of 20 feet draught. ISRAEL C. RUSSELL.

St.-Cloud, săn'kloo' : town ; in the department of Seine-et-Oise, France; on the Seine; 6 miles S. W. of Paris (see map of France, ref. 3–F). It derives its name from St. Clodoald, grandson of Clovis, who founded a monastery here in 551. The place was burned by the English in 1358, and again by the Armagnacs in 1411. In the palace of St.-Cloud, built in 1572, Henry III. was assassinated in 1589; and here the *coup d'état* of Nov. 10, 1799, which placed Napoleon Bonaparte at the head of the French Government, was effected. The capitulation of Paris in 1815 was signed here, and also the decrees of Charles X. in 1830 which caused the second Revolution. The Duke of Orleans, brother to Louis XIV., made extensive additions to the royal château. In 1870 the palace was seriously injured by fire, but many of the valuable works of art were preserved. Pop. (1896) 6,374.

St. Cloud: city; capital of Stearns co., Minn.; on the Mississippi river, and the Gt. North. and the N. Pac. railways; 3 miles S. of Sauk Rapids, 75 miles N. W. of St. Paul (for location, see map of Minnesota, ref. 8–C). It is on both sides of the Mississippi river, 2 miles below the mouth of the Sauk river; is in an agricultural and hard-wood timber region; has more than 20 granite-quarries in its vicinity; and derives good power for manufacturing from the river. There are 10 churches, public high school, graded schools, one of the State normal schools, 3 libraries (Public, High School, and State Normal School), a State reformatory for males (opened in 1889), a U. S. land-office, 3 national banks with combined capital of $300,000, a private bank, and 2 daily and 3 weekly newspapers. The city contains saw and grist mills, artificial-stone works, indurated-fiber works, several foundries and machine-shops, and large grain elevators, and is the commercial and manufacturing center of Northern Minnesota. Pop. (1880) 2,462; (1890) 7,686; (1900) 8,663. EDITOR OF "TIMES."

St. Croix: See SANTA CRUZ.

St. Croix (sānt-kroi') **River**: a part of the boundary between Maine and New Brunswick. It flows from Grand Lake in a general E. S. E. course, and falls into Passamaquoddy Bay. It is navigable to Calais, Me., above which it affords fine water-power. It is 75 miles in length. It is also called the *Schoodic*.

St. Croix River: a stream which rises in Douglas co., Wis.; flows S. W. to the Minnesota line; from this point southward, for more than 100 miles, it is the boundary between Wisconsin and Minnesota. It is some 150 miles long, and is navigable 54 miles to the Dalles or Falls of the St. Croix. After passing through Lake St. Croix it flows into the Mississippi at Prescott, Wis. At its falls it descends 50 feet in 300 yards. Half a mile below there is a picturesque cañon through which the river flows.

St. Cuthbert's Beads: See CRINOIDEA.

St.-Cyr, săn'seer': village of France; in the park of Versailles (see map of France, ref. 3–F). It is noted for the celebrated establishment which Madame de Maintenon founded here in 1686 for the education of 250 daughters of the French nobility. The building was erected by Mansard. In 1793 it was transformed into a military hospital, and in 1806 Napoleon removed the military academy from Fontainebleau to this place. Pop. (1896) 4,205.

St.-Denis, săn'de-nee': town; in the department of Seine, France; 4 miles N. of Paris, on the Great Northern Railway (see map of France, ref. 3–F). It is celebrated as the site of the ancient Benedictine abbey, the chosen place of burial of the Kings of France. The abbey of St.-Denis was founded by Dagobert I. in 613; a church begun by Pepin, the father of Charlemagne, was completed by the latter and consecrated in 775. This edifice was demolished during the reign of Louis VII., and a more imposing one erected in 1144, the porch and two towers of which yet remain; the rest of the present building was reconstructed by Louis VIII. Up to the time of the Revolution the remains of the kings and princes of France were deposited here. The Convention in 1793 ordered the removal of these bodies, and in 1795 the destruction of the building; the provisions of the latter decree, however, were not fully carried out. Napoleon I. restored the church, which has been further protected by subsequent governments, and is considered one of the most beautiful specimens of Gothic architecture existing in France. Pop. of the commune (1896) 54,432.

St.-Denis: capital of the French island of Réunion, formerly Bourbon; on the northeastern shore (see map of Africa, ref. 8–I). It has a college and a botanical garden, and carries on a considerable trade. Pop. of the commune (1889) 30,560.

St.-Die, săn'dee': town; in the department of Vosges, France; on the Meurthe; 50 miles by rail S. E. of Nancy (see map of France, ref. 4–H). It has a cathedral, a lyceum, and large breweries, cotton and flax spinning-mills, iron-works, tanneries, and dye-works. In the vicinity are several rich iron and copper mines, and much fine marble is quarried. Pop. (1896) 21,396.

St.-Dizier, săn'dee'ziā': town; in the department of Haute-Marne, France; on the Marne; 38 miles by rail S. E. of Châlons (see map of France, ref. 4–H). It has several iron-foundries, active ship-building, and a trade in iron and timber. Pop. (1896) 13,947.

St. Domingo: See SANTO DOMINGO.

Ste.-Anne-de-Beaupré, -bō'prā': village of Montmorency County, Quebec, Canada, containing a shrine to which many pilgrimages are made (see map of Quebec, ref. 4–D). The village is the terminus of the Quebec, Montmorency and Charlevoix Railway; about 25 miles N. E. of Quebec, at the mouth of the St. Anne river, a left-hand affluent of the St. Lawrence. The parish church contains relics of St. Anne, to which many miraculous cures have been attributed. The great day for pilgrimages is July 26, the feast-day of the patron saint. In the church is a fine painting by Le Brun, representing *St. Anne and the Virgin*, presented in 1666 by the Marquis de Tracey. About 3 miles distant are the beautiful falls of St. Anne, near which is good fishing for trout and salmon. MARK W. HARRINGTON.

Sainte-Beuve, săñt'böv', CHARLES AUGUSTIN: poet and critic; b. at Boulogne, France, Dec. 23, 1804; studied medicine in Paris; entered in 1824 on his literary career as a contributor to the *Globe*; published in 1828 his *Tableau historique et critique de la Poésie française au XVI. Siècle* (improved edition, 1843); removed after 1830 from the *Globe* to the *National* and *Revue des Deux Mondes*; received employment at the Mazarin Library in 1840 after publishing the first volume of his celebrated work, *Port-Royal* (3 vols., 1840–48; later much improved; 5th ed. 7 vols., 1888–91); became a member of the Academy in 1845; became in 1848 Professor of French Literature at Liège; returned to Paris in 1849 and held various positions under Napoleon III., contributing steadily to the *Constitutionnel* and the *Moniteur*; was made a senator in 1865. D. in Paris, Oct. 13, 1869. The various series of his *Critiques*, *Portraits*, *Galeries*, and *Causeries*, comprising over thirty volumes, contain some of the finest, most delicate, and most striking delineations of characters from history and literature which have ever been written. Selections have been translated into English: *Portraits of Celebrated Women* (Boston, 1868); *English Portraits* (1875). He also wrote a novel, *Volupté* (1834; 9th ed. 1877), and the collections of poems *Poésies et Pensées de Josephe Delorme* (1829); *Consolations* (1830); and *Pensées d'août* (1837). There are biographies of Sainte-Beuve by Haussonville (1875), Vattier (2d ed. 1892), and others.

Sainte-Claire Deville, HENRI ÉTIENNE: chemist; b. at St. Thomas, West Indies, Mar. 11, 1818; was educated at the Collège Rollin, Paris; was appointed dean of the faculty of science in Besançon 1844; in 1851 obtained the chair of Chemistry in the Normal School, Paris, and shortly afterward the similar post in the Sorbonne. D. in Paris, July 1, 1881. In 1850 he discovered anhydrous nitric acid; in 1855 he succeeded in making in mass aluminium, which before had been obtained only in globules; and with Debray he studied the six platinum metals. Along with Troost he experimented on the artificial production of minerals, and produced in this way the sapphire, ruby, and emerald. These and many other investigations were published in the *Comptes Rendus* and the *Annales de Chimie et de Physique*. His principal contribution to theoretical chemistry was his explanation of the phenomena of dissociation, of which he gave a complete account in a lecture delivered before the Chemical Society of Paris in 1866. He published *De l'Aluminium* (Paris, 1859) and *Métallurgie du Platine* (2 vols., Paris, 1863). R. A. ROBERTS.

St. Edmundsbury: See BURY ST. EDMUNDS.

Ste. Genevieve: city; capital of Ste. Genevieve co., Mo.; on the Mississippi river; 50 miles S. of St. Louis (for location, see map of Missouri, ref. 5–J). It is in an agricultural and stock-raising region, has mines of copper and quarries of sandstone in its vicinity, and is also largely interested in fruit-growing and wine-making. Pop. (1880) 1,422; (1890) 1,586; (1900) 1,707.

St. Elias, Mount: in Alaska; in lat. 60° 17′ 35·1″ and lon. 140° 55′ 47·3″. It has an elevation of 18,100 feet, as determined by the U. S. Coast and Geodetic Survey. It is not a volcanic mountain, as has been frequently stated, but the upturned border of a block of the earth's crust bounded by faults. It is covered with ice and snow from base to summit, and surrounded on all sides by glaciers. The timber-line has an elevation of 2,000 to 2,500 feet on the foot-hills at its southern base, but on the mountain itself there are no trees, and but slight traces of vegetation even at its base. Although its southern slope is exceedingly precipitous and avalanche-swept, the northern side is accessible and not too steep for mountaineers

to ascend. In 1891 an elevation of 14,500 feet was reached on its northern slope. Consult *Report on Second Expedition to Mt. St. Elias* in *Thirteenth Ann. Rep. U. S. Geol. Surv.* ISRAEL C. RUSSELL.

Ste.-Marguerite: See LÉRINS, THE.

Ste.-Marie: town of Beauce County, Quebec, Canada: on the river Chaudière: 30 miles S. of Quebec (see map of Quebec, ref. 4–D). It lies in a fertile region, has a fine Roman Catholic college, a spacious convent, a good trade, a large number of mills, and ores of copper and manganese. Pop. about 2,800.

Sainte-Maure: See BENOÎT DE SAINTE-MORE.

Saintes, sănt' (anc. *Mediolanum*): town; in the department of Charente-Inférieure, France; on the Charente; 28 miles by rail S. E. of Rochefort (see map of France, ref. 6–D). It has several interesting Roman remains, numerous breweries, distilleries, tanneries, and potteries, and an active trade in grain, hemp, leather, and wine. Pop. (1896) 20,285.

St.-Étienne, sănt'ā'ti-en': town; in the department of Loire, France; on the Furens, an affluent of the Loire; 36 miles by rail S. W. of Lyons (see map of France, ref. 6–G). It is situated in the center of rich coal-fields, from which over 3,000,000 tons are annually raised, and which have given to the city a most vigorous manufacturing impulse. It arose in an astonishingly short time; it had 49,614 inhabitants in 1851, and 136,030 in 1896. Its principal branches of manufacture are ribbons and firearms; looms, some of which (1895) are driven by electricity, employing about 40,000 persons are in operation, and produce ribbons to the value of nearly $19,000,000 annually, which are sent all over the world, and are unsurpassed in beauty of design and colors; 20,000 persons are employed in the ironworks, and produce, besides large quantities of cutlery, files, nails, etc., nearly all the rifles and revolvers for the army. The first railway in France, the Chemin de Fer de St.-Étienne à Lyon, was constructed to carry coal to Lyons.

St. Eusta'tius: an island of the Lesser Antilles, West Indies; crossed by lat. 17° 29′ N.; area, 7 sq. miles. It is little else than the summit of an extinct volcano, and has no running water. It now forms part of the Dutch colony of Curaçoa. Pop. (1892) 1,633. H. H. S.

Saint-Évremond: See ÉVREMOND.

St. Francis River: one of the six great tributaries of the St. Lawrence. It rises in Lake St. Francis, in Beauce County, Quebec, flows first in a southwesterly direction till it reaches Lennoxville, when it flows northwesterly and falls into the St. Lawrence at Lake St. Peter after a course of 120 miles. It is the principal river of the Eastern Townships. The tributaries are the Salmon, the Coaticook, the Massawippi, which drains the beautiful lake of the same name, and the Magog, which drains the magnificently picturesque Lake Memphremagog. The river runs through a fertile and well-cultivated territory, diversified with highlands and tracts of woodland. The towns and villages upon the river's banks are Angus, with its large paper-mill; Lennoxville, with its university; Sherbrooke, with its extensive manufactures; Windsor Mills, with its lumber and paper trade; Richmond, an important railway center; and Drummondville, the center of a rich farming district. Its course is frequently interrupted by shallows and rapids, and destructive floods are often caused by the blocking of the ice on or near these in early spring. The scenery amid which the river flows resembles in many places the character of an English landscape, more particularly in the vicinity of Richmond and Sherbrooke. J. M. HARPER.

St. Francis River: a tributary of the Mississippi, forming part of the boundary between Missouri and Arkansas. It rises in the Iron Mountain district of Southwest Missouri, and flows S. W. 450 miles, entering the Mississippi near Helena, Ark.; is navigable 150 miles, passes through a continuous swamp after entering Arkansas, and spreads into numerous lakes, one of which, 50 miles long by 20 wide, is supposed to have been produced by a sinking of the soil at the time of the great earthquake of 1811. It serves as an important backwater in overflows of the Mississippi river.
Revised by M. W. HARRINGTON.

St. Francis Xavier (zăv'i-*er*). **College of**: an institution of learning in New York, founded by the fathers of the Society of Jesus in Oct., 1847, and endowed with full collegiate powers by the regents of the University of the State of New York in Jan., 1861. The college buildings are located on Fifteenth Street, W. of Fifth Avenue, with a frontage of 275 feet and a depth of 200, extending to Sixteenth Street. The library contains 25,000 volumes. The regular course preparatory to the degree of Bachelor of Arts embraces the study of logic, metaphysics, and theodicy; English, Latin, and Greek; rhetoric, poetry, and elocution; mathematics and the natural sciences; history, geology; and mythology. The degree of Master of Arts is given to graduates who enter the post-graduate class, pass two examinations in ethics and sociology, and write three creditable dissertations on the subject-matter of the year. The president of the college is Rev. Thomas E. Murphy, of the Society of Jesus, and the teaching staff includes twenty members of the same society. The students number over 900: 200 in the post-graduate course, 150 in the collegiate, 400 in the grammar department, and nearly 200 in the preparatory department.
EDW. P. SPILLANE, S. J.

St.-Gall: canton of Switzerland; bounded E. by the Rhine and N. by the Lake of Constance. Area, 779 sq. miles. The surface exhibits a thoroughly alpine character—mountains covered with forests, pastures, and snow and ice, and valleys studded with vineyards, orchards, and grainfields. Agriculture, dairy-farming, and wine-making are the principal branches of industry. Pop. (June, 1894) 241,055, of whom more than half are Roman Catholics and the rest mostly Protestants.

St.-Gall: capital of the canton of St.-Gall, Switzerland; on the Steinach, in a valley at an elevation of 2,152 feet (see map of Switzerland, ref. 3–I). It was formerly fortified, but its walls and ramparts have been transformed into promenades. The town has a fine cathedral, many good educational institutions, two large public libraries, and extensive manufactures of woolen, linen, and cotton fabrics, especially fine muslins and printed calicoes. Pop. (1897) 34,025.

St. Gall: a saint of the Roman Catholic Church; a native of Ireland, and a pupil of St. Columban; originally named Cellach or Caillech; b. in 554; followed St. Columban to Switzerland in 590, and became the apostle of the Suevi and the Alemanni. In 614 he built his cell in a dense forest on the Steinach, in Switzerland, where now stands the flourishing city of St. Gall, and gathered around him a number of hermits, who lived together according to the rule of St. Columban. D. at Arbon, 15 miles S. E. of Constance, Oct. 16, 627. From this beginning gradually developed the famous monastery of St. Gall, one of the principal centers of learning during the Middle Ages. Abbot Otmar, 720–759, substituted the milder rule of St. Benedict for that of St. Columban, built a church, founded a hospital, organized a school, etc. Under Gozbert, 816–837, the monastery was made a free royal abbey, with right to elect its own abbot, and exempted from any episcopal control. Under Solomon III., 891–920, the institution reached the culminating point of its prosperity. The monks of St. Gall were celebrated not only for their learning, but also for their skill in music, in copying and ornamenting manuscripts, etc. The first check it suffered was the revolt of the city of St. Gall in 1415. The abbot was compelled to recognize its freedom and independence. After the Reformation it gradually fell into decay, but it retained its enormous revenues until the Revolution. It was secularized in 1798; its estates were confiscated, and its territory was formed into a bishopric. See Ildephons von Arx, *Geschichte des Kantons St. Gallen* (3 vols., St. Gall, 1810–13); Franz Weidmann, *Geschichte der Stiftsbibliothek St. Gallens* (1841); C. J. Greith, *Der heilige Gallus* (1865); and the edition by R. Shuli of Wahlafrid's original life of St. Gall (1890). Revised by S. M. JACKSON.

St. George: one of the PRIBILOF ISLANDS (*q. v.*) in Bering Sea. It is triangular, 30 miles around, with an area of 27 sq. miles. It is the highest of the group, reaching an elevation of 920 feet. M. W. H.

St. George, Cape: See CAPE ST. GEORGE.

St. George's: See BERMUDA ISLANDS.

St. George's: capital of the island of Grenada and of the British colony of the Windward islands, West Indies; on a bay near the south end of the island (see map of West Indies, ref. 9–M). The harbor is one of the best in the West Indies; the town, built in part on hills, is very picturesque; it has a considerable trade with the other islands and with Europe and the U. S. Pop. about 6,000. H. H. S.

St. George's Channel: a body of water connecting the Irish Sea with the Atlantic and separating Ireland from Wales. It is 100 miles long and 65 miles broad.

St.-Germain, or **St.-Germain-en-Laye**, săn'zhăr-măn'-ăăn-lā': town; in the department of Seine-et-Oise, France; on the left bank of the Seine; 8 miles W. of Paris (see map of France, ref. 3–F). The magnificent palace is used for barracks. Pop. (1896) 16,489.

St. Gotthard, Fr. pron. săn'gō'taar': central mountain mass of the Alps between the Swiss cantons of Uri and Ticino; the watershed of the rivers Rhine, Rhône, and Ticino. It is a ridge about 20 miles long, convex to the N., with a dozen peaks more than 8,750 feet in height, and culminating in Pizzo Rotondo, 10,490 feet high. It is best known from the St. Gotthard Pass, elevation 6,936 feet, between the head-waters of the Reuss, an affluent of the Rhine through the Lake of Luzern and the Aar, and of the Ticino, an affluent of the Po through Lake Maggiore. This pass has been traversed for many centuries, and until the St. Bernard, Simplon, and Splügen were made passable for vehicles, it was the chief route between the northern and southern slopes of the Alps. In 1872 a railway tunnel under the pass was begun, and in 1881 the first locomotive passed through. The tunnel is a little more than 9 miles long, 26 feet broad, 21⅓ feet high, and reaches an elevation of 3,786 feet at its culminating point, or 3,150 feet below the surface. The tunnel and its approaches formed the most important engineering work produced up to that time, and it permits of a ready and direct passage from Bavaria to Lombardy. The pass is of strategic importance and is fortified. MARK W. HARRINGTON.

St. Helena: a British island in the South Atlantic Ocean; lat. 15° 55′ S. and lon. 5° 44′ W. (for map, see map of Africa). It is 10½ miles long and 6½ broad, inclosing an area of 47 sq. miles. Pop. (1891) 4,116. St. Helena was discovered by Juan de Nova Castella, the Portuguese navigator, on May 21, 1501 (St. Helena's Day), but continued unknown to other nations until 1588, when it was observed by Capt. Cavendish. It remained uninhabited until the Dutch took possession of it. In 1673 it was taken from the Dutch by England, but soon after the East India Company was granted a charter by Charles II. for its possession. In 1834 it passed into the hands of the crown. The only good inlet is St. James's Bay, on the N. W. of the island, possessing a good harbor, where the chief town (Jamestown) is built. Though 700 miles from the nearest land, Isle of Ascension, and 1,140 miles from the nearest point of the African continent, it is one of the best known islands of the world, as being the place of exile and death of Napoleon Bonaparte. See NAPOLEON I.

St. Helena: town; Napa co., Cal.; on the S. Pac. Railroad; 8 miles S. of Calistoga; 60 miles N. of San Francisco (for location, see map of California, ref. 6–B). It is in a mountain valley noted for the extent and richness of its vineyards, and is principally engaged in grape-growing and wine-making. There are machine-shops, soda-works, foundry, a national bank with capital of $50,000, two State banks with combined capital of $110,000, and a weekly newspaper. Pop. (1880) 1,339; (1890) 1,705; (1900) 1,582.

St. Helens: town; in Lancashire, England; 12 miles E. N. E. of Liverpool (see map of England, ref. 7–F). Owing to the neighborhood of collieries and traffic facilities St. Helens has rapidly developed into a great center of industry. It is the principal seat in England of the manufacture of different kinds of glass, and has extensive alkali, copper-smelting, and iron works. A town-hall with a public library was opened in 1876. Since 1885 St. Helens has returned one member to Parliament. Pop. (1901) 84,410.

St. Helier: capital of the island of Jersey, on its southern coast, on the east side of St. Aubin Bay (see map of France, ref. 3–C). It has a good harbor, is fortified and defended by two citadels, and carries on an extensive trade. Pop. (1891) 29,133.

Saint-Hilaire, GEOFFROY: See GEOFFROY SAINT-HILAIRE.

Saint-Hilaire, JULES: See BARTHÉLEMY SAINT-HILAIRE.

Saint-Hilaire, săn'tēē'lār', MARCO, de: the pseudonym of Émile Marc Hilaire; b. about 1790; was educated as a page at the court of Napoleon I., but, left without any employment after the Restoration, took up literature merely as a means of living, writing biographies of the Duke of Berri and the courtesans of the Palais Royal, and commenced after 1830 to publish his books on Napoleon I., which were exceedingly popular: *Mémoires d'un Page de la Cour impériale* (2 vols., 1830); *Les Petits Appartements de Tuileries, de Saint-Cloud et de la Malmaison* (2 vols., 1831); *Souvenirs de la Vie privée de Napoléon* (2 vols., 1838); *Souvenirs intimes du Temps de l'Empire* (6 vols., 1838–40), and many more, none of which has any historical value. One of his later works was the *Histoire de Napoléon III.* (1853).

St.-Honoré-les-Bains, săn'tō'nō'rā'lā-băn': health resort, with thermal springs, in the department of Nièvre, France: 6 miles S. E. of Moulins-Engilbert, about 150 S. S. E. of Paris, and 5 from the nearest railway station (Vandemesse-Saint-Honoré). The thermal establishment utilizes five springs of waters with sodium sulphate in solution, having temperatures from 80° to 88° F. Roman remains have been found in considerable abundance, proving that this is the ancient *Aquæ Nisinæi*. Pop. about 1,700. M. W. H.

St. Hyacinthe: city; capital of St. Hyacinthe County, Quebec, Canada; on Grand Trunk Railway and the navigable Yamaska and Black rivers; 35 miles E. N. E. of Montreal (see map of Quebec, ref. 5–B). It contains a Roman Catholic college and seminary, three convents, a hospital, an academy, four large bridges, and numerous manufactories. Among the fine buildings are the bishop's palace, city-hall, and market. There is an active trade by rail and some by steamer. Pop. (1891) 7,016, nearly all French Canadians.

St. Ignace: the largest of the islands in the extreme north of Lake Superior, separating Nipigon Bay from the body of the lake; belongs to Ontario; area about 530 sq. miles; pop. about 200. It is separated from Black Bay Peninsula by a long passage less than a mile broad, but from 20 to 30 fathoms deep. Its highest elevation reaches an altitude of 1,440 feet, and is of basalt. M. W. H.

St. Ignace: city; capital of Mackinac co., Mich.; on the straits of Mackinac, and the Duluth, S. Shore and Atlantic Railway; opposite Mackinaw City, 45 miles N. of Petosky (for location, see map of Michigan, ref. 2–I). It is in an iron-mining and lumber region, has a beautiful harbor, and is a terminal port for several lines of steamers and a port of call for others. Six miles distant is the national park of Mackinac Island, a popular summer resort. The city contains four churches, of which the Church of St. Ignatius, founded by Jacques Marquette, is the oldest in Northern Michigan. It contains a famous old painting, *St. Ignatius Renouncing the World*. There are 3 graded union schools, a Roman Catholic academy, a national bank with capital of $50,000, and 2 weekly newspapers. The principal industries are those connected with iron mining and manufacturing and with lumbering. St. Ignace was the seat of an early Jesuit mission, which was the rendezvous of many exploring expeditions. Pop. (1880) 934; (1890) 2,704; (1900) 2,271.

St. Ignatius College: See the Appendix.

Saintin, săn'tăn', JULES ÉMILE: genre and portrait painter; b. at Lemé, Aisne, France, Apr. 14, 1829; pupil of Drölling, Picot, and Leboucher; medals, Salons, 1866 and 1870; chevalier of the Legion of Honor 1877; third-class medal, Paris Exposition, 1889. D. in Paris, July 14, 1894. He passed several years in the U. S., and painted, among other portraits, that of Stephen A. Douglas (1860). Two of his best-known works are *The Pony Express* (1863) and *Abandoned* (1880). He painted the portrait of Madame Carnot, wife of the president of the French republic, in 1891. His work is academic in style and without distinguishing qualities of color or drawing. W. A. C.

Saintine, săn'teen': the pseudonym of JOSEPH XAVIER BONIFACE, b. in Paris, France, July 10, 1798. He published a volume of poems, several novels, and (alone or in connection with Scribe, Duvert, Masson, and others) about 200 plays. He is best known for the sketch *Picciola*, which ran through forty editions, was translated into all European languages, and received the Montyon prize from the Academy. D. in Paris, Jan. 21, 1865.

St. Ives: town; in the county of Cornwall, England; on St. Ives Bay; 8 miles N. N. E. of Penzance (see map of England, ref. 15–B). It has a harbor, a pier, and a breakwater, and is the chief seat of the Cornwall pilchard-fishery. It is a favorite watering-place. Pop. (1891) 6,094.

St. Ives: town; in Huntingdonshire, England; on the Ouse; 5 miles E. of Huntingdon (see map of England, ref. 10–J). It has a parish church dating from the fifteenth century, and a six-arch stone bridge, built by the abbots of Ramsey, with an old chapel in the middle. Pop. (1891) 3,037.

St.-Jean d'Acre: See ACRE.

St. Jérôme, săn'zhā'rōm': town of Terrebonne County, Quebec, Canada; on the Rivière du Nord, and a branch of the Canadian Pacific Railway; 34 miles N. W. of Montreal

(see map of Quebec, ref. 5–A). It has a very fine water-power in the rapids of the river, which descend 300 feet in 3½ miles. The power is used for flour-mills, sawmills, and other factories. In the vicinity are mines of iron and plumbago. The climate is celebrated for its salubrity. Pop. (1891) 2,032, mostly French-Canadian. M. W. H.

St. John, West Indies: See ST. THOMAS.

St. John: the capital of Antigua, West Indies, and the seat of several military and civil authorities (see map of West Indies, ref. 6–L). It is beautifully situated and has a good and fortified harbor, which, however, is not accessible for large vessels. The town is generally well built, especially on the hills surrounding the port. It sometimes suffers greatly from lack of water, and it was seriously injured by the earthquake of Feb. 8, 1843. Pop. (1891) 9,738.
Revised by M. W. HARRINGTON.

St. John: city, seaport, and shiretown of St. John County, province of New Brunswick, Canada; on the St. John river at its entrance into the Bay of Fundy, and the Canadian Pacific, the Intercolonial and the Shore Line railways; 277 miles N. W. of Halifax, 481 miles E. of Montreal (for location, see map of Quebec, ref. 6–H). It has one of the finest harbors on the Atlantic coast, protected by a breakwater 2,250 feet long, and always free from ice. Partridge island, at its entrance, contains a fine lighthouse and a quarantine hospital. St. John river enters the harbor through a rocky gorge about 100 yards wide, and has a fall of 17 feet at low tide; but as the tides in the harbor rise from 25 to 35 feet, the waters of the river and harbor are at the same height twice daily, and then permit the safe passage of vessels either way. Including Carleton on the W. and the former city of Portland (annexed in 1889) on the N., the city has an area of about 6,000 acres, one-quarter of which is built up. It is laid out regularly with broad streets running N. and S. and E. and W., some of them hewn through 30 feet of solid rock, the principal ones laid with block pavement, the sidewalks generally being of asphalt. Water is supplied by gravitation from Little river, 5 miles distant. The plant is owned by the city, and in 1893 had cost $1,327,421. The city has a thorough system of sewerage and gas and electric-light plants.

Public Buildings.—Among the notable buildings are the custom-house, post-office, city building, General Public Hospital, Provincial Lunatic Asylum, Protestant and Roman Catholic orphan asylums, Home for Aged Females, Sailors' Home, Wiggin's Orphan Asylum for sons of seamen, Reformatory for Boys, Free Public Library, Mechanics' Institute, Masonic and Odd Fellows' halls, Dominion Savings-bank, and the railway station.

Churches, Schools, etc.—St. John contains 35 churches and 81 schools. The finest church buildings are the Roman Catholic Cathedral, and the Centenary Methodist, Trinity Episcopal, St. Andrew's Presbyterian, and the Germain Street Baptist churches. The school system is public and non-sectarian, and is ably maintained. The Victoria, Centennial, and Albert schools, the Mt. Pleasant Convent School (Roman Catholic), the Davenport School for Boys (Church of England), and the Madras School are of high grade. A reference library is maintained by the St. John Law Society, and there are 5 daily, 7 weekly, and 2 monthly periodicals.

Transportation.—The gorge is spanned by a suspension bridge for vehicles, and by a steel cantilever bridge (opened in 1885) for railways. The Intercolonial Railway connects the city with all parts N. and E.; the Canadian Pacific with all parts W., including the valley of the St. John; and the Shore Line with St. Stephen and Calais. There is regular steamship connection with Prince Edward Island, Nova Scotia, Boston, the West Indies, and European ports. A system of electric street-railway connects all parts of the city.

Business Interests.—The city has excellent facilities for manufacturing. Ship-building, once a great industry, has almost ceased since the introduction of iron and steel in the construction of vessels. The chief industries are the manufacture of lumber, cotton goods, rolled iron, nails, nuts and bolts, engines and boilers, furniture, lead pipe, paint, carriages, and sashes and doors. The exports in the fiscal year 1892–93 were valued at $3,943,867; the imports, $3,596,969. The seagoing tonnage entered in 1893–94 was inward, 513,296 tons; outward, 510,359; coastwise, inward, 270,552; outward, 287,429. Banking facilities are afforded by the banks of New Brunswick, Nova Scotia, Halifax, Montreal, and British North America, and there is a Dominion bank for savings.

Government and Finance.—The city is divided into thirteen wards, and is governed by a mayor with a board of fifteen aldermen, all elected by the city at large. The city and county return three members to the Dominion House of Commons and six members to the Provincial House of Assembly. In 1893 the revenue from taxes was $335,203, from other sources $201,117; assessed value of real and personal property, $24,256,700; debt, $3,592,007; assets, $4,051,804.

History.—The site was visited by de Monts in 1604; was occupied by the French as a fort under Charles de la Tour in 1635; passed under British rule in 1713 by the treaty of Utrecht; was settled by American loyalists, principally from New England, in 1783; and was incorporated by royal charter as a city in 1785. Pop. (1881) 26,127; (1891) 39,179.
ALFRED A. STOCKTON.

St. John, sin′jŭn or sānt-jon′, HENRY: See BOLINGBROKE.

St. John, JAMES AUGUSTUS: Orientalist and miscellaneous author; b. in Caermarthenshire, Wales, Sept. 24, 1801; acquired a good knowledge of languages, ancient and modern, including Arabic and Persian; was at an early age engaged as sub-editor of *The Oriental Herald*; started the London *Weekly Review* 1827; settled in Normandy 1829; traveled in Norway the same year; visited Egypt and Nubia, ascending the Nile to the second cataract; made several discoveries in physical geography and archæology, including that of the site of the tomb of Osiris on the Sacred Isle; explored Lake Moeris; followed the (supposed) track of the Israelites through the Desert of Sinai; gave an account of this journey in his *Egypt and Mohammed Ali* (1834), *Description of Egypt and Nubia* (1844), and *Isis, an Egyptian Pilgrimage* (1853); wrote at Chantilly, France, *The Hellenes, or the Manners and Customs of Ancient Greece* (3 vols., 1842), in which he was assisted by his son Bayle; published *The Nemesis of Power* (1854); the *History of the Four Conquests of England* (2 vols., 1862); a *Life of Sir Walter Raleigh* (2 vols., 1868); several novels; two religious treatises, *Philosophy at the Foot of the Cross* (1854) and *The Preaching of Christ, its Nature and Consequences* (1855); a biography of *Louis Napoleon, Emperor of the French* (1857); and a treatise on *The Education of the People* (1858). D. Sept. 22, 1875.

St. John, sānt-jon′, JOHN PIERCE: Governor of Kansas; b. at Brockville, Franklin co., Ind., Feb. 26, 1833; went to California in 1853; made voyages to South America, Mexico, and the Sandwich islands; removed to Charleston, Ill., in 1860 to study law; fought in the civil war, and was made colonel; settled in Kansas as a lawyer; was elected Governor of that State in 1878, and re-elected in 1880; was the candidate of the Prohibition party for President of the U. S. in 1884.

St. John, sin′jŭn, PERCY BOLINGBROKE: author; eldest son of James A. St. John; b. at Plymouth, England, Mar. 4, 1821; accompanied his father in his Eastern travels while a boy, and early devoted himself to literature; made a tour through the U. S., Texas, and Mexico about 1840; became Paris correspondent of *The North British Daily Mail* 1847; wrote the *Book of the War* (1853), for which he received the thanks of the Greek Parliament; wrote many novels and was a contributor to many magazines and literary periodicals. Among his best-known books are *The Young Naturalist's Book of Birds* (1844); *Three Days of the French Revolution* (1848); *Arctic Crusoe* (1854); *Quadroona* (1861); *The Creole Bride* (1864); *The Snow Ship* (1865); *Good as Gold* (1870); *The North Pole* (1875); and *A Daughter of the Sea* (1884). D. Mar., 1889. Revised by H. A. BEERS.

St. John, Sir SPENSER: diplomatist and Orientalist; son of James A. St. John; b. in London, Dec. 22, 1826; devoted himself to Oriental literature; became proficient in the Malay language; was appointed secretary to Sir James Brooke, rajah of Sarawak (Borneo), in 1848; was secretary to Brooke's mission to Siam 1850; was acting British commissioner and consul-general in Borneo 1851–55; was full consul-general 1855–62; published *Life in the Forests of the Far East, comprising Explorations of the Interior of Borneo, Sarawak, etc., with Illustrations* (2 vols., 1862); went to Haiti as *chargé d'affaires* 1863, and visited Spain in 1866 with his father, whom he assisted at Simancas in researches preparatory to the publication of the latter's *Life of Sir Walter Raleigh*. He was appointed minister resident to Peru in 1881, and minister plenipotentiary to Mexico in 1884. He was the author of *The Life of Sir James Brooke* (1879) and *Hayti, or the Black Republic* (1884). Revised by H. A. BEERS.

St. John (sānt-jon'), **Lake**: a large circular body of water lying about 200 miles N. of the city of Quebec, and forming the source of the river Saguenay. It is 28 miles long and 25 broad, and receives the waters of several large and navigable streams, namely, the Peribonca (the curious river), which is said to be over 400 miles long; the Mistassini (river of the big rock), 300 miles long; and the Ashuapmouchouan (river for moose-hunting), sometimes called the continuation of the Saguenay, over 250 miles long. Besides these there are the Metabetchouan with its falls of 236 feet in height at its mouth, and the Ouiatchouan, having its source near the head-waters of the St. Maurice. The lake lies in the center of a fertile plain of 31,000 sq. miles, which has been connected by the Lake St. John Railway with the city of Quebec. The principal settlements are along the shore of the lake, including Roberval, St. Jérôme, Hebertville, St. Gédéon, and Jonquière. The chief trade of the district is in lumber, firewood, and farm produce. Over twenty townships have been surveyed, and over 6,000 settlers have taken up their abode in them. The whole district abounds in game, while the lake and its streams teem with fish, including the ouananiche or lake-salmon. For the accommodation of settlers and sportsmen the Government has placed a small steamboat to run between Roberval and the river inlets or bays. J. M. Harper.

St. John of Jerusalem, Knights of the Order of, also known as **Knights Hospitallers**: a military and religious order that originated at the close of the eleventh century. Early in the eleventh century some merchants from Amalfi founded a hospital and hostelry for pilgrims in Jerusalem, and a confraternity of pilgrims took charge of the establishment, which subsequently increased much and was largely endowed. During the siege and capture of Jerusalem by the crusaders in 1099 this confraternity, under the direction of Pierre Gérard, excited general admiration by the heroism with which it administered help to all who suffered. Godfrey of Bouillon gave it a large endowment, and several knights joined it as Hospitallers. The confraternity was then organized as a monastic order with philanthropic purposes, Pope Paschal II. having formally sanctioned its establishment in 1113, and the members assumed the black Augustinian garment with a white cross. After Gérard's death in 1118, Raymond du Puy succeeded as provost of the order, and he immediately undertook a reorganization of the whole institution on a military basis, adding the defense of Christianity and war against the infidels as the new and the principal purpose of the order. Many celebrated knights joined it, great endowments were conferred on it from all Christian countries, brilliant exploits were achieved by it, and in a short time it rose to be one of the richest and most famous of the Christian orders. Soon it also began to exhibit the same signs of greed, intrigue, jealousy, and dissipation which characterized the other orders, and its quarrels with the Templars caused much scandal. After the conquest of the Holy Land by the Saracens the knights removed in 1291 to Limasol in Cyprus, and thence in 1309 to Rhodes where they acted as the bulwark of Christendom against the Turks. In the meanwhile their revenues were increased from the confiscated estates of their former rivals, the Templars, whose order had been suppressed by Philip the Fair. In 1479, while d'Aubusson was grand master, they repelled Mohammed II., who besieged them in the city of Rhodes with a force far superior to their own. Nevertheless, in spite of many brilliant exploits, they were compelled to surrender Rhodes to Suleiman II. in 1522, and at the same time they lost many of their possessions in England, Germany, and the Scandinavian countries. In 1530 Charles V. gave them the island of Malta, and here Suleiman II. attacked them in 1565 with an immense force. Under the grand master La Vallette they offered a most heroic resistance, and, to the astonishment and enthusiasm of all Europe, they finally succeeded in repelling the Turks. Soon after, however, the order began to sink into insignificance—less, perhaps, on account of any faults of its own than because the advancing spirit of the times had no more use for such an institution. During the Revolution the knights lost their large possessions in France. In 1798, on his way to Egypt, Napoleon drove them from Malta, and the British, who conquered the island in 1800, refused to reinstate them. In vain the last grand master, Hompesch, resigned his dignity and transferred it to Paul, Emperor of Russia. The pope would not recognize a man belonging to the Greek Church as grand master, and appointed an obscure Italian to the dignity. The exertions of the members to revive the institution by the aid of the Congress of Vienna failed, and since 1798 the order has existed only nominally. See Taaffe, *History of the Order of Malta* (London, 1852); Porter, *History of the Knights of Malta of the Order of St. John of Jerusalem* (London, 1883); and Delaville Le Roulx, *Archives de l'Ordre de St. Jean de Jérusalem* (Paris, 1883). Revised by F. M. Colby.

St. John River: of Maine and New Brunswick; rises on the boundary of Maine and Quebec, near the head of the Penobscot. For nearly 40 miles it is the boundary between the U. S. and Canada. It then traverses for 112 miles the wilds of Northern Maine, and is known as the Walloostook or Main St. John. Some 150 miles below its origin it joins with the St. Francis, and changes its northeasterly to a more easterly course. Below the mouth of the St. Francis it is the north boundary of Maine for about 75 miles. Below this part of its course it is wholly in Canadian territory, shortly after entering which its Grand Falls occur, 225 miles above its mouth. The river here falls 75 feet perpendicularly. From its mouth at St. John, New Brunswick, it is navigable by large steamers for 80 miles to Fredericton, and at high water to Woodstock, 145 miles, and by small steamboats, at good stages of water, even as high as the Grand Falls, above which it is again navigable some 40 miles. At the mouth of its estuary a singular phenomenon occurs. The water, compressed into a narrow channel, falls at low tide some 12 feet in order to reach the harbor, but at high tide the fall is reversed, and the waters of the Bay of Fundy flow into the estuary. Vessels can consequently pass from the river to the harbor, or from the harbor to the river, only at the turn of the tide. The total length of the river is 550 miles. Its drainage area is 26,575 sq. miles. Its navigation was made free to U. S. citizens by the Ashburton Treaty.
Revised by Israel C. Russell.

St. John's: city; the port of America nearest to Europe; capital of the colony of Newfoundland; on the Avalon peninsula and the Atlantic Ocean; 540 miles N. E. of Halifax, 1,640 miles W. by S. of Valentia, Ireland; lat. 47° 33′ 29″ N., lon. 52° 45′ 10″ W. from Greenwich (see map of Canada, ref. 7–P). It has a spacious and secure harbor, with 90 feet of water in the channel, and is accessible for the largest vessels at all periods of the tide. The entrance is through an opening in the rock-bound coast called the Narrows, which is 600 feet wide at its narrowest part. On the north side of the Narrows is Signal Hill, 510 feet above sea-level, and opposite is South Side Hill, which rises abruptly to a height of nearly 700 feet, and has the Fort Amherst lighthouse at its base. At the head of the harbor is a dry dock, completed in 1884 at a cost of $600,000, which is 600 feet long, 132 feet in extreme breadth, and 26 feet deep. The city is built on the north side of the harbor, on a moderately steep incline. On the south side a narrow strip between the water and the precipitous hills is utilized for oil-factories and warehouses. Water is supplied from Windsor Lake, 4½ miles distant, and 400 feet above the highest part of the city, the works being constructed originally at a cost of $400,000. The city is lighted by gas and electricity. Prior to the disastrous fire of 1846 nearly all the buildings in the city were of wood, but after that the stores and buildings on Water Street, the principal business thoroughfare, were rebuilt with stone or brick, as well as many others farther back from the harbor. The colonial board of works, which had charge of all civil affairs, was superseded in 1888 by a municipal council, under which many needed improvements were made. After the great fire of 1892 the streets were laid out on a new plan, and the principal ones widened and provided with fire-breaks.

Public Buildings.—The most conspicuous object in the city is the Roman Catholic Cathedral, on the highest ground, which, with its surrounding church buildings, cost $800,000. The colonial buildings include the Government house, House of Parliament, custom-house, hospital, penitentiary, poor-house, market-house, court-house, lunatic asylum (4 miles beyond the city), and the savings-bank.

Churches and Schools.—There are 11 churches—4 Wesleyan, 3 Church of England, 2 Roman Catholic, a Presbyterian, and a Congregational. Besides the colonial schools there are St. Bonaventura College (Roman Catholic), several convents, and Church of England, Methodist, and Presbyterian colleges.

Banks.—The banks of circulation were formerly the Union Bank, established 1854, capital in 1893 $450,000, and the

Commercial Bank, established 1857, capital in 1893 $306,000. All Government business was transacted through these banks. On Dec. 10, 1894, both were forced to suspend, causing heavy losses to shareholders and others, and creating a serious financial crisis, during which several of the oldest and most extensive mercantile establishments failed. They have since gone into liquidation, and three Canadian banks have opened branches in St. John's. The savings-bank is a Government institution, the Government controlling all its expenditures and the general revenue of the colony being liable for all its deposits. On Dec. 31, 1893, the amount of deposits was $3,068,288.

Transportation.—The city is connected by rail with Harbour Grace, Placentia, etc. The Allan line of steamships call at St. John's on their outward and inward passages, carrying mails and passengers. The service is weekly during nine months of the year, and fortnightly during three. The city has also steamboat communication with the principal ports N. and S. Steamers of two lines, plying between Liverpool and Halifax and between New York, Halifax, and St. John's respectively, call at intervals of about ten days.

Business Interests.—The people are engaged principally in business connected with the fisheries, which form the staple industry of the colony. Seal-oil and seal-skins are exported mainly to Great Britain, and codfish to Great Britain, Spain, Portugal, Italy, Brazil, and the West Indies. On Jan. 1, 1892, there were registered at the port of St. John's 2,222 vessels, of 94,583 tons. The imports in the preceding year aggregated in value $6,869,458, and the exports $7,437,158. The export of codfish was 1,244,834 quintals, valued at $4,864,525. The number of sailing vessels clearing from St. John's for the seal-fisheries was once very large, but these have been superseded largely by steamers. There are several sawmills, machine-shops, iron-foundries, furniture-factories, breweries, tobacco-factories, tanneries, and boot and shoe, and rope, twine, and net factories.

History.—Since 1855, when a responsible Government was granted the colony, the progress of the city has been rapid and substantial. In 1846 the city was visited by a fire which destroyed three-fourths of the buildings, and on July 8, 1892, by another, which laid waste more than one-half of the city. Nearly 1,800 buildings of all kinds, many of them built of stone and brick, were destroyed, causing a total loss of about $16,000,000, and two-thirds of the large mercantile establishments, with their stores, perished in the flames. Eleven thousand people were left homeless. The portion of the business part of the city which had been destroyed was rebuilt on a larger scale, and much finer shops and offices than the old sprang up. Pop. (1891) 29,007. M. Harvey.

St. Johns: *chef-lieu* of St. Johns County, Quebec; on the west bank of the Richelieu, and on the Grand Trunk, Canadian Pacific, and Vermont Central railways; 27 miles S. E. of Montreal (see map of Quebec, ref. 6–B). The principal manufacture is earthenware goods. There is also a silk-factory. The river trade includes exports of lumber and grain from the Lake Champlain district. The place is of some note in connection with the war of 1812, and near the barracks and military school there are still to be seen the remains of old fortifications. The river is spanned by three bridges, which connect Iberville with St. Johns. Pop. (1891) 4,722. J. M. Harper.

St. Johns: village; capital of Clinton co., Mich.; on the Detroit, Gr. Hav. and Mil. Railway; 22 miles N. of Lansing, 98 miles W. N. W. of Detroit (for location, see map of Michigan, ref. 7–I). It is in an agricultural region, and contains sawmills and grist-mills, foundry, carriage-shop, and one of the largest table-factories in the world. There are 2 State banks with a combined capital of $85,000, a national bank with capital of $100,000, a Ladies' Library Association, and 3 weekly newspapers. Pop. (1880) 2,370; (1890) 3,127; (1900) 3,388. Editor of "Clinton Republican."

St. Johnsbury: town; capital of Caledonia co., Vt.; on the Passumpsic river, and the Boston and Maine and the St. J. and Lake Champlain railways; 21 miles N. of Wells river, 34 miles E. N. E. of Montpelier (for location, see map of Vermont, ref. 4–D). It is noted for having the largest manufactory of scales and balances in the world, and contains also foundries, machine-shops, and agricultural-implement works. Among the notable institutions are the St. Johnsbury Academy, built and endowed at a cost of $200,000 by Thaddeus Fairbanks; the St. Johnsbury Athenæum, built and provided with a library of 10,000 volumes and an art gallery by Horace Fairbanks; and a museum of natural science. The town has 2 national banks with combined capital of $700,000, 2 savings-banks, and 2 weekly newspapers. Pop. (1880) 3,360; (1890) 3,857; (1900) 5,666.
Editor of "Caledonian."

St. John's College: an institution at Annapolis, Md. It originally existed as an institution of learning under the name of King William's School, which was founded in the year 1696, so that the continuity of its history would place it immediately after Harvard in regard to age. In 1784 the funds and library of the school were transferred to the infant college by special charter, and its name was changed to St. John's. It was formally opened Nov. 11, 1789. Among those who were active in promoting the welfare of the college in its infancy are to be found Rev. John Carroll, the first Roman Catholic archbishop of America, and the Rt. Rev. T. J. Claggett, Protestant Episcopal Bishop of Maryland. The college is non-sectarian, but receives a large share of its patronage from the Protestant Episcopal body. In Oct., 1900, there were about 160 students in attendance. The president is Thomas Fell, Ph. D., LL. D., and there are fifteen members in the faculty. The college receives annually from the State of Maryland about $15,000 for its support. It also has a small endowment. Thomas Fell.

St. John's Dance: a name given to the mediæval Dancing Mania (*q. v.*).

St. John's River: a stream which rises in the swamps of Brevard co., Fla., and after a course of nearly 400 miles reaches the Atlantic. It is regularly navigated by steamboats to Enterprise, 230 miles from its mouth, and small steamers have ascended some 60 miles above that point. It has but a slight fall and a very gentle current. Its banks are clad in rich half-tropical verdure, and for nearly two-thirds of its course it is nowhere less than a mile in breadth, and often expands into spacious lakes. Its lower course is nearly parallel with the coast and abont 20 miles from it. For nearly 100 miles from its mouth it forms a wide, sluggish sheet of water, more resembling a lagoon than a river, the distance from shore to shore in some places being fully 5 miles. It is fed by springs and by the sluggish overflow of swamps, and is but slightly influenced by freshets. After passing the bar at its mouth there is a depth of 14 or 15 feet to Jacksonville, 10 feet to Palatka, and 8 feet to Lake George. The minimum depth at mean low tide on the bar is 7 feet, with an average rise and fall of 5·4 feet.
Revised by Israel C. Russell.

St. John's University: an institution at Collegeville, Stearns co., Minn.; founded in 1857 by Very Rev. Demetrius Marogna, who was first president and died in 1869. It was chartered in 1857; empowered to confer university degrees in 1869; received from Leo XIII. in 1878 power to create doctors in theology, philosophy, and canon law; received title of university by act of Legislature 1883.
Revised by J. J. Keane.

St. Johnsville: village; Montgomery co., N. Y.; on the Mohawk river, the Erie Canal, and the N. Y. Cent. and Hud. River and the West Shore railways; 64 miles W. N. W. of Albany (for location, see map of New York, ref. 4–I). It is in an agricultural and dairying region, and contains manufactories of agricultural implements, paper, pianos, and woolen goods, a national bank with capital of $50,000, and a weekly newspaper. Pop. (1890) 1,263; (1900) 1,873.

St.-John's-wort Family: the *Hypericaceæ*, a small group of 240 species of choripetalous, dicotyledonous herbs, shrubs, and trees. The flowers are regular and hermaphrodite, with five sepals, five petals, many hypogynous polyadelphous stamens, and a one-celled many-ovuled ovary with from three to five carpels. The leaves are opposite and punctate-dotted. The forty species of North America, some of which are showy, belong mainly to the genus *Hypericum*. The common St.-John's-wort (*H. perforatum*) is a yellow-flowered perennial weed, naturalized in the U. S. from Europe, which is most difficult to eradicate from fields. C. E. B.

St. Joseph: island of the St. Mary's river, between Lake Huron and Lake Superior, belonging to Ontario and separated from the Canadian side by a narrow channel. It is about 45 miles long and half as broad, hilly, and fertile. It was early settled by French Canadians, and now contains a prosperous population of farmers and fishermen. There are three small towns, named St. Joseph, Hilton, and Pembroke, on the island. M. W. H.

St. Joseph: village; capital of Berrien co., Mich.; on Lake Michigan, at the mouth of the St. Joseph river, and on the

Chi. and W. Mich. and the Vandalia line railways; 2 miles S. W. of Benton Harbor, 22 miles N. N. W. of Niles (for location, see map of Michigan, ref. 8–G). It is in a rich fruit-growing region, especially for peaches; has a large trade in fruit and lumber; is noted as a summer resort; and has 2 State banks with combined capital of $50,000. several saw-mills and grist-mills, machine-shops, fruit-basket and package factory, a public-school library, and a daily and 2 weekly newspapers. Pop. (1880) 2,603; (1890) 3,733; (1900) 5,155.

EDITOR OF "PRESS."

St. Joseph: city; capital of Buchanan co., Mo.; on the Missouri river, and the Atch., Top. and Santa Fé, the Burlington Route, the Chi., Gt. West., the Chi., Rock Is. and Pac., the Mo. Pac., and the St. Jos. and Gr. Is. railways; 60 miles N. W. of Kansas City, 140 miles S. E. of Omaha (for location, see map of Missouri, ref. 2–D). It is the center of a fertile agricultural region, and is located on hilly ground that rises gradually from the river. The business portion is compactly built along the river front. The streets are laid out regularly, paved with brick, asphalt, and macadam, and lighted by electricity. There are 8 lines of electric street-railway, with 40 miles of track. The residence portion is on high ground, beautifully adorned, and many dwellings on the hills command fine views of the river. There are 5 public parks or squares, a large park given to the city by Henry Krug, where the city maintains greenhouses, and 4 smaller ones.

Public Buildings.—The city-hall and market-house is on a square donated by Joseph Robidoux in the original plat of the town; the county buildings are large and substantial; the U. S. Government building is a stone structure accommodating the post-office and customs departments; the Union Dépôt is of brick, and has hotel accommodations; an iron railway and wagon bridge across the river facilitates transportation; and the Free Public Library was established in 1890, contains 14,500 volumes, and has a yearly circulation of 105,000 volumes. There are 3 hospitals, one the property of the city; a Home for Little Wanderers, a Home for the Friendless, a Free Kindergarten for the children of the poor, and, within half a mile of the city, the Missouri State Insane Asylum No. 2.

Churches and Schools.—There are 75 churches, representing 25 denominations. The public-school system is liberally supported. There are 26 school-buildings, with a total enrollment of more than 28,000 pupils. The high school has a four years' term, and offers a choice of five different courses of study. There are 11 parochial and private schools, 2 medical colleges and 2 business colleges, and 6 daily and 8 weekly periodicals.

Business Interests.—In 1893 there were 181 manufacturing establishments, which employed 5,540 persons, paid $2,560,000 for wages, and had products valued at $14,150,000. The manufactories of men's shirts and overalls are said to be the largest in the U. S.; they employ from 2,500 to 3,000 persons. Other important manufactures are boots and shoes, harness, horse-collars, tinware, woolen goods, plows, pumps, stoves, and furniture. At the southern limits of the city are ample stockyard accommodations, with 1 packing-house for cattle and 3 for hogs. The receipts for the first 10 months of 1900 were: cattle, 338,061; hogs, 1,366,552. There are 5 flour-mills with a combined daily capacity of 1,750 barrels; elevator capacity, 400,000 bush. The grain shipments in 1893 were, corn, 11,787,700 bush.; wheat, 2,100,000 bush.; and oats, 570,500 bush. St. Joseph has a large jobbing trade, extending over the Western States and employing nearly 1,000 traveling salesmen.

Finances and Banking.—The total debt of the city in 1894 was $1,800,000, including $200,000 voted that year for the erection of a new high school and other public-school buildings; the assessed property valuation was $24,183,850, representing a cash valuation of nearly $60,000,000. There were in 1900 3 national banks with a capital of $350,000, 1 private and 5 State banks; the bank clearings for the first 9 months of 1900 were $160,420,120.89; and 6 building and loan associations with assets of more than $3,000,000.

History.—The city was founded by Joseph Robidoux, who for fifteen years was connected with the American Fur Company. In 1826 he left the company and established a trading-post here. He was the only white man in the region for many years. In 1834 what is known as the Platte purchase, including Buchanan County, was acquired by the Government from the Sac and Fox Indians, and opened for settlement. In 1837 several white families came to the Blacksnake Hills, as the site of St. Joseph was then called, and the building of the town began to take definite shape. In 1843 the original town was laid out and called St. Joseph; in 1846 it became the county-seat; in 1851 was made a city; and in 1885 a city of the second class, under a new charter. The growth from its founding until the outbreak of the civil war was large and steady. It was the principal outfitting point for parties crossing the plains in wagons for California before the building of the Pacific railways. It suffered severely, in common with all the border towns, during the war, but with peace came a new era of prosperity. There was a notable increase in population between 1880 and 1890, largely due to the efforts of the city board of trade, which has since been succeeded by the Commercial Club. Since the first plot was laid out by Mr. Robidoux there have been seventy-four additions thereto, and the corporation limits now include over 7 sq. miles and extend 2½ miles back from the river. Pop. (1880) 32,431; (1890) 52,324; (1900) 102,979.

Revised by J. M. WILLIS.

Saint-Just, săn′zhüst′, ANTOINE LOUIS LÉON, de: revolutionist; b. at Decize, department of Nièvre, France, Aug. 25, 1767; studied literature; published in 1789 a long poem, *Organt*; embraced the ideas of the Revolution with enthusiasm; wrote in 1791 *Esprit de la Révolution*; and entered the Convention in 1792 as a member for Aisne. As the firm supporter of Robespierre, he advocated the most extreme measures; became a member of the Committee of Public Safety, and was one of the most conspicuous leaders during the Reign of Terror. He became president of the Convention in Feb., 1794; brought Danton to the guillotine; attempted on the 9th Thermidor to defend Robespierre, but was arrested, and executed the next day, July 28, 1794. His *Œuvres politiques* were collected and published in 1834. His *Life* was written by Fleury in 1852 and by Hamel in 1859.

St. Kitts, or **St. Christopher**: an island of the British West Indies (Leeward islands colony); crossed by lat. 17° 18′ N. Area, 65 sq. miles. It is mountainous, though with no very high peaks; is fertile, well-watered, and has a salubrious climate. Nearly all the available land is planted with sugar-cane, and sugar and rum are the principal products and exports. Pop. (1891) 30,876. Capital, Basseterre. This town was devastated by a fire in 1807 and in 1880 by a flood from a mountain-stream, in which 200 persons perished. Dependencies of St. Kitts are the islands of Nevis, immediately S. E. of it (area, 50 sq. miles; pop. 13,087), and Anguilla, a little farther S. (area, 35 sq. miles; pop. 3,699). Their products are similar to those of the main island. H. H. S.

St. Lawrence Island: the northernmost great island belonging to the U. S.; in Bering Sea, just S. of Bering Strait, and nearer the Siberian than the Alaskan coast, extending E. and W., about 90 miles long by 30 broad. The coasts are generally low; in the northwest the hills reach a height of about 500 feet, and they are somewhat higher in the eastern part. The climate is arctic in character. There are no trees, though plenty of small shrubs; the bird fauna is rich. A few Eskimo live on the shores following the chase of the seal, walrus, and whale, and the trade with the mainland is in the products of these animals. Amber is sometimes found on the shores. The island was discovered by Bering in 1728, and fifty years after was taken to be two islands by Cook, who named them St. Lawrence and Clark.

MARK W. HARRINGTON.

St. Lawrence River and Gulf: The river St. Lawrence is the outlet of the Great Lakes of North America, and drains a total area of approximately 530,000 sq. miles, about two-thirds of which is in Canada and the remainder in the U. S. From the extreme head-waters of the St. Lawrence, W. of Lake Superior, to the mouth of its estuary, near Anticosti island, is about 2,200 miles. This vast drainage system is divided into three natural portions—(1) the lake-region, embracing the Great Lakes and the lands draining to them, above the outlet of Lake Ontario; (2) the river tract, from Lake Ontario to Quebec; (3) the estuary and gulf tract, from Quebec to the sea.

1. *The Lake-region.*—The principal lakes in this division are described in this cyclopædia under their respective names, and only such facts as pertain to them collectively are given here.

The combined water-surface of the Great Lakes and of their connecting rivers is 95,275 sq. miles; total land-area draining to the lakes, 174,800 sq. miles; total hydrographic basin above the outlet of Lake Ontario, 270,075 sq. miles.

The length of the shore-line of the Great Lakes and connecting rivers is 5,400 miles, or about equal to the Atlantic coast-line from Maine to the Isthmus of Panama. The discharge at the outlet of Lake Ontario is 300,000 cubic feet per second, or slightly less than half the estimated rainfall of the hydrographic basin, and nearly equal to one-half the discharge of the Mississippi. The total volume of the Great Lakes is estimated at 6,000 cubic miles, or sufficient to sustain Niagara Falls for 100 years. Evaporation from the surface of the Great Lakes is from 20 to 25 inches annually, and the average annual rainfall for the entire lake-region about 31 inches. For additional data, see *Chart of the Great Lakes*, by Charles Crosman (Milwaukee, Wis.); Report of U. S. Lake Survey, and Reports of the chief of engineers, U. S. army.

The geological history of the Great Lakes has not been fully studied, but the following conclusions are generally accepted: The basins which the lakes occupy are depressions principally in but slightly disturbed Palæozoic strata, due to erosion or the removal by mechanical and chemical agencies of the rock which once filled them. The last-formed rocks in the lake region, with the exception of the superficial deposits noticed below, belong to the Coal-measures, the youngest member of the Palæozoic. It is believed that between the close of the Palæozoic and the coming on of the Glacial period the region was a land-area in which streams excavated broad valleys similar to those which characterize the upper Mississippi region at the present day.

During the Glacial period the entire lake-region, in common with a vast surrounding area, was buried beneath ice which moved southward and greatly modified the previously formed topography. The changes in the relief of the region produced by the passage of glaciers over it, consist in part in the wearing down of prominences and the planing, grooving, and polishing of rock-surfaces. Still greater changes were made, however, by the deposition of ice-borne *débris*, consisting largely of bowlder-clay, a tenacious blue clay filled with angular and sub-rounded stones which are frequently striated, and bowlders, often 6 to 10 feet or more in diameter, that were carried southward and strewn over the country in great numbers. There are also vast deposits of gravel, sand, and clay that were washed from the ice by draining streams and deposited beneath the glaciers or about their retreating borders. In much of the lake-region this assorted material exceeds in volume the direct glacial deposits. Over vast areas the hard rocks which formed the surface before the Glacial period are buried from 100 to 200 feet deep by the deposits just referred to. The preglacial valleys were thus greatly obstructed, and on the melting of the ice new lines of drainage were initiated. Ancient river-valleys were thus dammed and lakes formed. In addition to the changes in the relief of the land thus produced, there were changes of level due to elevations and depressions affecting large areas which would have modified the drainage and converted the ancient river-valleys into basins had there been no obstructions produced by glacial deposits. The glaciers extended S. of the lake region to an irregular line passing through New Jersey, Pennsylvania, Ohio, etc., and the abundant streams produced by their melting had a free discharge southward so long as the slope of the land was favorable. When the southern margin of the glaciers retreated to the N. of the drainage divide running E. and W. through New York, Ohio, etc., the flow of the stream was obstructed by the northward slope of the land in front of the ice, and lakes were formed. This was the beginning of the Great Lakes. At first the lakes were small, and were retained at the N. by the glacial ice which still filled the northern part of the St. Lawrence basin. Their outlets were southward, through various channels, across the high lands which retained them. As the ice retreated the lakes expanded and became united one with another, and new and lower outlets were uncovered. Several of these ancient outlets have been discovered, and the courses of the draining streams traced. One outlet was at the south end of Lake Michigan, another at Fort Wayne to the W. of Lake Erie, and still another near Ithaca, N. Y. At a later stage the drainage was through the valley of the Mohawk. The beaches formed about these glacial lakes still remain, and have been traced in some instances for hundreds of miles. The highest of the ancient shore-lines about the southern and western borders of Lake Ontario, named the Iroquois beach, has an elevation at the W. of 116 feet, but increases in altitude toward the E., where it is 500 feet above the present lake. At the N. Lake Iroquois is supposed to have washed the foot of the retreating glaciers, and shore records are wanting. About the southern margin of Lake Erie the ancient shore-ridges are well defined, the highest having an elevation of 220 feet above the present lake. The Algonquin beach, to the E. of Lake Huron, has an elevation ranging from 618 to 875 feet above the sea, with other similar records both above and below it. The surface of Lake Huron is 582 feet above the sea, and at its southern end the Algonquin beach disappears beneath it. Around the northern shore of Lake Superior, from Duluth to Sault Ste. Marie, a series of beaches has been traced, the highest of which is about 600 feet above the lake surface. These records of abandoned shores were originally horizontal, and their present departure from that position is proof that movements of elevation or depression have taken place since the ancient lakes existed. The last chapter in the history of the drainage of the St. Lawrence basin began when the ice retreated to the N. of the present river-tract of the St. Lawrence, and the last and lowest outlet was established. The Great Lakes during their varied history spread sheets of sediment over their bottoms, in which bowlders were dropped from floating ice. These deposits are of broad extent, and are limited on their outer border by the ancient beaches. About Lake Superior the ancient lake-sediments are pinkish, finely laminated clays, and around the border of Lakes Erie and Ontario they are blue clays, covered in places by yellowish sands.

2. *The River-tract.*—The St. Lawrence river proper may be said to extend from the outlet of Lake Ontario to the island of Orleans below Quebec, a distance of 330 miles, where it becomes an estuary. Ocean steamers ascend to Montreal, 160 miles above Quebec, and the lowest rapids occur above that port; for these reasons the river-tract might be considered as ending where tide-water is reached, but the stream does not expand so as to have the characteristics of an estuary until after passing Quebec. Throughout this distance it is a surface-stream, for the reason that its clear waters have but little power to erode. It is obstructed by numerous islands and rapids, and at times expands into lakes several miles broad. There are no vertical falls. Steamers drawing less than 9 feet descend the rapids, but the return trip is made by a system of nine canals having a total length of 42 miles. The waters are pale blue, and carry 16 parts per 100,000 of mineral matter in solution, of which one-half is calcium carbonate (carbonate of lime). The volume of the river at its source, as already stated, is 300,000 cubic feet per second. Near Montreal it is joined by the Ottawa from the N. W., which adds about 90,000 cubic feet per second of clear, amber-tinted water. The Ottawa derives the most of its waters from areas of crystalline rock, and is much purer than the St. Lawrence; it carries but 6 parts in 100,000 of total solids in solution, of which about one-third is calcium carbonate. Before widening into an estuary, the St. Lawrence receives many other tributaries, the most important being the Richelieu, which drains Lake Champlain.

3. *The Estuary and Gulf Tract.*—Below Quebec the St. Lawrence loses its river-like character and becomes an estuary 250 miles long, which widens seaward until its shores are 35 miles apart; it then merges with a still greater estuary known as the Gulf of St. Lawrence. The estuary, together with a large part of the gulf, is really a submerged river-valley. There is unmistakable evidence in its physical features that a recent subsidence has taken place, which has allowed the sea to encroach on the lower course of the stream. This interesting fact is shown still more definitely by soundings that have been made. A submerged river-channel has thus been traced for 800 miles on the bottom of the estuary and gulf, to the submerged border of the continental plateau which lies about 100 miles beyond the present coast-line. The seaward position of the submerged river-valley is 3,600 feet below the present sea-level. When the St. Lawrence occupied its channel throughout and discharged at the true continental border, the land was elevated at least 3,600 feet higher than at present, and the rapid stream cut deeply into the rocks. Its tributaries were similarly affected, and were enabled to excavate deep cañons, as is shown by the Saguenay, which joins the St. Lawrence from the north in the central part of its estuary-tract. This remarkable river flows between precipitous rocky walls several hundred feet high, and has a depth of 840 feet. It is a river-channel modified slightly by glacial action, and is evidence that the land was high when it was excavated.

Observations show that after the Glacial period, but long before written history began, the valley of the St. Lawrence

ST. LOUIS.

Scale of Miles
0 ¼ ½ ¾ 1
Street Car Lines
Railroads

FOREST PARK
FAIR GROUNDS
O'FALLON PARK
BELLEFONTAINE CEMETERY
WEST END
VENICE
MADISON
BROOKLYN
ILLINOIS ST. LOUIS
CITY LIMITS
MERCHANTS BRIDGE
ST. LOUIS WATER WORKS
STEAMBOAT LANDINGS
BRIDGE

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Railroad Depots.

- **A.** UNION STATION, 4 E. Used by all trains except a few Suburban ones
- **B.** FOURTH ST., 5 F. Some Suburban trains of St. Louis Iron Mountain and Southern Railway.
- **C.** VINE ST., 4 F. Suburban trains on Wabash R. R.
- **D.** WEST END, 3 C. St. Louis and Suburban Railway.

Churches, Etc

1. Baptist, 4 D
2. Cathedral, (R. C.) 4 F
3. Christ, (Epis.) 4 E
4. Church of the Messiah, (Unit.) 4 D
5. Church of the Redemptorists, 3 C
6. First Presbyterian, 3 C
7. Grand Ave. Presb., 4 C
8. Pilgrim Cong., 4 D
9. St. Xavier's, (R. C.) 4 C
10. Union, (Meth.) 4 D
11. Jewish Temple, 4 E
12. Temple Israel, 4 D

Hotels.

13. Hotel Richelieu, 4 E
14. Lindell, 4 F
15. Planters, 4 F
16. St. James, 4 E
17. Southern, 4 F

Theatres, Etc.

18. Germania, 4 E
19. Grand Opera House, 4 F
20. Hagan, 4 E
21. Olympic, 4 F
22. Pope's 4 E
23. Schneider's Garden, 5 E

Public Buildings, Etc.

24. Chamber of Commerce, 4 F
25. City Hall, (New), 4 E
26. Cotton Exchange, 4 F
27. Court House, 4 F
28. Custom House and P. O. 4 E
29. Educational Institute, 5 E
30. Exposition Building, 4 E
31. Four Courts, 4 E
32. Insane Asylum, 6 A
33. Masonic Temple, 4 F
34. Mercantile Club, 4 E
35. Mercantile Library, 4 F
36. Odd Fellows' Hall 4 E
37. Public Library, 4 E
38. Union Market, 4 F
39. City Hospital, 5 E

Colleges, Etc.

40. Christian Brothers, (R.C.) 2 A
41. Institute of the Sacred Heart, (R. C.) 7 D
42. Museum of Fine Arts, 4 E
43. St. Louis Medical College, 4 E
44. St. Louis University, (R.C.) 4 C
45. Washington University, 4 E

ST. LOUIS and Vicinity

Scale of Miles 0 1 2 3 4 5

was more deeply submerged than at present, and that the head of the estuary was then above Montreal. This great submergence is proven by clays and sands containing marine shells, which occupy the St. Lawrence and Champlain valleys up to an elevation of about 600 feet above the present level of the ocean. Ancient sea-beaches not yet fully studied confirm this conclusion.

The submergence of the lower portion of the St. Lawrence valley is not only an interesting phase of the history of the stream, but its effects on civilization and commerce are instructive. By reason of this submergence Montreal is now a seaport, and ocean vessels are enabled to reach a point which would be over 1,000 miles inland were the land elevated so that the river could occupy its former channel to the sea. ISRAEL C. RUSSELL.

St. Lawrence University: an academic and literary institution of the college grade, at Canton, N. Y.; founded in 1858. It comprised formerly three departments, but now consists of two, a college of letters, science, and arts, and a theological seminary maintained by the Universalist Church. The two departments are separate and independent in their government and funds, though under the direction of one board of trustees. On a conspicuous and beautiful site of 27 acres are four university buildings, besides gymnasium and society buildings. Both departments have been open to women and men on the same conditions from the beginning. A nearly equal number of women with men have been educated in the college, while not far from thirty women have studied in the seminary. The president of the college is (1901) the Rev. Almon Gunnison, D. D. Fourteen associate professors comprise the faculty. There are four resident and three non-resident professors in the seminary. There are in the college 130 students, and in the seminary 32. Tuition in the seminary is free. The college has invested funds to the amount of $350,000. The funds of the seminary amount to $154,041. The value of the buildings, grounds, libraries, etc., raises the total property of the university to a figure considerably in excess of $500,000. ISAAC M. ATWOOD.

St. Leonards, EDWARD BURTENSHAW SUGDEN, Baron: See SUGDEN, EDWARD BURTENSHAW.

St.-Lo, săn'lō': town of France, capital of the department of Manche: on the Vire; 158 miles W. by N. from Paris (see map of France, ref. 3–D). It has manufactures of druggets, flannels, serges, calicoes, and laces, several large printing establishments, and an active trade in cattle, horses, poultry, honey, wax, and butter. The Church of St. Croix was built in 805. Pop. (1896) 11,121.

St. Louis: capital of the French colony of Senegal, West Africa; on an island at the mouth of the river Senegal (see map of Africa, ref. 4–A). It is fortified, has a good harbor, and carries on an important trade; chief exports are fruits and grains, oils, gums, India-rubber, woods, and skins. The export of ivory, formerly important, is slight. Pop. 20,000.

St. Louis: city; Gratiot co., Mich.; on the Pine river, and the Detroit, Lans. and N. and the Toledo, Ann Arb. and N. Mich. railways; 8 miles N. of Ithaca, the county-seat, 33 miles W. of Saginaw (for location, see map of Michigan, ref. 6–I). It is in an agricultural region, has valuable water privileges, and contains several noted magnetic springs, a large sanitarium, sawmills, hoop-mills, flour-mills, and iron-works, 9 churches, 2 public-school buildings, commercial college, a national bank with capital of $50,000, a State bank with capital of $25,000, and a semi-weekly and 2 weekly newspapers. Pop. (1880) 1,975; (1890) 2,246; (1900) 1,989. EDITOR OF "REPUBLICAN LEADER."

St. Louis: city (separated from St. Louis County in 1876), port of entry, metropolis of Missouri; on the west bank of the Mississippi river, 20 miles below the mouth of the Missouri; ranking (1900) fourth city in the U. S. in population and manufactures (for location, see map of Missouri, ref. 4–J). It has an altitude of over 480 feet above sea-level; is built on rolling ground, rising at some points 200 feet above the level of the river; has a river-frontage of about 19 miles; and with annexed portions covers an area of 62½ sq. miles. Beyond the third terrace the surface spreads out in a picturesque plateau. The climate is temperate and healthful, and the mortality low. There are over 500 miles of streets, those in the business portion being paved with granite, while asphalt and telford are used in the residential parts. Local transit is facilitated by two systems of cable railway and by electric railways operating 465 miles of track. The water-supply is drawn from the Mississippi river, about 9 miles above the city, the inlet being but a short distance below the mouth of the Missouri; hence the water is essentially from the Missouri, and its great bulk is from the melting snow of the Rocky Mountains. The water is received in eight great settling basins, and is pumped thence into distributing reservoirs, the total capacity of the plant being 100,000,000 gal. daily.

Parks and Public Buildings.—St. Louis is noted for the number and beauty of its public parks, which have an aggregate area of 3,200 acres. The most prominent ones are Forest Park (1,374 acres); Tower Grove Park (267), containing bronze statues of Columbus, Humboldt, and Shakspeare; the Missouri Botanical Garden (50), containing an arboretum, fruticetum, herbaceous and floral gardens; labyrinth, museum, and botanical library; Carondelet Park (180); O'Fallon Park (160); Lafayette Park (30), containing a bronze replica of Houdon's Washington and a statue of Thomas H. Benton; and the Fair-grounds (83), with a race-course and large amphitheater. Tower Grove Park and the Missouri Botanical Garden adjoining were laid out and presented to the city by Henry Shaw. In the northern part of the city, and adjoining O'Fallon Park, are Bellefontaine (350 acres) and Calvary (415) cemeteries. Among the public buildings of note are the new city-hall, cost $2,000,000; the old court-house, now used by civil courts, built in the form of a Greek cross, with an iron dome 300 feet high in the center, cost $1,250,000; the Four Courts building, planned after the Louvre, and used for a prison, as police headquarters, and by the criminal courts; the exposition building, cost $500,000; State Insane Asylum, cost $900,000; U. S. Government building, cost $6,250,000; Chamber of Commerce, built of sandstone, in the Renaissance style, cost nearly $2,000,000; Emigrants' Home, Museum of Fine Arts, Mercantile Club, and the Public Education building.

Churches, Schools, etc.—The churches include a Roman Catholic Cathedral, Christ church (Protestant Episcopal), Grand Avenue Presbyterian church, Church of the Messiah (Unitarian), First Presbyterian, Pilgrim Congregational, and several synagogues, and number about 330. The public-school system originated in a grant of land within the district of St. Louis by Congress in 1812. In 1831 this grant was made effective by additional legislation; in 1833 the first public school-board was elected; and in 1846 the first public school was opened. In 1899 there were 78,684 pupils enrolled in the public schools; the income of the board was $2,089,478; expenditures were $1,958,752; and the value of school-buildings and land was $5,416,967. The system includes a central high school and a city normal school. Among the institutions for higher instruction are WASHINGTON UNIVERSITY (*q. v.*); St. Louis University (Roman Catholic, opened 1829); the College of the Christian Brothers (Roman Catholic, 1849); Concordia Theological Seminary (Lutheran, 1839); Theological Seminary of the German Evangelical Synod of North America (1850); St. Louis Medical School and Dental School; Beaumont Hospital Medical College (1886); Marion Sims College of Medicine; St. Louis College of Physicians and Surgeons (1879); Homœopathic Medical College of Missouri (1857); Missouri Dental College (1865); St. Louis College of Pharmacy (1866); St. Louis Training-school for Nurses (1884); the St. Louis Law School, and the St. Louis School of Fine Arts. The School of the Good Shepherd (Protestant Episcopal), Walther College (Lutheran), Academy of the Sacred Heart (Roman Catholic), Mary Institute, Hosmer Hall, Smith Academy, and the Manual Training-school (1880) are schools of high reputation. Among the institutions for dependents are a State School for the Blind, St. Louis Day School for Deaf Mutes, and a deaf-mute institute connected with the convent of Maria Consilia. In 1900 St. Louis had 28 libraries of 1,000 volumes and upward each. The Free Public Library has 120,000 volumes; Mercantile, 100,000; St. Louis University, 50,000; St. Louis Law School, 25,000; and the St. Louis Academy of Science, 20,000. In 1900 12 daily newspapers were published in the city, and the total number of journals and magazines, including dailies, was 333.

The *government* of St. Louis consists of a mayor elected for four years, a council of 13 members, a house of delegates of 28 representatives, one from each ward, and a board of public improvement, consisting of a president, a street commissioner, a water commissioner, a sewer commissioner, a park commissioner, and a harbor commissioner. The first three commissioners must be educated engineers. The bonded debt in 1900 was $18,916,278; assessed valuation of

real and personal property, $380,779,280; rate of taxation for municipal purposes, exclusive of the tax to pay interest on the bonded debt, limited to 1 per cent.; total tax within old limits of city (1900), $1.95 on $100. In 1900 there were 25 banks and trust companies in the city, which together had $42,285,538 capital and surplus, $156,054,512 deposits, and $173,361,043 in loans, currency, bonds, stocks, and real estate. The clearings of the year aggregated $1,688,849,494.

Manufactures.—Estimates for 1900 showed over 7,000 manufacturing establishments, with a combined capital of $300,000,000, paying $100,000,000 in wages, and turning out products valued at $340,000,000. The principal establishments, according to the value of products, were breweries, $25,000,000; tobacco-factories, $33,000,000; flour-mills and grist-mills, $6,350,000; slaughtering and packing houses, $18,000,000; foundries and machine-shops, $15,000,000; manufactories of men's clothing, $13,000,000; publishing houses, $10,600,000; shops for making and repairing steam-cars and street-railway cars, $7,300,000; and manufactories of boots and shoes, furniture, carriages and wagons, paints, saddlery and harness, iron and steel, brick and tile, and lumber.

Transportation.—The trade of the city, which depended a long time upon navigation by river, received great impulse from new railway connections, and the deepening of the channel of the Mississippi at its mouth, so as to admit sea-going vessels of the largest size, gave St. Louis further importance as a receiving dépôt for much of the grain of the Northwest consigned to Europe. There are 22 lines of railway, some of which are parts of extensive systems, comprising 30,609 miles of track, entering the city. The receipts of freight by rail aggregated 15,272,482 tons in 1899, and the shipments 8,469,598 tons. The city also commands over 6,000 miles of direct navigation by river, accessible to steamers and barges during a large part of the year. St. Louis is an interior port to which foreign merchandise can be transported without appraisement at the port of original reception, and during the year ending Dec. 31, 1900, it had imports valued at $4,100,544. Transportation by rail is facilitated by five bridges across the Mississippi and Missouri rivers and by a Union Station in the city. The most noted bridge, as well as the most noted structure in the city, is the lofty steel viaduct across the Mississippi for railway and highway traffic, designed and built by James B. Eads. (See ARCH and BRIDGES, *Arched Bridges.*) The Merchants' bridge, built of steel on the truss plan, and completed in 1890 at a cost of $3,000,000, crosses the same river 3 miles above the Eads bridge, and the Bellefontaine bridge crosses the Missouri river just above its junction with the Mississippi, and connects with the Alton bridge across the Mississippi, furnishing a new approach from the N. and the E. The Union Railway Station is used by 22 railways, has a train-shed of steel and glass covering 30 tracks, each accommodating 8 full-length cars, and with its site cost $6,500,000. Its electrical lighting plant furnishes 300 arc-lights and 5,500 incandescent lamps. Cupples Station, a regular railway station within the city and about a mile from Union Station, consists of seven tracks running into the center of a large block of buildings, in which eight of the largest commercial firms do business. The facilities for loading and unloading cars are perfect, and the speed with which the work is done is remarkable. There are 2,000 trucks, capable of holding 2 tons each, in use, and hydraulic elevators carry them to all floors.

History.—St. Louis was founded Feb. 15, 1764, by Pierre Ligueste Laelède as a trading-post, and named in honor of the patron saint of Louis XV. of France. In 1765 it was made the capital of Upper Louisiana, with Saint-Ange de Bellerive as governor. Although subject to the authority of Spain by the treaty concluded at Paris in 1763, St. Louis was practically under French control, and remained so until formal possession was taken by Don Pedro Pierras, Nov. 29, 1770. The transfer by France to the U. S. of the territory of Louisiana took place in St. Louis Mar. 9, 1804. The town was incorporated Nov. 9, 1809; the first brick building was erected in 1813; the first steamboat arrived Aug. 2, 1817; John Jacob Astor located the Western department of his company here in 1819; the town received a city charter in 1822; suffered fearfully from cholera in 1848; Carondelet was annexed to it in 1870; and the city was made independent of the county in 1876. During the civil war it was held for the Union through the foresight and courage of Gen. Nathaniel Lyon and Frank P. Blair. It was constantly occupied by troops, was a base of supplies for the army, and contained a large military hospital. The Western sanitary commission had its headquarters here, and at a single fair, lasting twelve days, $554,591 was realized for the commission. In 1900 Congress passed a bill authorizing St. Louis to hold an international exposition in 1903, to celebrate the Louisiana Purchase Centennial. A subsequent act of Congress appropriated $5,000,000 in aid of the exposition. The city of St. Louis issued bonds to the amount of $5,000,000, and raised $5,000,000 more by popular subscription, making $15,000,000 in all available for the promotion of the enterprise. The erection of buildings and improvement of the exposition grounds began in the summer of 1901. Pop. (1880) 350,522; (1890) 451,770; (1900) 575,238.

HOWARD L. CONARD.

St. Louis Series: a division of the Subcarboniferous or Mississippian group of rocks, typically exposed at St. Louis, Mo., whence its name, but occurring as an important deposit of limestone, sometimes oölitic or brecciated, and passing into calcareous shale in Missouri, Iowa, Illinois, Indiana, etc. The rocks are commonly from 200 to 250 feet thick, and yield a great variety of invertebrate marine fossils. Spergen Hill, Ind., is noted for the abundance and variety of fossils there obtained from rocks of this group. See *Correlation Papers—Devonian and Carboniferous*, by H. S. Williams, Bull. No. 80 U. S. Geological Survey.

ISRAEL C. RUSSELL.

St. Lu'cia: an island of the British West Indies (Windward islands colony); one of the Caribbee group, N. of St. Vincent. Area, 243 sq. miles. It is of volcanic origin, mountainous, and has a crater which emits sulphur fumes and, rarely, flames. The scenery is very picturesque, the mountains assuming strange forms, and having their sides clothed with tropical forests. The soil of the valleys is very fertile; sugar and cacao are the principal products and exports. This is one of the islands infested by the poisonous fer-de-lance; the climate is somewhat insalubrious. St. Lucia was long disputed by the French and British; the latter have held it permanently since 1803. Pop. (1891) 43,708. Capital, Castries, with about 5,000 inhabitants.

H. H. S.

St.-Malo, săn'mă'lō': town; in the department of Ille-et-Vilaine, France; near the mouth of the Rance, on a small island in the English Channel; connected with the mainland by a causeway 650 feet long (see map of France, ref. 3–C). The harbor, which is perfectly dry at ebb-tide, has from 40 to 50 feet of water at flood-tide, is large and safe, and defended by fortifications both on the mainland and on the island. Fishing for cod and herring in the Channel, and for seals and whales in the Arctic Ocean, trading along the coast and to foreign ports, ship-building, and the manufacture of sailcloth, ropes, etc., are vigorously carried on. Pop. (1896) 11,476.

Saint-Marc Girardin: See GIRARDIN, FRANÇOIS AUGUSTE SAINT-MARC.

St. Martin, săn'măr'tăn': an island of the West Indies, in the Caribbee chain; crossed by lat. 18° 4′ N. Area, 37 sq. miles. It is mountainous, but less than 1,400 feet high; is fertile, and has a salubrious climate. By an arrangement originally made in 1648, this island is nearly equally divided between France and the Netherlands: the French portion (pop. in 1887 3,445) is a dependency of Guadeloupe; the Dutch portion, pop. (1892) 4,023, is attached to Curaçoa.

Saint-Martin, ALEXIS: See BEAUMONT, WILLIAM.

Saint-Martin, LOUIS VIVIEN, de: See VIVIEN.

Saint-Martin, LOUIS CLAUDE, Marquis de: generally known under the name of LE PHILOSOPHE INCONNU, the name under which he published his writings; b. at Amboise, department of Indre-et-Loire, France, Jan. 18, 1743; served in the army until 1771, but afterward devoted himself to the study of theology and philosophy, especially the mystics Martinez, Pasqualis, Swedenborg, Jakob Böhme, and the dissemination of their teachings. He entertained very lofty views as to the incoming of a purely spiritual Christianity and as to the final restoration of all things through Christ. D. at Paris, Oct. 13, 1803. His writings, *Des Erreurs et de la Vérité, par un Philosophe inconnu* (Paris, 1775); *Tableau naturel des Rapports, qui existent entre Dieu, l'Homme et l'Univers* (1782); *Ecce Homo* (1796); *De l'Esprit des Choses* (1800); *L'Homme de Désir* (1790), etc., are all against sensualism and materialism. In France they made no great

impression, but most of them were translated into German. See Matter, *Saint-Martin, le Philosophe inconnu* (Paris, 1862). Revised by S. M. Jackson.

St. Martin's Summer: See Indian Summer.

St. Martinville: village; capital of St. Martin parish, La.; on Bayou Teche, and the S. Pacific Railroad; about 50 miles S. W. of Baton Rouge (for location, see map of Louisiana, ref. 10–D). It is in a cotton, corn, sugar-cane, and rice region, has direct steamboat communication with the Gulf of Mexico, and contains 5 churches, 5 public schools, cottonseed-oil mill, 2 cotton ginneries, several sugar refineries, a State bank with capital of $15,000, and two weekly newspapers. Pop. (1880) 1,606; (1890) 1,814; (1900) 1,926.
Editor of "Messenger."

St. Mary: village; Auglaize co., O.; on the Miami and Erie Canal, and the Lake Erie and West. Railroad; 10 miles W. of Wapakoneta, the county-seat (for location, see map of Ohio, ref. 4–D). The St. Mary reservoir, a mile W. of the village, is a feeder to the canal, covers an area of 17,560 acres, and is said to be the largest artificial body of water in the world. The village contains 7 churches, 2 public-school buildings, 2 opera-houses, 3 hotels, oil and natural-gas wells, 3 lumber-mills, 2 machine-shops, flour, woolen, linseed-oil, and tow mills, straw-board, chain, spoke, and carriage factories, a national bank with capital of $60,000, an incorporated bank with capital of $34,000, and 3 weekly newspapers. Pop. (1880) 1,745; (1890) 3,000; (1900) 5,359.
Publisher of "Argus."

St. Mary's: town of County Perth, Ontario, Canada; on the northwest branch of the river Thames; at the junction of the London branch with Grand Trunk Railway; 22 miles N. of London (see map of Ontario, ref. 5–C). It is a prosperous and well-built town, has a large trade in grain, quarries of fine limestone, two splendid railway viaducts, and important manufactures. Pop. (1891) 3,416.

St. Mary's Cape: See Cape St. Mary's.

St. Mary's River: a stream which flows from Lake Superior to Lake Huron, and has a length of about 40 miles; it divides into two main branches, which embrace large islands, and each branch expands so as to form lakes 4 or 5 miles broad. It receives the direct drainage of about 800 sq. miles of land, and has a water-surface of 150 sq. miles. The fall of the river is 20 feet, 16 feet of which is at St. Mary's rapids. The rapids, caused by an outcrop of Potsdam sandstone, are about a mile in length, and may be descended safely in canoes. At first there was a portage about the rapids for goods carried in canoes; later a tramway was built on the Michigan side to aid in making the transfer. In 1850 a grant of land was made to the State of Michigan by the U. S. Government to defray the cost of building a canal. Work was begun in 1853, and the canal opened to navigation June 18, 1855. The canal was 5,400 feet long and provided with two locks, each 350 feet long, 70 feet wide, and would allow the passage of vessels drawing 12 feet; cost, $1,000,000. In 1870 the U. S. Government began the enlargement of the State canal, and replaced the two locks originally constructed by a single lock, 515 feet long, 80 feet wide in the center and narrowing to 60 feet at the gates; depth, 39½ feet, with a lift of 18 feet and a depth of 17 feet of water on the sills; total length of canal, 7,000 feet; width, 180 feet; and depth, 16 feet; total cost, $2,150,000. The growth of commerce soon rendered this magnificent work inadequate, and still further enlargements were begun in 1887, and are (Jan., 1895) approaching completion. The new lock occupies the site of the old State locks, and enters the canal just above the lock described above. It is 800 feet long, 100 feet wide, with a depth of water on the sills of 21 feet, and a lift of 18 feet. Other improvements in St. Mary's river are in progress which supplement the great lock, and will enable vessels drawing 20 feet to pass from one lake to the other. A canal with a lock of equal dimensions with those built by the U. S. Government was later constructed on the east side of St. Mary's river, at the rapids, by the Canadian Government. The importance of these improvements to commerce is shown by the fact that during the year ending June 30, 1892, 11,557 vessels, carrying 10,107,603 tons of freight, passed through the St. Mary's Fall Canal, in 5,615 lockages. The freight passing through the Suez Canal is of less weight, although of greater value. Israel C. Russell.

St. Maurice River: one of the six great tributaries of the St. Lawrence, which it joins near the town of Three Rivers, not far from the expansion of the river into Lake St. Peter. It has a course of 360 miles and drains an area of 16,000 sq. miles. Its chief tributaries are the Matawin, the Bostonnais, the Croche, the Trenche, and the Manouan. The river is navigable for a considerable distance of its course below and between the interruptions of the Falls of Grand Mère and the Shawenagan Falls. From La Tuque, the Hudson Bay outpost, to Grandes Piles steamers can ply for a distance of 70 miles. The Shawenagan Falls, 30 miles from Three Rivers, are 130 feet high and form the center of an attractive landscape. The basin has an abundance of fine timber, with good water-power. Iron ore is found, and there are quarries of marble, granite, sandstone, and mica. Though the surface is generally hilly there are some level fertile stretches near the upper waters. J. M. Harper.

St. Michael: town: Talbot co., Md.; on a navigable inlet of Chesapeake Bay, and the Balt. and E. Shore Railroad; 12 miles W. of Easton, the county-seat, 22 miles S. E. of Annapolis (for location, see map of Maryland, ref. 4–F). It is in an agricultural region, is principally engaged in the oyster and fish trade, and in ship-building, and has a savings-bank and two weekly newspapers. Pop. (1880) 1,175; (1890) 1,329; (1900) 1,043.

St. Michaels (Portug. *São Miguel*): the largest of the Azores (*q. v.*); in lat. 37° 44′, lon. 25° 30′ W.; comprises an area of 300 sq. miles, with a population in 1881 of 125,669. It is the most fertile and best cultivated of the Azores, and exports annually to England alone 100,000 boxes of oranges. Grain is exported to Portugal, coarse linen and pottery to Brazil. Chief towns, Ponta Delgada and Ribeira Grande.

St. Michaels: the most important Alaskan station on Bering Sea, and the port at the mouth of the Yukon (see map of Alaska, ref. 3–D). It is a fair port, but shallow; the region is low, swampy, and subject to inundation. It was a station of the Russian fur company, by whom it was called *Mikhailovsk*. Pop. village (1900) 857. M. W. H.

St.-Nazaire, sănˊnăăˊzărˊ: town; in the department of Loire-Inférieure, France; at the mouth of the Loire, on the north side; has a large and commodious harbor (see map of France, ref. 5–C). As the navigation of the Loire has become difficult for large vessels on account of the amount of sand which it carries with it, St.-Nazaire has become the chief entrepôt of the great traffic of this river. Pop. (1896) 30,813.

St. Nicholas: See Nicholas, Saint.

St.-Nicolas, Fr. pron. sănˊnēcˊkōˊlaaˊ: town; in the province of East Flanders, Belgium; 12 miles by rail W. by S. of Antwerp (see map of Holland and Belgium, ref. 9–D). It has a large flax-market, and extensive manufactures of linen, woolen, cotton, and silk fabrics, hosiery, hats, soap, leather, salt, and tobacco. It is situated in one of the most fertile and most densely peopled districts of Belgium, and besides the exportation of its manufactured goods its home trade is very important. Pop. (1896) 29,452.

St. Nicolas: village; in Levis County, Quebec, Canada; on the south shore of the St. Lawrence; 15 miles above Quebec, with which it is connected by steamer (see map of Quebec, ref. 4–D). It has a large lumber-trade and many manufactories. Pop. of sub-district, 2,250.

St.-Omer, sănˊtōˊmărˊ: town; in the department of Pas-de-Calais, France; on the Aa; 26 miles S. E. of Calais by rail (see map of France, ref. 1–F). It is fortified and well built, and has extensive manufactures of salt, beetroot-sugar, soap, brandy, and clay pipes. Pop. (1896) 21,481.

Sainton-Dolby, Charlotte Helen: composer, singer, and vocal teacher; b. in London, May 17, 1821; in 1834 entered the Royal Academy of Music, and was subsequently elected king's scholar. Her first public appearance was on June 14, 1841; Mendelssohn dedicated to her his set of six songs, op. 57, and he wrote the contralto music in *Elijah* with a special view to her singing it. She sang in concert tours in France, Germany, and the U. S. with great success. In 1860 she was married to Prosper Sainton, and in 1870 retired from public life. In 1872 she opened a vocal academy. She was one of the finest contraltos England has produced. Besides a number of excellent songs she composed four cantatas, *The Legend of St. Dorothea*, produced June 14, 1876; *The Story of a Faithful Soul*, June 19, 1879; *Thalassa* (the poem by Joseph Bennett), Dec. 21, 1881; and *Florimel*, completed just before her death and performed posthumously. D. Feb. 18, 1885. D. E. Hervey.

St. Paris: village; Champaign co., O.: on the Ohio S., and the Pitts., Cin., Chi. and St. L. railways; 11 miles W. of Urbana, the county-seat, 15 miles E. of Piqua (for location, see map of Ohio, ref. 5–D). It contains a public high school, flour and planing mills, broom and carriage factories, a national bank, and two weekly newspapers; and ships large quantities of grain, flour, lumber, and live stock. Pop. (1890) 1,145; (1900) 1,222. EDITOR OF "ERA-DISPATCH."

St. Paul: the principal one of the Pribilof or Seal islands, in Bering Sea. It is the largest and the northernmost of the group, triangular in form. Area, 32 sq. miles. The highest point is Bogoslof, reaching about 650 feet above sea-level. Pop. about 300 Aleuts, devoted to the hunting of seals. The climate is severe. Potatoes and peas can be raised, and many swine are kept. M. W. H.

St. Paul, Fr. pron. săñ′pōl′: town of the French island of Réunion, on the western side of the island; has a good harbor and considerable trade. Pop. (of commune) 26,000.

St. Paul: city; port of entry; capital of the State of Minnesota and of Ramsey County; on both sides of the Mississippi; lat. 44° 52′ 46″ N., lon. 93° 04′ 54″ W.; 410 miles N. W. of Chicago (for location, see map of Minnesota, ref. 9–F). The city is mainly on the east bank of the river, and the two sections are connected by three substantial highway bridges. It is built on three plateaus, the lowest being the river flats; the second, the main plateau, on which the business portion and a part of the residence portion are built; and the higher, a range of irregular bluffs, on which are the principal residences. The city limits include 35,487 acres, within which lie the suburbs of Merriam, St. Antony, Union, Groveland, Macalester, and Desnoyer parks, Arlington Hills, and others. There are 45·49 miles of paved streets and 51 bridges, five of which cross the river, the others being built over ravines and tracks. The water-supply is obtained from a chain of lakes N. of the city, the daily consumption and supply being 8,000,000 gal.; length of conduit for water service, 4½ miles; sewers, 143·71 miles; water-mains, 227 miles. There are 24 parks, with a total of 450 acres, including Como Park,

State Capitol, St. Paul, Minn.

with 377 acres. The notable buildings are the State Capitol, city-hall, U. S. Government building (cost over $800,000), Pioneer Press, Manhattan, New York Life, Germania Life, Globe, and Endicott office buildings. There are 10 libraries, and 56 newspapers and periodicals.

Churches and Schools.—St. Paul contains 167 churches: Lutheran, 28; Methodist Episcopal, 26; Roman Catholic, 21; Congregational, 18; Baptist, 18; Presbyterian, 17; Protestant Episcopal, 16; Evangelical, 5; Jewish, 5; People's, 3; Unitarian, 2; and one each, Christian, Christian Science, Gospel Tabernacle, Salvation Army, Spiritualist, and Swedenborgian. There are 47 public schools with 545 teachers and an enrollment of 23,000 pupils. The public schools include a large and finely equipped manual training-school, a teachers' training-school, and 26 public kindergartens. The total annual expense (1900–01) is $720,000. There are 60 parochial and private schools, with an estimated enrollment of 8,000 pupils. The colleges are: Hamline University, for both sexes (Methodist Episcopal, established in 1854), endowment $175,000; Macalester College, for both sexes (Presbyterian, incorporated in 1874), endowment $200,000; St. Thomas's Seminary (Roman Catholic, established in 1885); St. Paul's Seminary (Roman Catholic, established in 1894), endowment $500,000; and Concordia College (German Lutheran, established in 1894).

Charitable Institutions.—These include two Roman Catholic orphan asylums, Protestant orphan asylum, Roman Catholic Infants' Home, Protestant Babies' Home, Day Nursery, Home for the Aged, Home for the Friendless, House of the Good Shepherd (Roman Catholic), Woman's Christian Home, St. Paul Bethel, and the Friendly Inn. Other benevolent institutions and societies are: Board of Control, Children's Home Society, Needlework Guild, Newsboys' Home Association, Parish Settlement, Free Dispensary, St. Vincent de Paul Society, Hebrew Relief Society, Society for the Relief of the Poor, Society for Prevention of Cruelty, St. Mary's Home, Young Women's Friendly Association, City and County Hospital, Bethesda Hospital, St. Joseph's Hospital, St. Luke's Hospital, and the Homœopathic Hospital.

City Finances.—The total bonded debt, Jan. 1, 1900, was $8,001,100, of which $2,460,000 was for the city water system. The revenues of the water department are now sufficient to provide for future extensions, pay interest on these bonds, and provide a sinking fund for their redemption at maturity. The floating debt was $235,000. The annual cost of the city government is about $2,000,000; assessed value of real estate is $78,523,015, of personal property $14,509,467, and the annual tax-rate 2 mills on the dollar.

Business Interests.—The manufacturing establishments reported in the census of 1890 number 1,442 (distributed among 61 industries), representing an invested capital of $22,501,211, employing 18,558 persons, paying $10,373,396 in wages and $15,865,573 for materials, and turning out products to the value of $33,035,073. St. Paul does a large jobbing business (about $150,000,000 annually), the available trade area, covering Minnesota, the Dakotas, Montana, Idaho, Washington, and Northern Oregon, being 582,164 sq. miles, with a population of 2,536,170. There are 22 banks, of which 5 are national, 5 savings, and 12 State; total capital, with surplus and undivided profits, $8,527,615.

Means of Communication.—St. Paul is an important railway center, from which extend seven eastern trunk lines and four transcontinental systems. It is connected with the East and South by the lines of the Chicago, Milwaukee and St. Paul, Chicago and Northwestern, Burlington and Northern, Chicago and Great Western, Wisconsin Central, and Minneapolis and St. Louis, now part of the Rock Island system. The "Soo" line, through its relation to the Canadian Pacific, gives an outlet to the East independent of the Chicago systems. To the West connection is made with the Pacific coast over the systems of the Northern Pacific, the Great Northern, Canadian Pacific, and Union Pacific, in combination with the line of the Chicago, St. Paul, Minneapolis and Omaha. The St. Paul and Duluth, now merged in the Northern Pacific, Eastern Minnesota, a part of the Great Northern Pacific, and the Omaha all have lines extending from St. Paul to the head of Lake Superior, and a very large part of the commerce between St. Paul and the East is over the lake route. The city has 103 miles of electric street-railway. An electric railway connects the city with Minneapolis, and another line connects it with Stillwater.

History.—The first house in St. Paul was built in 1838. The early settlers were principally French, and engaged in the fur and whisky trade. A Roman Catholic mission was begun in 1841, from which the city takes its name. The site was surveyed and plot recorded in 1847; the settlement was incorporated as a town and made the territorial capital in 1849, and became a city in 1854. St. Paul owes its early growth to its situation at the head of navigation on the Mississippi river. The assistance of the Federal Government has been secured in extending the navigable channel to Minneapolis, and a survey of practicable routes for a ship-canal to connect the city with Lake Superior has been authorized by the Government. Pop. (1880) 41,473; (1890) 133,156; (1895) 140,292; (1900) 163,065. J. G. PYLE.

St. Paul: city (founded in 1886); capital of Howard co., Neb.; on the Loup Fork of the Platte river, and the Burlington Route and the Union Pac. railways; 23 miles N. of Grand Island, 174 miles W. of Omaha (for location, see map of Nebraska, ref. 10–F). It is in a grain-growing and stock-raising region, and has 5 churches, a grammar school, several flour-mills, 3 national banks with combined capital of $150,000, and 3 weekly newspapers. Pop. (1880) 482; (1890) 1,263; (1900) 1,475. EDITOR OF "REPUBLICAN."

St. Paul de Loanda, or simply **Loanda** (more correctly *Luanda*, i. e. tribute): the first settlement of the Portuguese (1578) in Southwest Africa (see map of Africa, ref. 7–D). In early days the Zimbo tribe dug shellfish here and paid an annual tribute in shells to the King of Congo, whence the native name, which the Portuguese have perpetuated. Loanda is the capital of Angola, is favorably situated in Bengo Bay, near the mouth of the Bengo; in lat. 8° 48′ S. and lon. 13° 13′ E.; and is well adapted for commerce. It is the terminus of a railway extending eastward to Ambaca, 150 miles distant, and is the largest town on the west coast between Lagos and Cape Town. Pop. about 15,000. While Loanda saw its most thriving days when it was the center of the slave export trade to Brazil, the growth of legitimate trade has saved it from predicted ruin. About 150 ships and steamers visit the port every year, and the annual trade is about $3,000,000. The public buildings and European residences are well built of brazilwood, stone, or brick. Good water is brought for some miles from the Bengo river. Steamers connect the port with the rich plantations on the Cuanza river. C. C. Adams.

St. Peter: city; capital of Nicollet co., Minn.; on the Minnesota river, and the Chi. and N. W. and the Chi., St. P., Minn. and Omaha railways; 11 miles N. of Mankato, 75 miles S. W. of St. Paul (for location, see map of Minnesota, ref. 10–D). It is situated between a stretch of prairie land on the W. and one of timber land on the E.; is the seat of Gustavus Adolphus College (Lutheran, chartered in 1874) and of the State Hospital for the Insane (cost $500,000); and contains a high school, a national bank with capital of $60,000, a State bank with capital of $50,000, flour-mills, foundry and machine-shops, and a monthly and three weekly periodicals. Pop. (1880) 3,436; (1890) 3,671; (1900) 4,302.
Editor of "Herald."

St. Peter Port: capital of the island of Guernsey. It is an old and picturesque town with many interesting buildings. Among them are the Government house, the Elizabeth College, and the Hauteville House, where Victor Hugo spent his exile (1856–70). The harbor, formed by two piers which inclose 73 acres, is a favorite resort of pleasure-yachts. Pop. (of parish with garrison) 16,658. M. W. H.

St. Petersburg: government of European Russia, bordering N. on the Gulf of Finland and Lake Ladoga; area, 20,759 sq. miles. The ground is low and level, the climate damp and cold, the soil thin and little productive. Marshes and forests cover two-thirds of the surface; hemp, flax, and rye are the common crops; market-gardening is extensively carried on around the capital, the city of St. Petersburg. Pop. (1897) 2,104,511.

St. Petersburg: capital of Russia; the residence of the czar, and the seat of the Government; in lat. 59° 56′ 30″ N., lon. 30° 19′ E.; on the delta of the Neva, about 20 miles E. of its port, Cronstadt (see map of Russia, ref. 5–D). Its location is not very favorable. The climate is severe; the Neva is covered with ice for five months, and with a mean winter temperature of 18° the thermometer is known to have fallen to −38°. The elevation of the site above the river is so small that, although both the river arms and the canals are lined with high stone quays, destructive inundations have taken place, as in 1824. Nor is the ground itself salubrious; it is marshy and oozy, and, in spite of extensive draining, typhoid fevers are frequent. To form a sufficiently solid foundation for the Nikolaievski bridges three sets of piles had to be driven into the ground, one on the top of the other; and the foundation of the Church of St. Isaac is said to have cost $4,000,000. Nevertheless, Peter the Great, who founded the city in 1703, and declared it his capital in 1712, and Catherine II., who was very solicitous for its growth and prosperity, succeeded in building up here one of the most brilliant capitals of Europe, and forming a commercial and industrial center of great importance. The city consists of two parts—the Great Side (*Bolshaya Storona*), situated on the mainland, on the southern side of the Great Neva; and the Petersburg Side, situated on the numerous islands formed by the arms of the Neva, Vasili Ostrov, Volni, Petrovski, Citadel island, Aptekarski, Krestovski, Kamennoi, and Velaginski. Only one permanent bridge leads across the Great Neva—namely, the Nikolaievski, from the English quay in front of the admiralty building on the southern branch to the Vasili Ostrov shore. It is a magnificent structure of granite, 1,200 feet long, resting on seven elegant arches, and was completed in 1850. The other bridges across the Great Neva are all temporary, supported on boats and removed each autumn when the frost comes. The Annitchkoff bridge, across the Fontanka Canal, is also a splendid structure, 110 feet long, decorated with four groups of wild horses. About 150 bridges connect the islands with each other. The Great Side is the more elegant part of the city, containing a great number of palaces, churches, Government buildings, etc., all of which are of immense dimensions, generally gorgeously decorated, and often of a fine architectural effect. The Nevski Prospekt, leading in a southeastern direction from Admiralty Square, is one of the finest streets in Europe, 130 feet broad, 4 miles long, lined with palaces and planted with trees. The Petersburg Side is principally the seat of the commercial and industrial interests; some of the islands are occupied by villas and gardens. The most remarkable of the public buildings is the Church of St. Isaac, 330 feet long, 290 feet broad, 310 feet high, built in the form of a Greek cross, entered from each side through a magnificent peristyle composed of twelve or sixteen monolithic columns of polished granite 60 feet high and 7 feet in diameter at the base, and surmounted by a dome rising 120 feet above the peristyles, resting on thirty columns, covered with copper, and richly gilded. In the Church of St. Peter and St. Paul, whose elegant gilt spire rises 208 feet, and can be seen from all parts of the city, the Russian czars have been buried since the time of Peter the Great. In the Church of St. Alexander Nevski the body of this saint is preserved in a sarcophagus of solid silver. The Winter Palace, one of the largest palaces in the world, forms a square 455 feet long, 350 feet broad, contains immense wealth in its decorations and furniture, and is inhabited, when occupied by the czar, by 6,000 persons; it was burned down in 1837 and rebuilt in 1839. The Hermitage, built by Catherine II., and connected with the Winter Palace, contains a famous picture-gallery, rich especially in works of the Spanish school, collections of statuary, gems, vases, arms, a library of 120,000 volumes, a theater, etc. The Annitchkoff Palace was the residence of Nicholas I. Of the public squares, Admiralty Square is the largest. The Palace Square contains the Alexander column, 150 feet high, whose shaft is a monolith 80 feet high, of red granite. In Peter's Square stands a fine equestrian statue of Peter the Great. The educational and benevolent institutions are numerous. The Imperial Library contains about 1,100,000 volumes and 35,000 MSS. The Academy of Sciences, founded by Peter the Great, has a library of 300,000 volumes, an excellent ethnographic museum, large numismatic and anatomical collections, etc., and a botanical garden with the largest palm-house in Europe. The university, founded in 1819, is attended by over 2,000 students. The mining-school has an unsurpassed collection of minerals. Many special schools and gymnasia for girls are established, and a number of compulsory elementary schools were opened in 1873. A celebrated institution is the foundling hospital. The manufactures, imperial and private, comprise glass, porcelain, and malachite ware, Gobelin tapestry and embroidery, arms, surgical and optical instruments, linen, woolen, cotton, and silk goods, paper, soap, tobacco, etc. A maritime canal from Cronstadt permits vessels drawing 18 to 20 feet to reach the quays of the city. A system of fresh-water canals gives ready and inexpensive communication with the interior, and railways connect the city with Moscow, Warsaw, and Berlin. Pop. (Dec., 1889) 924,105; with the suburbs (1897) 1,267,923.
Revised by M. W. Harrington.

St. Petersburg Declaration: an agreement concluded Dec. 11, 1868, by delegates from sixteen European states and Persia, called together at the suggestion of the Emperor of Russia to "examine into the expediency of forbidding the use of certain projectiles in times of war between civilized nations." The principle governing the convention was that the use of weapons which "uselessly aggravate the sufferings of disabled men or render their death inevitable" is contrary to the laws of humanity. Accordingly the contracting parties engaged "mutually to renounce in case of war among themselves the employment by their military or naval troops of any projectile of a weight below 400 grammes (a little less than a pound) which is either explosive or charged with fulminating or inflammable substances." The magazine-rifle, the mitrailleuse, new explosives, mines, and similar inventions for carrying on war are not legislated against, but solely the small explosive ball, on the ground that the object of war is to disable the greatest number possible, but not to render recovery from wounds impossible or to increase their severity. This

prineiple of the St. Petersburg eonvention has been incorporated into later codes like that worked over by the Brussels Conferenee in 1874. The U. S. has never aceeded to it. The obligations of this St. Petersburg Declaration are reeiproeal only, so that its signatories if at war with the U. S. would not be bound by them. THEODORE S. WOOLSEY.

St. Peter's Church: See PETER'S, ST.

St. Peter's Sandstone: a deposit of friable white and yellow sandstone oecurring principally in Wiseonsin, but eoming to the surfaee in the adjaeent portions of Minnesota, Iowa, and Illinois; named from St. Peter's (now Minnesota) river, at the mouth of which it is well displayed. Its average thiekness is from 80 to 100 feet, with a maximum of 212. It is one of the minor divisions of the roeks deposited during the Cambrian period; it rests on Lower Magnesian limestone and is overlaid by Trenton limestone. By many geologists it is considered as the equivalent of the Chazy of New York, but is probably more nearly equivalent to the basal member of the Trenton. Fossils are rare, and eonsist of tubes made by worms when the sands were soft, impressions of seaweeds, and shells of *Lingulepis*. It is an important souree of artesian water. Consult *Geology of Wisconsin*, vol. i., by T. C. Chamberlin. ISRAEL C. RUSSELL.

St.-Pierre, sănˊpi-ărˊ: prineipal town and port of the island of Martinique, Freneh West Indies; on a bay of the west eoast (see map of West Indies, ref. 7–N). It has no harbor, properly speaking, but the roadstead is proteeted by the island itself exeept during hurricanes, when its exposed position makes it very dangerous. The town is partly on low and somewhat insalubrious lands, partly on pieturesque hills, where the residenees are eharmingly plaeed among trees and flowers. The botanieal garden is one of the finest in the West Indies. Pop. about 20,000. H. H. S.

St.-Pierre: town of the Freneh island of Réunion, formerly Bourbon; in the Indian Ocean; on the southern shore of the island. It has a good harbor and a rapidly inereasing trade. Pop. of commune, 24,500.

Saint-Pierre, JACQUES HENRI BERNARDIN, de: author; b. at Havre, Franee, Jan. 19, 1737; studied at first for the Church; went in 1750 to Martinique as a sailor, and on his return a few years later attended the sehool of engineering at Rouen, but in 1760 lost his position in the army on aeeount of insubordination. After unsueeessful ventures at several employments he went to St. Petersburg, and was appointed a eaptain in the engineering eorps of Finland, but failed to interest Catherine II. in his sehemes of a model republic. Leaving the eountry in 1766 he fought against the Russians in Poland, inspired by a Polish prineess; then again in Saxony against the Poles, to avenge himself on his former inspiration. After this he returned to Franee and reeeived a position as an engineer in the Isle de Franee, but settled in 1771 in Paris and devoted himself to literature, assoeiating much with Rousseau, who exercised a considerable influence both on his style and his ideas. He published in 1773 *Voyage à l'Isle de France*, etc.; in 1784 *Études de la Nature* (5 vols.), whieh gave him rank among the best French prose-writers; in 1788 *Paul et Virginie*, whieh beeame one of the most eelebrated books of the age and was translated into all European languages; in 1790 *La Chaumière indienne* and *Le Café de Surate*; and subsequently many other works, none of whieh attained sueh suceess as *Paul et Virginie*; was made director of the botanical garden in 1792, Professor in Morals at the normal sehool in 1794; reeeived a pension under the empire. D. at Eragny-sur-Oise, Jan. 21, 1814. Aimé Martin, who married his widow, published a eollected edition of his works in twelve volumes in 1813–20; his posthumous works, letters, and a biography in 1833–36.

St.-Pierre and Miquelon, -meekˊlōⁿ: a group of three islands and many islets at the mouth of the Gulf of St. Lawrenee, near the south eoast of Newfoundland, eonstituting a Freneh eolony; valuable only as a rendezvous for vessels engaged in the eod-fisheries, of whieh some 1,500 annually enter the port. Area, 91 sq. miles. Pop. (1889) 5,983. St.-Pierre, the eapital, has a population of 800.

St.-Privat, Battle of: See GRAVELOTTE, BATTLE OF.

St.-Quentin, sănˊkaănˊtănˊ: town; in the department of Aisne, France; on the Somme; 95 miles by rail N. E. of Paris (see map of Franee, ref. 2–F); has extensive manufaetures of eotton yarn, linen, tableeloths, laee, muslin, and gauze, besides large distilleries and soap-works. It eontains an aneient Gothie ehureh, and is surrounded by beautiful promenades oeeupying the site of its old fortifications. Pop. (1896) 48,868. A battle took plaee here on Aug. 10, 1557, between the army of Philip II. of Spain, assisted by an English eontingent, and the Freneh, in which the French were defeated. During the Franeo-German war, on Jan. 19, 1871, the Germans under von Goeben here defeated the French under Gen. Faidherbe; the former lost 3,000 men and captured 10,000 prisoners.

St. Regis Falls: village; Franklin eo., N. Y.; on the St. Regis river, and the N. Adirondack Railroad; 22 miles S. W. of Malone, the county-seat (for loeation, see map of New York, ref. 1–I). It has excellent water-power, large lumber trade, several manufaetories, and a weekly newspaper. Pop. (1880) not in census; (1890) 1,210; (1900) 879.

St. Roque, Cape: See CAPE ST. ROQUE.

Saint-Saëns, sănˊsaaˊăaⁿˊ. CHARLES CAMILLE: organist and composer; b. in Paris, Franee, Oct. 9, 1835. He showed a remarkable aptitude for musie in his ehildhood, and made rapid progress under his teachers; entered the Conservatory in 1847, obtained seeond organ prize in 1849, and first in 1851; eomposed his first symphony when sixteen years old; in 1853 beeame organist of the Chureh of St. Merri, and in 1858 organist of the Madeleine, which post he resigned in 1877. He has composed largely in almost every art-form. Among his operas *Le Timbre d'Argent*, *Étienne Marcel*, *Henry VIII.*, *Ascanio*, and *Phryné* may be specially noticed, as also *Samson et Dalila*, a sacred eantata. He has written four very popular symphonie poems for full orchestra, entitled respectively *Le Rouet d'Omphale*, *Phaëton*, *Danse Macabre*, and *La Jeunesse d'Hercule*. D. E. H.

Saintsbury, GEORGE EDWARD BATEMAN: eritie and literary historian; b. at Southampton, England, Oct. 23, 1845. He graduated at Oxford in 1867; was classieal master in Elizabeth College, Guernsey, 1868–74, and head master of the Elgin Edueational Institute 1874–76. Among his publications are a standard *Primer of French Literature* (1880) and *Short History of French Literature* (1882); a life of *Dryden* (1881) and of *Marlborough* (1885); *A History of Elizabethan Literature* (1887) and several volumes of selections, translations from the French, etc. H. A. BEERS.

Saints' Days: in the calendar of the Chureh, days set apart for the special eommemoration of any saint. In the Roman Catholie Chureh the number of saints is very great, and a considerable number of saints are eommemorated on eaeh day of the year; but it is the custom to assign to partieular eountries, districts, or dioeeses a eertain number of saints for speeial eommemoration. These saints' days eonstitute the ealendar for that distriet. Any day not a saint's day in the loeal ealendar, and not a festival nor a Sunday, is called a *feria* or vaeant day; other days are either holy days of obligation, doubles, semi-doubles, and simples, aeeording to the solemnity of the occasion and of the service for the day. See the *Ordo*, published annually. J. J. K.

St.-Servan, sănˊsărˊvaănˊ: town of Franee; department of Ille-et-Vilaine; at the mouth of the Ranee, opposite St.-Malo (see map of Franee, ref. 3–C). It has two good harbors and an aetive eommeree. It is fortified and much frequented as a watering-place. Pop. (1896) 12,240.

Saint-Simon, sănˊsēˊmōⁿˊ, CLAUDE HENRI, Comte de: founder of Freneh soeialism; b. in Paris, Franee, Oet. 17, 1760; received a military edueation and aided the American colonies in the Revolutionary war. Early eoneeiving the idea that a great destiny awaited him, he sought by every means to enlarge his knowledge of men and things by varied experienee. He gave up the military eareer and proposed a scheme for a Duteh and French expedition against the British East Indies, but neither this nor a subseqnent project for connecting Madrid with the sea by a eanal attracted the attention of the authorities. In the revolution he took no prominent part, but was imprisoned for nearly a year during the Reign of Terror. He speculated in the eonfiseated estates of the *émigrés* and realized a small fortune, but spent it all in a little more than a year. An unhappy marriage, dissolved by the mutual eonsent of the parties, eompleted his experiments. Reduced to absolute penury, he lived partly on the eharity of his friends and partly on the precarious results of the literary work to whieh he now devoted himself. The first of his writings was *Lettres d'un Habitant de Genève* (1803). This was followed by several seientifie and political writings which passed almost without notiee. His charaeteristic views were first propounded in *L'Industrie* (1817) and further developed in *L'Organisateur* (1819); *Du Système*

Industriel (1821); *Catéchisme des Industriels* (1823); and, most important of all, *Nouveau Christianisme* (1825). The last two works present his social philosophy in a systematic form. Despite their diffuse style and want of logieal arrangement his writings reveal a keen critical faculty and considerable constructive power, qualities which won over to his views some of the most brilliant young men of the day, as Comte and Thierry. D. in Paris, May 19, 1825.

The school of social or economic philosophy called after its founder Saint-Simonianism demands thorough application of the principle of assoeiation to production. The "exploitation of man by man" must give way to the exploitation of the globe by man associated with man. To do this all instruments of labor must be held as social and not as private property, the law of inheritance must be abolished, and a system of distribution based on the merit of the individual must be introduced. This idea of rewarding the laborer according to his merit was strongly insisted upon by the Saint-Simonians, who advocated the grading of the laborer in the new social system according to his capacity, and rewarding him according to his work. The new philosophy had little effect in the lifetime of the founder, but under the leadership of ENFANTIN and BAZARD (*qq. v.*) attracted much attention in the Revolution of 1830. The *Globe* became the organ of the society, which included many of the ablest young men of the time; but dissensions arose between the two leaders on aecount of the innovations favored by Enfantin, who tended toward mysticism and lax ideas with regard to the marriage relation. Bazard and many of the strongest members withdrew, and the sect represented by Enfantin was broken up in 1832. F. M. COLBY.

Saint-Simon, LOUIS DE ROUVROI, Duc de: memoir writer; b. Jan. 16, 1675; received a very careful edueation; entered the army in 1692; distinguished himself at the battle of Neerwinden, but left the army in 1702 for the court, where he acquired considerable influence, both under Louis XIV. and the regent, and developed a great activity, partly in futile intrigues, partly in diplomatic negotiations. He never attained a position of commanding influenee even under the regency of his friend and patron, the Duke of Orleans, though in 1721 he figured prominently as ambassador to the court of Spain. After his return he had little to do with public affairs, and on the death of the regent, in 1723, he retired to his family estate. D. in Paris, Mar. 2, 1755. This long term of leisure he employed to prepare his *Mémoires*, which were intended to be published by his grandchildren; but at his death the Government seized them, and a multitude of unauthentic extracts came into circulation and considerable curiosity was excited. At last Charles X. returned the manuscript to the family of the author, and an edition appeared in twenty-one volumes (1829–30). This was followed by one of twenty volumes edited by Chéruel, and in 1874 by an edition which was estimated to contain thirty volumes, of which the eighth volume appeared in 1891. The work, though marred by prejudice, is of great historical value and is considered the most remarkable collection of memoirs ever written. See Sainte-Beuve, *Causeries de Lundi*; Collins, *Saint-Simon* in *Foreign Classics*; and Cannan, *The Duke of Saint-Simon* (London, 1885). Revised by F. M. COLBY.

St. Stephen: port of entry of Charlotte County, New Brunswick; pleasantly situated on the east bank of St. Croix river, opposite Calais, Me., with which it is connected by a bridge (see map of Quebec, etc., ref. 6–G). It is on the Canadian Pacific and Shore Line railways, does a heavy business in manufacturing and shipping lumber, and has a custom-house and many fine residences. Pop. (1891) 2,680.

St. Thomas: an island off the western coast of Africa; in the Gulf of Guinea; in lat. 0° 27′ N., lon. 6° 3′ E. Area, 359 sq. miles. The island, which belongs to Portugal, is high, of volcanic origin, exceedingly fertile, but extremely unhealthful. Sugar was formerly the principal product; coffee is more extensively cultivated. Forests abound, yielding excellent timber and the finest varieties of wood. Pop. 18,000, of whom 1,200 are white. Chief town, St. Thomas.

St. Thomas: one of the Virgin islands, West Indies; E. of Puerto Rico; area, 23 sq. miles. It belongs to Denmark. The surface is mountainous; portions are fertile, but very little land is cultivated. The importance of the island is entirely due to the free port of Charlotte Amalie, where most of the inhabitants are gathered. Formerly much of the commerce of the West Indies centered here; the place still has much trade with the other islands, and is an important port of call and coaling-station. It is occasionally visited by severe epidemics of yellow fever. The harbor is good and ordinarily very safe; but the island is frequently visited by hurricanes, and when these blow from the S. the anchorage is very dangerous. In 1867 every vessel in the harbor was wrecked by an earthquake wave, which also swept part of the town. In 1870 President Grant secured the purchase of the island for the U. S. for $7,500,000, but Congress refused to ratify the treaty. Pop. (1890) 12,019. Dependencies of St. Thomas are SANTA CRUZ (*q. v.*) and St. John's (area, 21 sq. miles; pop. 984), islands near it. HERBERT H. SMITH.

St. Thomas: capital of Elgin County, Ontario, Canada; on London and Port Stanley and Canada Air-line railways; 9 miles N. of Port Stanley, on Kettle creek (see map of Ontario, ref. 5–B). It has a large grain-trade and two weekly newspapers. Pop. (1891) 10,370.

St. Ubes: See SETUBAL.

St. Vincent: an island of the Windward islands colony, British West Indies; between St. Lucia and the Grenadines. Area, 133 sq. miles. It is mountainous, with fertile valleys, and half the surface is still covered with forest. Near the northern end is a quiescent volcano, the Soufrière, with two craters, one of which is occupied by a deep lake; the other was formed by the great eruption of Apr. 27–May 1, 1812, which devastated part of the island and darkened Barbados, 80 miles to windward, with a shower of ashes. The principal exports of St. Vincent are sugar and arrowroot. The island was the last stronghold of the West Indian Caribs, who were finally conquered by the British in 1795–96, and transported to Ruatan in the Bay of Honduras; a few returned and now have a small reservation. Pop. (1891) 41,054; nearly nine-tenths are colored. Capital, Kingstown, with 4,547 inhabitants. The Grenadines, except Carriacou, are dependencies. HERBERT H. SMITH.

St. Vincent, Cape: See CAPE ST. VINCENT.

St. Vincent, EARL OF: See JERVIS, SIR JOHN.

St. Vitus's Dance: (1) a disorder of the Middle Ages akin to tarantism (see DANCING MANIA); (2) another name for CHOREA (*q. v.*).

Saird: See SEURT.

Sai'vas: worshipers of SIVA (*q. v.*).

Sajous, CHARLES EUCHARISTE: See the Appendix.

Sakhalin: See SAGHALIEN.

Sakḳarah: See SAQQARAH.

Sakyamuni: the "Sakya Sage," a name frequently given to Gotama or Gautama, the historical BUDDHA (*q. v.*). *Shih-kia-mu-ni* is the Chinese form of the name, and *Shaka-muni* the Japanese. See also GAUTAMA.

Sala, GEORGE AUGUSTUS HENRY: journalist and author; b. in London, England, in 1828; educated as an artist, but at an early age devoted himself to literature as a constant contributor to Dickens's *Household Words* and other periodicals, especially *The Illustrated London News* and *The Cornhill Magazine*; visited the U. S. 1863–64 as correspondent of *The Daily Telegraph*, and published *America in the Midst of War*; represented the same paper in Algeria 1864 and again 1875, at the Paris Exposition 1867, on the Continent during the Franco-German war 1870–71, and in Spain, Morocco, and Venice 1875. He published several novels (*Quite Alone*, *Captain Dangerous*, etc.), works of travel, etc., including *Paris Herself Again* (1881); *America Revisited* (1882); *London Up to Date* (1894); *Life and Adventures of George Augustus Sala* (1895); and was the founder and editor of the *Temple Bar* magazine. He visited the U. S. in 1885, and lectured in its principal cities on his way to Australia, which he visited as correspondent of *The Daily Telegraph*. In 1892 he started *Sala's Journal* in London. D. at Brighton, Dec. 8, 1895. H. A. BEERS.

Salaam [from Arab. *salām*, peace, safety]: the Oriental salutation, of which there are various forms, mostly accompanied by the words meaning "Peace be with you!" and sometimes by an inclination of the body. Strict Mohammedans never give the salaam to an unbeliever.

Salado, Rio, ree′ō-saă-laa′dō: a river in the northern part of the Argentine Republic; rising in the Andes of Salta and flowing with a general southeasterly course to the Paraná, it coincides nearly with the southwestern side of the region called the GRAN CHACO (*q. v.*). Length about 1,000 miles. After entering the plains the Salado is partly lost in great marshes and salines, and becomes impregnated with salt. It is shallow and not navigable. H. H. S.

Sal Aëra'tus [Mod. Lat., aërated salt; *sal*, salt + *aëratus*, Latinization of aërated, from Lat. *a'er*, air]: a somewhat impure and imperfectly carbonated bicarbonate of potash, made by exposing a concentrated solution of neutral potassic carbonate to an atmosphere of carbon dioxide proceeding from fermentation or other source; hence the name. The finely granular form of the commercial article is probably a result of agitation during the absorption of the carbonic acid. Medicinally, a purer crystalline bicarbonate of potash is used, which is, or should be, fully charged with 2 equivalents of carbonic acid for 1 of potash. Sal aëratus was at one time extensively used as an article of domestic consumption, but has been chiefly displaced by the cheaper and better compound bicarbonate of soda, known as cooking-soda, sometimes as soda saleratus. Revised by Ira Remsen.

Sal'ahdin (*Yusuf-ben-Ayub-Salah-ed-Din*): Sultan of Egypt and Syria; b. in 1137 at the castle of Tekrit, on the Tigris, of which his father, the Kurdish chieftain Ayub, was governor. His uncle Shir-koh in 1163 was sent by Nur-ed-din Mahmud, Sultan of Syria, to Egypt to reinstate the dispossessed Emir Shaour. Salahdin accompanied him, and in the subsequent campaign showed great courage and military ability. Shaour became suspicious of his protectors and joined the crusaders, but was defeated and beheaded. Thereupon Shir-koh became governor of Egypt as Nur-ed-din's representative and on his death was succeeded by Salahdin, who manifested remarkable capacity as a civil ruler. On the death of Nur-ed-din (1174) he became independent Sultan of Egypt, to which Syria was speedily added, his title to both being confirmed by the Caliph of Bagdad. The Christian knights in Palestine constantly violated their treaties, attacking and plundering the Mussulman caravans. To end these outrages Salahdin invaded Palestine and destroyed the Christian army at the battle of Tiberias (July 4, 1187), where the King of Jerusalem, Guy of Lusignan, was taken prisoner. The capture of Jerusalem followed (Oct. 8, 1187). The king and inhabitants were treated kindly, but the knights of the various orders were put to death as violators of their treaties. Excitement at the fall of Jerusalem caused the third crusade (1189), and after a siege of two years Acre was captured by the Christians. The contest between Richard Cœur de Lion and Salahdin was really a species of tournament, wherein the most brilliant exploits were performed on both sides, with little gain by either. A three years' truce was concluded (Sept. 2, 1192) whereby the coast from Tyre to Jaffa was ceded to the Christians. Salahdin died at Damascus, Mar. 3, 1193. His estates were divided among his seventeen sons and his brother Malek-el-Adil. His fame was deservedly great. Magnanimous and just, skillful and intrepid in war, judicious and far-sighted in civil affairs, the founder of a vast and wisely administered empire comprising Egypt, Syria, Mesopotamia, Palestine, and Arabia, he is the hero of Mussulman chivalry.

E. A. Grosvenor.

Sal Alem'broth, or **Salt of Wisdom**: a compound of corrosive sublimate and sal ammoniac, once used in medicine, but now discarded.

Salaman'ca (Rom. *Salamantica* or *Elmantica*): town of Spain; capital of the province of the same name; on the right bank of the Tormes, which is here crossed by a magnificent bridge of twenty-seven arches (see map of Spain, ref. 14–D). It is surrounded with old walls, but several portions within the walls have been in ruins since the occupation of the city by the French in 1812. The streets are mostly steep, narrow, crooked, and dark, but they are often lined with lofty edifices most interesting in architectural respects. The university was founded in 1200. It is the first institution of its kind in Spain, and enjoys a high reputation all over Europe. Pop. (1887) 22,200.

Salamanca: a town of the state of Guanajuato, Mexico; on the river Lerma and the Mexican Central Railway; 34 miles S. of Guanajuato (see map of Mexico, ref. 6–G). It has manufactures of cotton cloths. Pop. about 10,000.

Salamanca: village; Cattaraugus co., N. Y.; on the Alleghany river, and the Erie, the Buffalo, Roch. and Pitts., the W. N. Y. and Penn., and the N. Y., Penn. and O. railways; 34 miles E. of Jamestown, 60 miles S. of Buffalo (for location, see map of New York, ref. 6–C). It contains 7 churches, union graded school with three buildings, 2 Roman Catholic schools, public-school library, sewerage, natural-gas and electric-light plants, gravity system of water-works, 2 national banks with combined capital of $100,000, 2 weekly newspapers, railway-shops, sole-leather tannery, 4 saw and planing mills, 3 cigar-factories, 2 grist-mills, wire-mattress factory, foundry, and embroidery factory. It was incorporated as a village in 1878. Pop. (1880) 3,498; (1890) 3,692; (1900) 4,251. Editor of "Cattaraugus Republican."

Salamander [viâ O. Fr. from Lat. *salaman'dra* = Gr. σαλαμάνδρα; cf. Pers. *samander*, salamander]: any one of numerous forms of tailed amphibians, especially the species of Salamandridæ (*q. v.*). These are small and of lizard-like form, and are terrestrial as distinguished from the aquatic newts of the same family. They inhabit damp, shady places, and feed mostly on worms, slugs, snails, insects, etc. *Salamandra maculosa* is the common spotted salamander of Central and Southern Europe. The black salamander (*S. atra*) is Alpine, and in this species the larvæ attain the air-breathing stage within the body of the mother. The salamander has been popularly identified with the fabulous animal of that name formerly supposed to be able to live in or to extinguish fire. The salamander of Marco Polo was asbestos. The animal locally known in the southern parts of the U. S. by the name is a pocket-gopher (*Geomys tuza*), a rodent.

Salaman'dridæ [Mod. Lat., from Lat. *salaman'dra*, salamander. See Salamander]: an Old World family of amphibians of the order Urodela (*q. v.*), including the typical salamanders and newts. They have posterior palatine processes, with teeth on their inner margins; the parasphenoid toothless; no post-frontosquamosal arch or ligament; and opisthocœlian vertebræ.

Sal'amis (modern *Kolouri*): Greek island; in the Gulf of Egina; 8 miles W. of Athens. Area, 36 sq. miles. Pop. (1889) 6,254. It is arid, rocky, mountainous, and well wooded; produces cotton, olives, and wine. The village of Ambelaki occupies the site of the ancient city of Salamis. In the strait, hardly over a mile in width, between Salamis and Attica, the Greeks under Euribiades utterly defeated the Persian fleet (Oct. 20, 480 B. C.). E. A. G.

Sal Ammoniac: See Ammonia.

Salamstone: See Corundum.

Salaverry, saä-laä-ver-ree', Felipe Santiago, de: soldier; b. at Lima, Peru, May 3, 1806. He was a student at Lima, and with several classmates ran away and joined the patriot army in 1821; served through the revolution; was lieutenant-colonel under Lamar; headed revolts against Gamarra 1833, and was general of division in the campaign against him 1834; declared against Orbegoso Feb. 23, 1835, seized Lima, and proclaimed himself supreme chief of Peru. In the confused condition of affairs most of the people of the republic adhered to him. Orbegoso invoked the aid of Santa Cruz, president of Bolivia, who marched into Peru; Salaverry was defeated, captured, and shot at Areqnipa, Feb. 19, 1836. He was a brilliant and popular leader and a writer of some note. H. H. S.

Saldanha Oliveira e Daun, saäl-daan'yaä-ō-lĕe-vā'i-raä-ā-down', João Carlos, Duke of Saldanha: statesman and soldier; grandson of the Marquis of Pombal; b. at Lisbon, Nov. 17, 1791; fought against the British and was taken prisoner, but was soon permitted to join the Portuguese court at Rio de Janeiro, where he served in the army and held important official positions. When Brazilian independence was declared he returned to Portugal, and afterward as a moderate constitutionalist and supporter of Dom Pedro took part in the war against Dom Miguel. At first unsuccessful, he was again forced to leave the country, but returned in 1832, and after repeated successes received the capitulation of Dom Miguel at Evora 1834. He became Minister of War and president of the council May 31, 1835, but resigned in November of the same year. Having taken part in the unsuccessful conservative revolution of 1836, he lived abroad until recalled by the queen in 1846. In the following year he formed a ministry; was replaced by the second dictatorship of Costa Cabral 1849; overthrew that administration by force of arms 1851; conducted the government until the accession of Pedro V. (1856), when he became again the head of the opposition; was minister at Rome 1862–64, and again 1866–69; went to Paris as minister Mar., 1869; instigated a revolution in the palace May 19, 1870, in consequence of which he again became Prime Minister, but resigned in August, and was sent to London, where he died Nov. 21, 1876. F. M. Colby.

Sale (of goods): the transfer by the seller of the general property in goods to the buyer, pursuant to contract, for a

money consideration. If a speeial property only is transferred, the transaction may be a BAILMENT (*q. v.*) or a lease, but is not a sale. A part-owner's interest in goods is a general property. When goods are transferred for goods or serviees the transaetion is not a technical sale, but a barter, although for most purposes, except that of eommon-law pleading, the rules governing the two transaetions are the same. An agreement to sell is one whose performanee is to result in the transfer of the general property in goods at a future time or on the fulfillment of some eondition.

Quasi-sale.—The property in goods may be transferred for a priee without a contraet between the parties. This happens where the owner sues for trespass to or conversion of goods and recovers and eolleets a judgment for their full value. It has been called an involuntary sale. Title does not pass until the judgment is paid; but there is eonsiderable authority in the U. S. for the doctrine that upon payment of the judgment the quasi-purchaser's title, as against the judgment creditor, relates back to the original conversion. *Smith* vs. *Smith*, 51 N. H. 571.

Subject-matter.—This, in the case of a present sale, is goods then owned by the seller, but in the case of an agreement to sell it may be goods thereafter to be procured or produced. Aecording to the common law, the owner of property can make a valid present sale of its product, growth, or increase; for example, the offspring of his animals, the wool of his sheep, the milk of his cows, the crops to be grown on his land. Such future goods are treated as having a potential existenee, and, as soon as they come into aetual existence, become the property of the buyer. A eontraet purporting to be a present sale of property which has neither actual nor potential existence can operate only as an agreement to sell. In such a case the legal title will not pass to the purchaser until the goods are delivered to him by the seller, or until he takes possession of them under authority derived from the seller. The rule in equity is somewhat different. It is stated as follows in the leading English case of *Holroyd* vs. *Marshall* (10 House of Lords Cases 191): "A man can not in equity, any more than in law, assign what has no existence. A man can contract to assign property which is to come into existence in the future, and when it has come into existenee equity, treating as done that which ought to be done, fastens upon that property, and the contract to assign thus becomes a complete assignment." It should be borne in mind that even under this doctrine the purchaser gets only the equitable interest and not the legal title, so that his claim to the property may be defeated wholly by the seller's transferring it to another purchaser for value without notice. This equity rule is not aecepted in all jurisdictions. See *Blanchard* vs. *Cooke*, 144 Mass. 207.

Where parties agree for the sale and purchase of a particular thing whieh, without their knowledge, has perished, there is no contract, for there is no subject-matter. Where they agree to sell and to buy a particular thing which perishes without fault of the seller before the property passes, the agreement is avoided. In such a ease the contract is conditional on the performance remaining possible.

The Price.—This is generally determined by the agreement between the parties. It may be left, however, to be fixed in the future, as by reference to the price then eurrent, or even by the valuation of a third party. In the latter case, if the third party can not or does not make a valuation, the contract is avoided, but if the buyer has appropriated any of the goods, he is bound to pay a reasonable price therefor; and if the third party's failure is caused by the fault of either contracting party such one will be liable to the other in damages. Where goods are sold without any statement or provision as to price, the purchaser is bound at common law to pay a reasonable price; that is, the price which the jury shall decide to be reasonable. While the market price is treated ordinarily as reasonable, it may be highly unreasonable owing to a corner, a pool, or a trust.

Condition and Warranty.—A brief statement of the leading principles of these important and diffieult topics must suffice. A condition is a material term of the eontract of sale, the breach of whieh gives the other party the right to treat the eontract as repudiated. It may be expressed by the parties or implied by law. Some of the implied eonditions in sales are the following: That the seller has a right to sell the goods; that goods sold by description shall correspond with the description; that the bulk of goods sold by sample shall correspond with the sample in quality, and that the buyer shall have a reasonable opportunity to compare them. A stipulation as to time of payment is not treated as a condition ordinarily, although in several of the U. S. it has been held that a sale of speeific goods for eash is eonditional, and that title does not pass until such payment is made or waived.

In the law of sales a warranty is not a term of the sale eontraet, but is an agreement respecting the goods subsidiary and eollateral to the sale contraet, the breaeh of which does not give the other party the right to treat the contraet as repudiated, but only the right to damages. Sueh at least is the doctrine established by the English courts, and declared by the Sale of Goods Act of 1893 (56 and 57 Viet., c. 71) to be the law of England and Ireland. The same statute provides that in Scotland a breaeh of warranty by the seller may be treated by the buyer as a breaeh of condition, and that the latter may within a reasonable time after delivery rejeet the goods and treat the eontract as repudiated. This doetrine obtains in some of the U. S. (See *Smith* vs. *Hale*, 158 Mass. 178.) Warranties are either express or implied. The word warrant is not necessary to an express warranty, nor is actual intention to warrant on the part of the seller essential. If the language employed eontains an assertion, as distinguished from a mere opinion, that the subject of the sale has certain qualities or will answer eertain requirements, and the assertion is relied upon by the buyer in making the purchase, there is an express warranty. An example of an implied warranty is found in a sale by sample—that the goods shall be free from any defect, rendering them unmerchantable, which is not apparent on a reasonable examination of the sample.

Transfer of Property.—This, in the ease of aseertained or specific goods, is determined by the intention of the parties. Frequently they fail to disclose their intention, and the courts have found it necessary to establish rules, more or less arbitrary, for the decision of sueh cases. These rules are formulated as follows in the British Sale of Goods Act (*supra*): Rule 1. When there is an unconditional contract for the sale of specific goods, in a deliverable state, the property in the goods passes to the buyer when the contraet is made, and it is immaterial whether the time of payment or the time of delivery, or both, be postponed. This rule is modified in some of the U. S. by the doetrine that in eash sales the property does not pass until payment. Rule 2. Where there is a contraet for the sale of speeifie goods, and the seller is bound to do something to the goods for the purpose of putting them into a deliverable state, the property does not pass until such thing be done, and the buyer has notiee thereof. Rule 3. When there is a contract for the sale of specific goods in a deliverable state, but the seller is bound to weigh, measure, test, or do some aet or thing with referenee to the goods for the purpose of ascertaining the price, the property does not pass until such aet or thing be done, and the buyer has notice thereof. If the buyer is to do the weighing, etc., or the goods are delivered to the buyer before weighing, etc., property passes at onee. In the U. S. there is authority for the view that, if the goods are aseertained, property will pass, although weighing, ete., may be necessary in order to arrive at the total price. (*Sanger* vs. *Watterbury*, 116 N. Y. 371.) Rule 4. When goods are delivered to the buyer on approval, or "on sale or return" or other similar terms, the property therein passes to the buyer when he signifies his approval or aceeptanee to the seller, or does any other act adopting the transaction; if he does not signify his approval or acceptanee to the seller, but retains the goods without giving notiee of rejeetion, then, if a time has been fixed for the return of the goods, on expiration of sueh time, and if no time has been fixed, on the expiration of a reasonable time. What is a reasonable time is a question of fact. In the U. S. it is held generally that a contract "of sale or return" of ascertained goods vests the property in the buyer at once, with an option to return.

In ease of an agreement to sell goods of a particular deseription, as distinguished from a present sale, property will pass when goods of that deseription and in a deliverable state are appropriated uneonditionally to the contract. The assent of both seller and buyer to the appropriation is neeessary, but either party may give his assent in advanee, and the assent may be express or implied. "The seleetion of the goods by the one party, and the adoption of that act by the other, converts that which was before a mere agreement to sell into an actual sale, and the property thereby passes." (*Rhodes* vs. *Thwaites*, 6 Barnwell and Cresswell 388.) Where the buyer orders goods to be sent to him by the seller, implied assent is given by the purchaser to the seller to make the appropriation; and the appropriation is complete upon

the delivery of the goods to the buyer, or to a third person for transmission to the buyer. If such appropriation is unconditional, and the goods conform to the order, property passes. But the seller may appropriate the goods conditionally. In such case property does not pass until the imposed conditions are fulfilled. For example, the seller may take a bill of lading of the goods in his own name, attach thereto a draft for the purchase price, and require payment of the draft as a condition of the buyer's acquiring the property. Where the condition is expressly imposed the rights of the parties are clear. Frequently the language and acts of the parties are equivocal, and the question whether the seller intended to appropriate the goods absolutely to the contract or to reserve to himself the right to their disposal becomes a difficult one. This is exemplified by the case of *The Calcutta Company* vs. *De Mattos* (32 *Law Journal*, Queen's Bench 322; 33 *ibid.* 214), the judges of the lower court being equally divided as to the intention of the parties, and, on appeal, two of the judges entertaining a third view.

Where a contract is made for the manufacture and delivery of an article, the property therein does not pass, according to the English decisions and those of many of the U. S., until delivery and acceptance, or until the article is ready for delivery and approved by the buyer. In some of the States it is held that the buyer assents in advance to the appropriation of the finished article to the contract, and that title passes upon the seller's tendering it.

Whether a contract for the sale of a part of a larger bulk of goods, of uniform kind and quality—e. g. 1,000 bush. of wheat from a grain elevator, or 100 gal. of oil from a tank, or 50 barrels of flour from a car-load—is one for a present sale of specific goods, or one for the sale of goods thereafter to be ascertained, is a question upon which the authorities are divided. The English view, which has been adopted in many of the U. S., is that the contract can not be more than an agreement to sell, and that property can not pass until the portion contracted for has been separated from the bulk. It is said there is no individuality until it is divided; the law knows no such thing as a floating right of property, which may attach itself either to one parcel or the other, as may be found convenient afterward. (*Golder* vs. *Ogden*, 15 Penn. St. 528.) On the other hand, it is maintained by many State courts that the subject-matter of such a contract is ascertained or specific goods, where it is a designated quantity out of a specified mass of uniform quality (*Kimberly* vs. *Patchin*, 19 N. Y. 330); and that the property in such designated quantity will pass, upon making the contract, if the parties so intend. This doctrine seems to accord with commercial usage. In some States it has been adopted wholly or in part by statute. See Mass. Pub. Stat., c. 72, § 7.

Risk of Loss.—This, unless otherwise agreed, passes from the seller to the buyer with the property in the goods, without regard to their possession. If delivery has been delayed through the default of either buyer or seller, the goods are at the risk of the party making default as regards any loss which would not have occurred but for such default. Sale of Goods Act, § 20.

Transfer of Title.—At common law a person can give no better title to goods than he possesses, unless he acts as the true owner's agent, or unless the true owner's conduct respecting the goods has estopped him from denying such person's authority to sell them. (See ESTOPPEL.) In England this rule does not apply to sales in MARKET OVERT (*q. v.*), and there, as well as in most of the U. S., it has been modified by Factors' Acts and similar statutes. The chief feature of this legislation is the power it confers on agents or consignees, who are intrusted by the owner with goods or with documentary evidence of title thereto, such as a bill of lading, warehouse certificate, delivery order, or the like, to give a perfect title to *bona-fide* purchasers. See *Lee* vs. *Butler* (1893), 2 Queen's Bench 318; *Goodwin* vs. *Mass. Company*, 152 Mass. 189; *Soltau* vs. *Gerdau*, 119 N. Y. 380, applying such legislation.

As delivery is not necessary to the transfer of ownership of goods, it should follow that one who has sold goods to A can not give title to them to B, although they are allowed by A to remain in his possession. Such is the general rule. In a few of the U. S. the courts have held that a seller who has never delivered the goods to the first purchaser may confer a perfect title upon a second *bona-fide* buyer. (*Huschle* vs. *Morris*, 131 Ill. 587.) The adoption of this doctrine in the British Sale of Goods Act, § 25, is "the result of a long struggle between the mercantile community on the one hand and the principles of the common law on the other."

We have seen that the owner of goods may deliver them under a contract that the title shall remain in him, until the performance of some condition by the buyer, such as the full payment of the price. Here the common law does not recognize any power in the conditional vendee to pass any greater interest than he possesses. (*Harkness* vs. *Russell*, 118 U. S. 663.) A different rule has been declared by the Pennsylvania courts, and statutes have been passed in many jurisdictions requiring contracts for conditional sales to be in writing and recorded, in order to be effectual against the buyer's creditors and *bona-fide* vendees.

Seller's Duties.—The most important is that of delivery. If the contract specifies the time, place, and manner of delivery, its terms must be followed. In the absence of agreement or custom, the seller must deliver the goods upon payment or tender of the price; the place of delivery is the seller's place of business, or residence, or their place of deposit at the time, according to the subject-matter of the sale; or, if the seller is to send the goods to the vendee at a distance, the place of their receipt by the common carrier; delivery must be made at a reasonable hour; the exact quantity agreed upon must be delivered. Any expense incidental to putting the goods into a deliverable state must be borne by the seller. He is also bound, when delivering goods to a carrier on behalf of the buyer, to make a reasonable contract for their transportation, and to give accurate directions for their delivery to the buyer. If the buyer has not had an opportunity to inspect the goods, the seller must afford him a reasonable opportunity for inspection so that he may ascertain whether they are in accordance with the contract.

Buyer's Duties.—The buyer is bound to accept and pay for the goods, and, if the terms of the contract require it, he must send for them. While the buyer is under no obligation to accept a different quantity of goods from that which he ordered, if he does accept it he must pay therefor at the contract rate. In case the buyer rightfully rejects goods tendered to him by the seller, he is under no duty to return them; he need only inform the seller of his rejection. The courts have experienced much difficulty in some cases in determining whether the buyer has accepted the goods. Perhaps no better rule can be framed on this subject than the one laid down in the British Sale of Goods Act, § 35. "The buyer is deemed to have accepted the goods when he intimates to the seller that he has accepted them, or when the goods have been delivered to him, and he does any act in relation to them which is inconsistent with the ownership of the seller, or when, after the lapse of a reasonable time, he retains the goods without intimating to the seller that he has rejected them."

Seller's Remedies.—If the property in the subject-matter of the sale contract has passed to the buyer, or if the buyer has agreed to pay the price on a day named, the seller can maintain an action for the purchase price. In other cases the buyer's breach of his contract will give the seller the right to maintain an action for damages for refusal to accept and pay for the goods. (See DAMAGES, MEASURE OF.) According to English decisions, the refusal of the buyer to take and pay for goods, the property in which has passed to him, does not divest him of such property, unless by the terms of the contract such a result is stipulated for, and with slight modifications such is still the rule under the Sale of Goods Act (§§ 39 and 48). The doctrine which generally obtains in the U. S. is as follows: "The vender of personal property, in a suit against the vendee for not taking and paying for the property, has the choice ordinarily of either one of three methods to indemnify himself: (1) He may store or retain the property for the vendee, and sue him for the entire purchase price; (2) he may sell the property, acting as the agent for this purpose of the vendee, and recover the difference between the contract price and the price obtained on such resale; or (3) he may keep the property as his own, and recover the difference between the market price at the time and place of delivery and the contract price." (*Dustan* vs. *McAndrew*, 44 N. Y. 72.) Other remedies of the seller are discussed under STOPPAGE IN TRANSITU (*q. v.*).

Buyer's Remedies.—These are an action for damages for breach of the seller's contract, or for CONVERSION (*q. v.*), or for SPECIFIC PERFORMANCE (*q. v.*).

Other topics connected with sales of personal and real property are presented in the articles on DEED and FRAUDS, STATUTE OF (*q. v.*).

Authorities.—Benjamin on *Sales*; Blackburn on *Sales*; Campbell on *Sales*; Newmark on *Sales*; Williston, *Cases on Sales*; Bingham, *Executory Contracts for the Sale of Real Property*; Clerke and Humphrey, *Sales of Land*; and Sugden, *Vendors and Purchasers.*

Francis M. Burdick.

Roman and Modern European Law of Sale.—The contract of sale imposes upon the vendor and vendee obligations substantially identical with those of the English common law. The chief points of difference are as follows: (1) The vendor impliedly warrants that the vendee shall not be disturbed in his possession of the thing sold (*rem habere licere*); and this warranty is not a collateral or subsidiary obligation, but a part of the contract. Many of the modern codes have changed this warranty of quiet possession into a warranty of title; but since, as a rule, no liability is incurred by the vendor until the purchaser is deprived of possession, the change is of theoretical rather than practical importance. (2) The vendor impliedly warrants that the thing sold is what it appears to be. If important defects are discovered, which were not obvious, and of which the vendee was unaware, he has his choice between a rescission of the sale and a suit for the difference between the price paid and the real value. The fact that the vendor was also ignorant of the defects is no bar to either action; but the fact that he knew the defects and did not mention them may make him liable on the ground of fraud.

As far as the reciprocal obligations of the vendor and vendee are concerned, the Roman law draws no distinction between the executory and the executed contract. It has, indeed, no technical terms to express this distinction. As far as the passing of title is concerned, sale is treated simply as a form of conveyance (*traditio*), and the rule is, as in other conveyances, that title passes only with delivery of possession. The French code declares, indeed, that title passes with the conclusion of the contract; but since this rule does not affect honest third parties, the change is rather apparent than real. The German codes retain the Roman rule. A further rule of the Roman law of sale is that title does not pass with delivery until the price is paid, unless it be expressly or impliedly agreed that the price is not to be paid at once. This rule is generally discarded in the modern codes.

It is a rule of the Roman law that with the conclusion of the contract the property sold is at the risk of the vendee. If, therefore, the thing sold is destroyed or damaged before delivery, without fault on the part of the vendor, the vendee is still bound to pay the full price agreed upon. This rule is certainly inconsistent with the theory that title does not pass before delivery, and it has been discarded in the Prussian and Austrian codes, and in the German draft code.

Among the more recent treatises are those of Couëtoux (Paris, 1874), Bernhöft (Jena, 1874), and Bechmann (Erlangen, 1884). Munroe Smith.

Sale, George: Orientalist; b. probably in Kent, England, about 1690; educated at King's School, Canterbury; became a lawyer; wrote the Oriental biography and criticism for Dr. Thomas Birch's translation of Bayle, entitled *A General Dictionary, Historical and Critical* (10 vols. fol., London, 1734–41), and executed a still unrivaled translation of the *Koran* (1734), to which he prefixed a scholarly *Preliminary Discourse* upon Arabian history, manners, customs, and religion before Mohammed. The liberal manner in which Sale spoke of Mohammed fastened upon him the reputation of heresy. D. in London, Nov. 14, 1736.

Sale, Sir Robert Henry, K. C. B.: soldier; known as the hero of Jellalabad; b. in England in 1782; son of Col. Sale of the East India Company's service; entered the army at the age of thirteen; was engaged in the storming of Seringapatam 1799, at the storming of the Travancore lines 1809, at the capture of Mauritius 1810, and in the Burmese war of 1824–25. He was appointed in 1838 to the command of the first Bengal brigade in the army on the Indus, which constituted the advance guard of the expedition against Afghanistan; commanded the storming party at Ghazni July 23, 1839, on which occasion he was severely wounded; was knighted and promoted to the local rank of major-general the same year; subdued the Kohistan country Sept., 1840; captured several fortresses; defeated Dost Mohammed Khan at Purwan, obliging him to surrender. In evacuating Afghanistan in 1841 he had to fight his way through the Khurd, Cabul, and Jagdalak passes and other strongholds, but was compelled to retreat upon Jellalabad, where he was besieged by Akbar Khan from Nov. 12, 1841, to Apr. 9, 1842, when he attacked and utterly routed the Afghans, capturing guns, ammunition, and camp—a feat which procured him the thanks of Parliament and the highest military reputation; took part in the general action of Tezen and the recapture of Cabul; and in the Punjaub campaign of 1845 as quartermaster-general, but was mortally wounded at the battle of Mudki Dec. 18, 1845, and died Feb. 28, 1846.—His wife, Lady Florentia Wynch Sale, b. in England, was a witness of much of her husband's career in India, and wrote *A Journal of the Disasters in Afghanistan in 1841–42* (1843). She also furnished descriptions of the plates to a folio volume entitled *Sale's Defense of Jellalabad* (1846), and supplied materials to Rev. G. R. Gleig for his book, *Sale's Brigade in Afghanistan* (1846).

Sale, Bill of: See Bill of Sale.

Salem (native *Selam* or *Shelam*): town of British India; capital of a district of the same name in the Presidency of Madras; on the Toiromanni, at an elevation of 1,070 feet above sea-level (see map of S. India, ref. 6–E). The town has a railway station and is well built, and has important cotton and silk manufactures. Pop. (1891) 67,710. M. W. H.

Salem: city; capital of Marion co., Ill.; on the Balt. and Ohio S. W. Railway; 16 miles N. E. of Centralia, 71 miles E. of St. Louis (for location, see map of Illinois, ref. 9–E). It is in an agricultural and coal-mining region; grows, evaporates, and ships large quantities of fruit; and contains a national bank with capital of $50,000, and three weekly newspapers. Pop. (1880) 1,327; (1890) 1,493; (1900) 1,642.

Editor of "Republican."

Salem: town; capital of Washington co., Ind.; on the Louisv., New Alb. and Chi. Railway; 35 miles N. N. W. of New Albany (for location, see map of Indiana, ref. 10–E). It is in an agricultural region; has quarries of oölitic limestone, 3 sawmills, 2 planing-mills, steam-tannery, and chair-factory, and contains 5 churches, high school, 2 public-school buildings, Eikosi Academy, water-works, electric-light plant, a State bank with capital of $25,000, a private bank, and 3 weekly newspapers. Pop. (1880) 1,615; (1890) 1,975; (1900) 1,995. Editor of "Leader."

Salem: city; chief county seat of Essex co., Mass.; on Massachusetts Bay, and the Boston and Maine Railroad; 16 miles N. E. of Boston (for location, see map of Massachusetts, ref. 1–I). It is on a peninsula between two arms of the sea, with an excellent drive along the North shore; is irregularly laid out, but compactly built; and has a commodious, sheltered harbor, which is a refuge for coasting vessels in storms. There are three public parks—Washington Square, of 8 acres, in the center of the city; Mack Park, in North Salem; and The Willows, of 30 acres, a mile E. on the Neck Shore. The city is a modern Mecca for historical pilgrims and antiquaries, and an important center of trade and shopping for a large district which is connected by an elaborate system of electric street-railways. It contains many fine residences, two court-houses, a U. S. custom-house (see introduction to Hawthorne's *Scarlet Letter*); city-hall, jail, water-supply from Wenham Lake, 4 miles distant, and gas and electric-light plants.

Churches and Schools.—Salem has 21 churches: 3 Unitarian, 3 Congregational, 3 Baptist, 4 Roman Catholic, 2 Protestant Episcopal, 2 Methodist Episcopal, and one each Swedenborgian, Friends, Universalist, and Advent. The public-school system comprises a State normal school for girls, a high school, 5 grammar schools, 12 primary schools, 4 kindergartens, 2 evening schools, and a drawing and an industrial school. In 1900 there was a public-school enrollment of 4,987 pupils, and the cost of maintenance was $117,000. There are 3 large Roman Catholic parochial and many private schools.

Charitable and Benevolent Institutions.—With the exception of the city alms-house and the administration expenses of the public library, all scientific, literary, and charitable institutions are maintained by private trusts and subscriptions. The city holds, in addition, trust funds for charitable and educational purposes amounting to $110,000. The principal institutions are 3 free hospitals, Old Men's Home, Old Ladies' Home, two homes for children, a farm school for boys, a Woman's Friend Society, and the Fraternity.

Finances and Banking.—The public expenditures in 1900 were $666,819; receipts, $170,000; the assessed valuations,

$28,995,000, of which $18,910,900 was on real estate; and the net debt, Jan. 1, 1901, was $777,896. There are 6 national banks with combined capital of $2,000,000, 2 savings-banks with combined deposits of $12,000,000, and 3 mutual insurance companies.

Business Interests.—Salem merchants early established fishing industries; in 1670 sent vessels to the West Indies and Europe; and immediately after the Revolutionary war opened trade with China, India, Java, Sumatra, the Philippine islands, Arabia, Cape of Good Hope, Russia, South America, and other foreign parts. For many years the city was noted for its large foreign trade, and at one time had almost the monopoly of the East India and China trade; but it no longer has a foreign commerce. There is a large coasting trade, and an immense tonnage of coal is here landed for transshipment to interior cities. The manufactories comprise a cotton-mill with 160,000 spindles, a lead-factory, and several tanneries, machine-shops, and shoe-factories.

Notable Buildings.—There are a few buildings typical of the period of 1634–1700. The public library (established in 1889) contains 40,223 volumes; the Essex Institute (society established in 1848) has a library of 40,000 volumes, and 100,000 pamphlets on science, art, local history, and music, a large collection of historical relics and portraits, and the frame of the Puritan meeting-house of 1634; the Peabody Academy of Science has a museum of ethnology (including an East India marine museum dating from 1799) and zoölogy, and special collections of Essex County zoölogy, botany, and archæology; and the Athenæum has a library of 20,000 volumes.

History.—Salem was settled by Roger Conant and the "Old Planters" in 1626. Endicott, with a second charter, came in 1628. Banished by the magistrates, against the wishes of his people, Roger Williams went from Salem to settle Rhode Island in 1636. In 1692, as the result of the witchcraft delusion in Salem village (Danvers), nineteen persons were hanged by order of the court, appointed by the royal governor, sitting in Salem. Here, too, the awakening first occurred, and in 1693 all convicted and accused persons were set free. In the Revolution the first provincial assembly sat here in 1774; the first armed resistance to British authority (Leslie's Retreat) occurred at the North bridge Feb. 26, 1775; and Salem furnished large numbers of troops and 158 armed privateers. The U. S. frigate Essex was built in Salem in 1799. In the war of 1812–15, 40 of the 250 American armed vessels went from Salem, and in the war of 1861–65 the city furnished 3,000 men and gave 200 lives to the Union cause. Pop. (1880) 27,563; (1890) 30,801; (1900) 35,966.

WINFIELD S. NEVINS.

Salem: city (founded in 1854); capital of Dent co., Mo.; on the St. L. and San Fran. Railway; 127 miles S. W. of St. Louis (for location, see map of Missouri, ref. 6–I). It is in an agricultural, stock-raising, and iron-mining region; and contains 7 churches, Salem Academy, 5 roller-process flour-mills, 3 steam planing-mills, several sawmills, 2 State banks with combined capital of $40,000, and 4 weekly newspapers. Pop. (1880) 1,624; (1890) 1,315; (1900) 1,481.

EDITOR OF "MONITOR."

Salem: city; capital of Salem co., N. J.; on the Salem river, and the W. Jersey Railroad; 14 miles S. E. of Wilmington, Del., 34 miles S. W. of Philadelphia (for location, see map of New Jersey, ref. 6–B). It is in a rich agricultural region, has regular steamboat communication with Philadelphia, and contains 13 churches, high school, several public schools, Friends' School, public library (founded in 1804), 4 hotels, 2 national banks with combined capital of $250,000, and 3 weekly newspapers. There are 6 canneries for fruit and vegetables, 3 iron-foundries, 3 manufactories of glass, machine-shops, mills, hosiery, and hollow-ware and oilcloth factories. Pop. (1880) 5,056; (1890) 5,516; (1900) 5,811.

W. H. CHEW, EDITOR OF "STANDARD."

Salem: village; capital of Washington co., N. Y.; on the Delaware and Hudson Railroad; 25 miles S. of Whitehall, 41 miles N. E. of Troy (for location, see map of New York, ref. 4–K). It is in an agricultural, dairying, and slate-quarrying region, is a popular summer resort, and contains Washington Academy (opened in 1791), St. Paul's Hall (Protestant Episcopal, opened in 1885), Raleigh School, 2 national banks with combined capital of $100,000, 2 weekly newspapers, cheese-factory, several mills, and railway repair-shops. Pop. (1880) 1,410; (1890) not separately returned; (1900) 1,391.

Salem: city (founded by Moravians in 1766); Forsyth co., N. C.; on branches of the Norfolk and Western and the Southern railways; adjoining Winston, the railway station and banking-place; 112 miles W. of Raleigh (for location, see map of North Carolina, ref. 2–F). It was the center of important movements in the early Indian and the Revolutionary wars, and was visited by Union and Confederate armies in the war of 1861–65. It is the seat of Salem Female Academy (Moravian, founded in 1802), which retains its original name, although it has become one of the leading colleges for women in the Southern States and has collegiate and post-graduate courses, schools of music, art, and languages, and commercial and industrial departments. The manufactories comprise cotton and woolen mills, tobacco-factories, and iron-works. Pop. (1880) 1,340; (1890) 2,711; (1900) 3,642.

JOHN H. CLEWELL.

Salem: city; Columbiana co., O.; on the Salem and the Penn. railways; 70 miles W. of Pittsburg, Pa. (for location, see map of Ohio, ref. 3–J). It contains 7 churches, 3 graded public schools, a public high school, 2 national banks with combined capital of $300,000, 2 private banks, 2 daily and 2 weekly newspapers, and manufactories of machinery, engines, sheet-iron, church-organs, wire nails, pumps, stoves, furniture, and other articles, art-works, church-furniture works, tile-works, and brick-works. Pop. (1880) 4,041; (1890) 5,780; (1900) 7,582.

EDITOR OF "DAILY NEWS."

Salem: city; capital of the State of Oregon and of Marion County; on the Willamette river, and the Southern Pac. Railroad; 53 miles S. of Portland (for location, see map of Oregon, ref. 3–C). It is in an agricultural and fruit-growing region; is laid out with streets 100 feet wide, and blocks 330 feet square, with 16-foot alleys; and is one of the handsomest cities on the Pacific coast. It has communication with Portland twice a day by railway and once a day by steamboat. Water for manufacturing purposes is brought to the city from the Willamette and Santiam rivers by a canal 18 miles long. In 1900 over $1,500,000 was invested in manufacturing industries, which included several large flour-mills, a woolen-mill, foundries and machine-shops, tanneries, tobacco-factories, plants for fruit-drying and canning, carriage and wagon factories, brick-kilns, and agricultural-implement works. The city contains 2 public parks, 20 churches, a public high school and 5 grammar schools, a State, a Masonic, and 2 educational libraries, Willamette University (Methodist Episcopal, opened in 1844), the Academy of the Sacred Heart (Roman Catholic, opened in 1860), a Friends' Institute (opened in 1892), a national bank with capital of $75,000, an incorporated bank, 2 private banks, and 4 daily, 4 weekly, and 2 other periodicals. The reformatory and charitable institutions comprise the State Penitentiary, Reform School, Deaf Mute School, Institute for the Blind, Insane Asylum, and Orphans' Home. The city is an important business center, and is very progressive. A Methodist mission was established 9 miles below the present city in 1834; the city was incorporated in 1853, and became the State capital in 1860. Pop. (1880) 2,538; (1890) 4,515; (1900) 4,258.

S. T. RICHARDSON.

Salem: town; capital of Roanoke co., Va.; on the Roanoke river, and the Norfolk and Western Railroad; 60 miles W. by S. of Lynchburg, 180 miles W. by S. of Richmond (for location, see map of Virginia, ref. 6–E). It is in an agricultural and tobacco-raising region, is the seat of ROANOKE COLLEGE (*q. v.*), has good water-power, and contains a graded public school, a national bank with capital of $75,000, a State bank with capital of $67,300, a loan and trust company with capital of $50,000, and a weekly and a monthly periodical. Pop. (1880) 1,759; (1890) 3,279; (1900) 3,412.

Saleratus: See SAL AËRATUS.

Saler'no; chief town of the province of Salerno, Italy; 33 miles by rail S. E. of Naples, on the Gulf of Salerno (see map of Italy, ref. 7–F). The chief object of interest is the old Norman cathedral (1084), injuriously restored in 1768, but still the most imposing specimen of Norman architecture in Southern Italy, and containing, besides rich marbles and mosaics, twenty-eight magnificent granite and porphyry columns from the temples of Pæstum. Tradition asserts that the body of St. Matthew was brought from the East in 930 and deposited in the crypt of the cathedral. Salerno was originally a Roman colony; it became the capital of a principality in the ninth century, and in 1077 it was taken by Robert Guiscard, who made it his capital. The

great boast of mediæval Salerno was its celebrated medical school. Its great reputation drew to it during many centuries invalids and pupils of all classes and nations. The *Schola Salernitana*, a set of hygienic rules drawn up in Latin at this school in the twelfth century, and dedicated to the King of England, was translated into many European languages, and published in numerous editions soon after the invention of printing. The *Erbario*, a still earlier medical work, also emanated from Salerno, and was widely circulated throughout Europe. Pop. of the commune (1892) about 39,000. Revised by M. W. HARRINGTON.

Sales, FRANCIS de: See FRANCIS DE SALES.

Saleyer (sā'lī'er) **Islands**: a group of about 30 small islands situated to the S. of the island of Celebes in the East Indies; area, 265 sq. miles; pop. 57,000, consisting of Mohammedan Malays, ruled by native chiefs, but subject to the Netherlands. Cotton, coffee, sugar, pepper, and mustard are cultivated; also maize and *botta* (a kind of millet), but not rice, on account of certain superstitious ideas of the natives. Fine timber, both sandal and teak, abounds.

Salford: city; in Lancashire, England; on the west bank of the Irwell (see map of England, ref. 7–F). It practically forms one town with MANCHESTER (*q. v.*) on the east bank of the Irwell. It is connected with Manchester by 16 bridges as well as by several railway viaducts. Salford covers an area of 8 sq. miles; has 4 public parks, 4 public libraries, and a museum. It returns three members to Parliament. Pop. (1891) 198,139; (1901) 221,015.

Salians: See FRANKS.

Salica'ceæ, or **Salicin'cæ**: See WILLOW FAMILY.

Sal'icin [from Lat. *sa'lix*, *sa'licis*, willow]: a bitter crystalline principle contained in the bark of all the willows and of some poplars. Its composition is $C_{13}H_{18}O_7$. It has no alkaloid properties, like quinine, strychnine, and some other crystalline bitter principles, but is a glucoside. By the action of hot dilute acids or of the ferment EMULSIN (*q. v.*) or synaptase it breaks up into glucose and another compound called saligenin:

$$\underset{\text{Salicin.}}{C_{13}H_{18}O_7} + H_2O = \underset{\text{Glucose.}}{C_6H_{12}O_6} + \underset{\text{Saligenin.}}{C_7H_8O_2}.$$

Salicin has valuable medicinal virtues in the treatment of intermittents, though much less efficient than quinine.

Salic Law [transl. of Lat. *Lex Salica*]: the law of the Salian Franks, who established a Frankish kingdom in Gaul in the fifth century; especially that provision of the Salic code which prevents women from inheriting any landed estate which is not an acquired but inherited possession in the family. This principle was appealed to in France in the controversy between Edward III. and Philip of Valois, with respect to the inheritance of the crown; and in Spain, where previously the Visigothic law prevailed recognizing the succession of women, it was introduced by the Bourbon, Philip V., in 1713, but abolished by Ferdinand VII. in 1830 in favor of his daughter Isabella. In accordance with a similar law the crowns of Great Britain and Hanover became separate in 1837. See *Lex Salica: the Ten Texts with the Glosses and the Lex Emendation* (London, 1880).

Salicyl'ic Acid (formula $C_7H_6O_3$; *oxybenzoic* and *para-oxybenzoic* acids have the same formula): an organic acid existing in the flowers of *Spiræa ulmaria*, and in combination as acid methylsalicylate, forming the essential oil of wintergreen (*Gaultheria procumbens*).

History.—It was discovered by Piria in 1838, who formed it by oxidizing salicylol (essential oil of *Spiræa ulmaria*) with chromic acid; in 1844 Cahours obtained it from oil of wintergreen; and in 1860 Kolbe and Lautermann discovered the mode of making it from phenol (carbolic acid). In 1874 Kolbe modified and improved his original process for the manufacture from phenol, and thereby cheapened the article so much that it could be brought into use in medicine and as an antiseptic. Some chemists—Fleck, Feser, and Friedberger—have made experiments with it, in which they call in question the claims made for it as an antiseptic. *Arch. f. Wissensch. u. prakt. Thierheilkunde*, 1875, Heft. 2, 3, and 4.

Formation.—Salicylic acid may be obtained in several ways—as (1) by treatment of salicylol with an oxidizing agent, as chromic acid; (2) by fusing salicylol with caustic potassa; (3) by treating oil of wintergreen with strong potash lye, or (4) with gaseous hydriodic acid; (5) by heating a mixture of indigo and caustic potash to 300°; (6) by treating phenol (carbolic acid) with sodium and carbon dioxide, (7) with sodium and ethylchlorocarbonate, (8) with acid potassium carbonate, or (9) with caustic soda, the mixture being heated and carbon dioxide passed into it.

Preparation.—For use, salicylic acid is made from oil of wintergreen or from phenol. In making it from the former the oil is simply heated with strong potash lye until methyl alcohol ceases to be evolved. The resulting product is potassium salicylate, from which hydrochloric acid precipitates salicylic acid. This is filtered off, washed, and purified by dissolving and recrystallizing from alcohol. To prepare it from phenol, the phenol is dissolved in caustic soda, the exact equivalence of each being used (an excess of one or the other having a considerable effect on the yield obtainable), and the solution is evaporated to dryness. The mass is then placed in a retort and heated gradually, and a current of carbon dioxide passed through it at a temperature between 120° and 140° C. under pressure; or, better, the sodium compound of phenol is mixed with liquid carbon dioxide at a low temperature in an autoclave and heated to the temperature 120° to 140° C. The mass left in the retort consists of sodium salicylate, which is dissolved in water and precipitated by hydrochloric acid. It is usually brownish, on account of a resinous impurity, which may be more or less perfectly removed by resolution and recrystallization or passing the solution through bone-black.

Properties and Uses.—Salicylic acid when pure crystallizes in white four-sided prisms, which fuse at 155°–156° C. It has a sweetish-sour taste, reddens litmus strongly, is slightly soluble in cold water (in proportion of 1 part to 1,000 of water), more so in hot, still more so in alcohol, ether, and oil of turpentine. By heating with strong hydriodic or hydrochloric acid or with dilute sulphuric acid it decomposes into phenol and carbonic acid. It is a dibasic acid, forming acid and neutral salts. In very small quantities it acts as an antiseptic, and experiments have shown its efficiency in preserving wines, beer, milk, eggs, and other articles of food from the changes which unfit them for use. It can not, however, be used for milk and butter, as it gives them a peculiar taste. Experiments in the preservation of meat gave unsatisfactory results. Its action as a disinfectant is not so powerful as that of carbolic acid. When acting as an antiseptic it appears to undergo no chemical change. Its salts have no disinfecting or antiseptic properties. On account of its being odorless and less irritating than carbolic acid, and not poisonous, it has been used with advantage in surgical treatment, where it can be used for every purpose for which carbolic acid is used, except for the cleansing of instruments. In medicine, salicylic acid is used as an antipyretic, and as an internal factor as antiseptic in cases of diphtheria. The dose is from 7 to 45 grains. It is frequently dispensed in solutions of alkaline phosphates, in which it is more soluble than in pure water. Its use has been proposed in the manufacture of glue, leather, etc., of perfumery, and as a dye in connection with iron salts, with which it gives a fine purple. It has been used with great success as a remedy in the case of certain diseases that affect bees. It has come into extensive use in the manufacture of dyestuffs. Certain azo-colors obtained by its use are much prized as yellow and orange dyes. Revised by IRA REMSEN.

Sali'da: city; Chaffee co., Col.; on the Denver and Rio Grande Railroad; 56 miles W. of Cañon City, 97 miles N. by W. of Pueblo (for location, see map of Colorado, ref. 4–D). It is in a region in which gold, silver, copper, lead, and iron are mined, and marble, onyx, and lime are quarried; has large stock-raising interests; and contains 6 churches, the Rio Grande General Hospital, extensive railway-shops, a public high school, Salida Academy (Presbyterian, opened in 1884), a national bank with capital of $50,000, and a semi-weekly, a weekly, and a monthly periodical. Pop. (1880) not in census; (1890) 2,586; (1900) 3,722.

EDITOR OF "MAIL."

Salien'tia [Mod. Lat., from Lat. *sa'liens*, neut. plur. *salien'tia*, pres. partic. of *sali're*, leap]: that order of BATRACHIA (*q. v.*) which contains the frogs and toads, and which, from the fact that in the adults the tail is lacking, is better known as *Anura*. In the larval (tadpole) stage gills and tail are present, while legs are absent. With growth the gills and tail are absorbed (the tail is not dropped as is often supposed), and the legs grow out, the fore legs being the first to form, although owing to the fact that they are covered by a fold of the skin they do not appear until after the hinder pair. With the loss of the gills the lungs begin to function, and these are supplemented by the skin. In the

adult the following skeletal peculiarities may be mentioned: Ribs as a rule are lacking, their place being taken by the transverse processes of the few (usually ten) vertebræ. The caudal vertebræ have been replaced by a bony rod (urostyle). The skull is very complex; the ethmoid bone is in the shape of a girdle (*os en ceinture*) around the cerebrum, and the quadrato-jugal arch is usually complete. Teeth never occur in the lower jaw, and they may be lacking from the upper one. Pectoral and pelvic girdles are always present, and the two halves of the former may either be firmly united or they may play one over the other, differences seized upon by Prof. Cope to divide the otherwise homogeneous order into two subdivisions. The skin is naked (i. e. without plates or scales), but it is not infrequently "warty," from the presence of large defensive glands which secrete an acrid fluid. In all except a few tropical forms a tongue is present, and is used in capturing the prey, which consists to a large extent of insects.

Some of the *Salientia* are aquatic (frogs), some (toads) are terrestrial, going into the water only for the purpose of oviposition in the spring, and still others (tree-toads) live in trees and bushes, and have the tips of the toes modified into sucking-disks to insure a firm hold upon the branches upon which they dwell. All of the *Salientia* have vocal organs, but these are most exercised at the time of reproduction. Most interesting are some of the reproductive habits. The eggs are laid in gelatinous strings or masses, usually deposited freely in the water. In the case of the obstetrical toad of Europe the male wraps the egg-strings around himself. In the members of the genus *Nototrema* of South America the skin of the back becomes folded into a sac in which the eggs are carried until hatched. In the Surinam toad (*Pipa*) the eggs are received upon the back of the male, the skin of which grows up around the separate eggs until each is inclosed in a cup and covered with a lid of skin. In these cups the eggs develop until they have obtained the adult form, when they escape to begin free life.

None of the *Salientia* is marine. Their great home is in the tropics. The typical toads are especially developed in tropical America, Africa, and Asia; the true tree-frogs and related forms are most abundant in Australia and tropical America; and the typical frogs are most numerous in tropical Asia and Africa, while they are entirely excluded from Australia. Comparatively little is known of their geological history, but frogs and toads have been found in the Upper Eocene of Europe.

LITERATURE.—Ecker, *Anatomie des Frosches* (1864–82); Boulenger, *Catalogue of the Batrachia Salientia in British Museum* (London, 1882); Cope, *Batrachia of North America* (1889).

J. S. KINGSLEY.

Saligenin: See SALICIN.

Sali'na: city; capital of Saline co., Kan.; on the Smoky Hill river, and the Ateh., Top. and S. Fé, the Chi., Rock Is. and Pac., the Mo. Pac., and the Union Pac. railways; 47 miles W. of Junction City, 118 miles W. of Topeka, the State capital (for location, see map of Kansas, ref. 5–G). It derives power for manufacturing from the river, has 5 grain elevators, flour-mills, paper-mills, and planing-mills, foundry and machine shops, gas, water, and electric-light plants, and street-railways, and contains 16 churches, 5 public schools, Kansas Wesleyan University (Methodist Episcopal, chartered in 1885), Normal University, St. John's School (Protestant Episcopal), 3 national banks with combined capital of $250,000, a State bank with capital of $50,000, and a daily, 5 weekly, and 3 monthly periodicals. There are valuable salt-springs and gypsum-quarries in the vicinity. Pop. (1880) 3,111; (1890) 6,149; (1900) 6,074.

EDITOR OF "REPUBLICAN JOURNAL."

Salina Group: an American geological formation of Upper Silurian age, otherwise known as the Onondaga salt group. It consists of red and green shales and impure limestone, containing large masses of gypsum, and is best developed in Central New York, where it is about 1,000 feet thick and forms an east-and-west belt averaging about 10 miles broad, passing through Syracuse. It is the source of brine from which 8,000,000 to 12,000,000 bush. of salt are made annually.

I. C. R.

Sali'nan Indians: a linguistic stock of North American Indians deriving its name from the Salinas river, California, in the main and tributary valleys of which, in Monterey and San Luis Obispo Counties, they formerly resided. It is represented by a single known tribe, the Chalone, whose villages were Aspasniagan, Chulare, Ekgiagan, Eslanagan, Gocharone, Ichenta, and Yumanagan. These settlements supplied the neophytes of the missions of San Antonio and San Miguel, established by the Spanish padres in 1771 and 1797 respectively. A large proportion of the natives connected with the Soledad mission, founded in 1791, also belonged to this family, and some of the Aspasniagan were neophytes of the mission of San Carlos.

In their general habits and customs the Salinan Indians resembled the Costanoan, Esselenian, Mariposan, and other southern Central California tribes. By Galiano, in 1792, they were described as of medium size, dark color, and as being the ugliest and filthiest of the natives of America. They led in part an agricultural and pastoral life. Their houses were circular and were constructed of stones or adobes and roofed with thatch.

Though the San Antonio and San Miguel tribes were probably never very populous, the missions bearing those names when first established contained respectively 1,400 and 1,200 Indians. In 1884 only a dozen Indians of the Salinan group were known to survive.

AUTHORITIES.—D. A. Galiano, *Viaje por las goletas Sutil y Mexicana en 1792* (Madrid, 1802); Alexander S. Taylor, *Indianology of California*, in *California Farmer* (San Francisco, 1860–63); H. H. Bancroft, *History of California*, vols. i.–vii. (San Francisco, 1884–90); H. W. Henshaw, *Missions of California*, in *Popular Science Monthly* (Aug., 1890); J. W. Powell, *Indian Linguistic Families*, seventh report Bureau of Ethnology (Washington, 1891). See INDIANS OF NORTH AMERICA.

F. W. HODGE.

Sali'nas: city; capital of Monterey co., Cal.; on the Southern Pacific Railroad; 94 miles S. E. of San Francisco (for location, see map of California, ref. 9–C). It is in an agricultural, stock-raising, and wool-growing region, and has 6 churches, a public high school, 2 State banks with combined capital of $420,000, 2 agricultural-implement factories, a large beet-sugar refinery, electric lights, and 2 daily and 2 weekly newspapers. Pop. (1880) 1,854; (1890) 2,339; (1900) 3,304.

EDITOR OF "JOURNAL."

Saline'ville: village; Columbiana co., O.; on the Penn. Railroad; 30 miles S. S. E. of Alliance, 63 miles W. N. W. of Pittsburg (for location, see map of Ohio, ref. 3–J). It is in a coal-mining region, and contains a private bank and a weekly newspaper. Pop. (1890) 2,369; (1900) 2,353.

Salinometer: a form of HYDROMETER (*q. v.*) for measuring the amount of salt in a given solution.

Salisbury, sawlz'berry, or **New Sarum**: capital of Wiltshire, England; in a valley near the confluence of the Avon, Bourne, Wily, and Nadder; 84 miles W. S. W. of London (see map of England, ref. 13–H). It has a magnificent cathedral, which is the purest and richest specimen of the Early English style. The main building was constructed 1220–58 in the form of a double cross. The cloisters and chapter-house were added in 1270, and the spire, the highest in England (400 feet), was erected about 1330; it leans over 2 feet toward the S. It is 449 feet long and 81 feet high in the interior; the length of the great transept is 203 feet. It was much damaged by injudicious restoration (1782–91), but this has been considerably remedied by a restoration begun by Sir Gilbert Scott in 1863, and continued afterward by Street and Sir Arthur Blomfield. Old Sarum (*Sorbiodunum*), in Roman times a camp of importance, stood about a mile N. of the present city. It consists of a conical hill encircled with intrenchments. Salisbury returns one member to Parliament. Pop. (1891) 17,362.

R. A. ROBERTS.

Salisbury: township (settled about 1720, organized in 1740); Litchfield co., Conn.; on the Housatonic river, and the Phila., Reading and New Eng. Railroad; 63 miles N. W. of Hartford (for location, see map of Connecticut, ref. 7–D). It contains the villages of Salisbury, Lakeville, and Lime Rock, 7 churches, public schools, kindergartens, a parochial school, Scoville Memorial Library, Connecticut School for Imbeciles, St. Mary's Convent, Hotchkiss School, a savings society, and a private bank. It is picturesquely located and has 6 large lakes and a variety of mountain scenery. Salisbury contains iron mines (yielding the widely known Salisbury ore), blast furnaces, car-wheel works, and cutlery and cutlery-handle factories. The assessed valuation of the township is about $1,800,000. Pop. (1880) 3,715; (1890) 3,420; (1900) 3,489.

DONALD T. WARNER.

Salisbury: town; capital of Wicomico co., Md.; on the Wicomico river, and the Balt. and E. Shore and the N. Y., Phila. and Norfolk railways; 95 miles S. E. of Annapolis, the State capital, 140 miles S. E. of Baltimore (for location,

see map of Maryland, ref. 4–G). It has a large coasting and inland trade; exports lumber, grain, fruit, and vegetables; and has several saw and planing mills, the largest yellow pine box-factories in the U. S. (using 50,000,000 feet of lumber annually in making cases for petroleum oil), flour-mills, and a wool-carding mill. It has a national bank with capital of $50,000, a State bank with capital of $50,000, and a monthly and two weekly periodicals. Pop. (1880) 2,581; (1890) 2,905; (1900) 4,277. EDITOR OF "ADVERTISER."

Salisbury: city; capital of Rowan co., N. C.; on the Southern Railway; 44 miles N. N. E. of Charlotte, 131 miles W. of Raleigh, the State capital (for location, see map of North Carolina, ref. 3–E). It is in an agricultural and mining region, is the seat of Livingstone College (African Methodist Episcopal Zion, chartered in 1879), and of a State normal school for colored pupils, and has a national bank, a State bank, a monthly and four weekly periodicals, several tobacco-factories, tanneries, foundries and machine-shops, the workshops of the Southern Railway, a woolen-mill, etc. Pop. (1880) 2,723; (1890) 4,418; (1900) 6,277.

Salisbury, EDWARD ELBRIDGE, LL. D.: philologist; b. in Boston, Mass., Apr. 6, 1814; graduated at Yale College 1832; studied theology there; studied Oriental languages in Paris and Berlin; Professor of Arabic and Sanskrit in Yale College 1841–54, and of Arabic alone for several years later; was one of the founders of the American Oriental Society, editor of and leading contributor to its *Journal*, and endowed the professorship of Sanskrit in Yale College.

Salisbury, MARQUISES OF, EARLS OF, VISCOUNTS CRANBORNE (1604), and BARONS CECIL (1603): a prominent family of the British nobility. The earldom of Salisbury was first held by William Longespée, a Norman noble (d. 1226), afterward by the Montacute family, of which Thomas, the fourth and last earl, was distinguished in the wars against France (d. 1428). The title was conferred anew upon Sir Richard Neville on his marriage to Alice Montacute, daughter of Thomas (1442). This nobleman was a prominent Yorkist leader, gained the victory of Bloreheath 1459, and was beheaded at Pontefract Jan. 1, 1461, by order of Queen Margaret, the day after the battle of Wakefield, in which he was taken prisoner. Subsequently, the title was borne by Margaret Plantagenet, mother of Cardinal Pole, who was beheaded as a pretender to the crown 1541.—ROBERT CECIL: the famous Secretary of State to Queen Elizabeth; b. in 1550; continued the policy of his father, Lord Burleigh, devoting much attention to the domestic interests of the country, and in foreign affairs striving to prevent Spain from gaining an undue ascendency. He is noted as the enemy of Essex and of Raleigh, and seems to have felt an unworthy jealousy of his cousin, Lord Bacon. He was made Earl of Salisbury May 4, 1605, and the title still remains in his family, the marquisate having been added in 1787.

Salisbury, ROBERT ARTHUR TALBOT GASCOYNE CECIL, Marquis of, K. G.: statesman; b. at Hatfield, England, Feb. 10, 1830; educated at Eton; graduated at Oxford; sat in Parliament for Stamford, first as Lord Robert Cecil, and later as Viscount Cranborne, from Aug., 1853, until his accession to the marquisate Apr. 12, 1868; became Secretary of State for India in Earl Derby's third administration July, 1866; resigned Mar. 2, 1867, in consequence of unwillingness to support the Reform Bill, and accepted the same post in Disraeli's second administration Feb., 1874; succeeded Lord Derby as Minister of Foreign Affairs in May, 1878; was one of the British plenipotentiaries at the Congress of Berlin. For the next six years he maintained a vigorous opposition to Gladstone and succeeded in checking the Liberals in their Irish policy. From June to Nov., 1885, he was Prime Minister and Secretary of State for Foreign Affairs, and again from Aug., 1886, to Aug., 1892, when the question of Irish Home Rule wrecked both the ministry and the party. On the defeat of the Roseberry Government in June, 1895, the premiership fell once more to Lord Salisbury, who formed a strong coalition ministry, in which many prominent Liberal-Unionists found places. A vigorous foreign policy and a strict enforcement of the law in Ireland as elsewhere have characterized all his administrations.

Sa'lishan Indians [*sälst*, from which the term Salish is derived, is the Okanagan term for "people"]: name originally applied to a division of a linguistic family of the northwestern coast of North America, but subsequently employed in the more comprehensive family sense. They are also (wrongly) called Selish or Salish, and Flatheads.

Tribes.—Very little is known of the social and political divisions of this stock. There appears to have been nothing among them answering to the extensive political leagues and confederacies of eastern American Indians. A tentative list of the divisions contains the names of fifty-eight tribes, including the Bellacoola or Bilqula, Calispel, Chehalis, Colville, Cowlitz, Lummi, Nanaimo, Nestucca, Nisqualli, Okanagan, Puyallup, Skagit, Skitsuish or Cœur d'Alene, Spokane, and Tillamook.

Habitat.—Recent investigations establish the habitat of the Salishan stock as follows: The most southern outposts of the family, the Nestucca and Tillamook, were on the coast of Oregon about 50 miles S. of Columbia river, where they were separated from their northern kindred by Chinookan tribes. Beginning on the northern side of Shoalwater Bay, Salishan tribes held the entire northwestern part of Washington, including all the Puget Sound region save a few insignificant spots. Eastern Vancouver Island to about midway its length was also held by Salishan tribes, while the great bulk of their territory lay on the mainland opposite and including much of the upper Columbia. On the S. they were hemmed in mainly by the Shahaptian tribes. On the E. they dwelt to a little beyond the Arrow Lakes and their inlet, one of the extreme north forks of the Columbia. On the S. E. tribes of this family extended into Montana, including the upper Columbia drainage. On the N. E. Salishan territory extended to about lat. 53° N.; in the N. W. it did not reach the Chilcotin river, except in an isolated spot occupied by the Bilqula on Dean Inlet and Bentinck Arm. See INDIANS OF NORTH AMERICA.

General Characteristics.—The widespread bands of the Salishan people show many varieties of character, as might be expected in the septs of that which Hale says "is evidently a mixed race." The majority are industrious, and readily adapt themselves to the new conditions of their present life. The language is split into a great number of dialects, many of which are doubtless mutually unintelligible. Evidences of radical affinity between this family and the Wakashan have been discovered by Boas and Gatschet.

Population.—The total Salishan population of British Columbia is 12,325. Most of the Salishan tribes in the U. S. are on reservations in the State of Washington. They number about 5,500. JAMES OWEN DORSEY.

Saliva [from Lat. *sali'va*, slime, spittle, saliva; cf. Gr. σίαλον, spittle, and Sanskr. *kṣiv-*, spit. The Latin word is possibly a folk-etymological corruption of **kṣīvala*]: the liquid secretion of the mouth. It comes from several glands secreting different liquids. Though numerous interesting facts are known about it, its chemistry can not be regarded as completely studied. It has an alkaline reaction, and contains an albuminoid ferment called ptyaline, which has the power of converting starch into sugar, thus assisting in its digestion. For this reason it is claimed that young infants, whose lack of teeth renders mastication impossible, and who swallow their food without admixture with saliva, should not be fed upon starchy food, such as arrowroot, which to them proves indigestible. On the other hand, it is asserted that ptyaline acts only in alkaline liquids, and that in the acid liquid of the stomach it is therefore inert. Saliva, very curiously, contains sulphocyanide of potassium in minute proportion, but readily detectable by a ferric salt. It contains about 1 per cent. of solid matter, of which as much as one-fifth in some cases is made up of saline substances. The amount of saliva secreted *per diem* varies widely in different persons and in the same person at different times. Revised by IRA REMSEN.

Salivary Glands [*salivary* is from Lat. *saliva'rius*, slimy, deriv. of *sali'va*, slime, spittle]: the glands which secrete saliva. In man they are essentially three in number on each side: (1) the parotid, the largest, situated beneath the integument and immediately below the ear; (2) the sub-maxillary, beneath the lower jaw; (3) the sub-lingual, under the tongue. These glands are composed of a number of sections or lobes of polygonal shape and flattened sides, the result of coaptation and pressure. The structure is termed *racemose*, from its resemblance to that of a bunch of grapes. (See HISTOLOGY, *The Digestive Organs.*) The tree or stem-like framework upon which the glandular lobes are set is a system of excretory tubules, which take up the saliva secreted by the gland, and the trunk is a common duct conveying it through the deep tissues to the surface of the mouth. The names of eminent anatomists are commemorated in the designation of these ducts, which they

discovered. The parotid has one large duct, the duct of Steno; the sub-maxillary, the duct of Wharton; the sublingual—from eight to twenty minute ducts opening independently beneath the tongue—the ducts of Rivinius; and a few uniting to form a single duct, the duct of Bartholine, which joins that of Wharton. These ducts, their branches, and the interior of the glands are lined with epithelial cells. The process of secretion, more or less constant, is most active during the mastication of food; then saliva is abundantly formed and poured into the mouth. The salivary glands are the seat of disease—mumps or parotiditis, a specific inflammation (see MUMPS) of the parotid; inflammation and abscess of the parotid in low fevers; deposits of diphtheritic infiltration in some cases of that disease; not infrequently concretions of chalky matter form in the glands. Revised by W. PEPPER.

Salivation [from Lat. *saliva'tio*, deriv. of *salivare*, *saliva'tus*, to spit, salivate, deriv. of *sali'va*]: a specific irritation of the salivary glands, mouth, and throat. Though most frequently due to mercury, it may be caused by other drugs, as iodine, and may occur in certain diseases. In former years mercury, in heroic doses, ranked as a remedy second only to bloodletting. Salivation, though now rare, was then a frequent occurrence—intentionally produced in many cases, in others the accidental result of large doses and individual susceptibility. Children will endure large doses of mercurials without salivation; adults are relatively susceptible. An active state of the skin, kidneys, and bowels, and a healthy state of the mouth, favor immunity from salivation, even when the mercurial taken is considerable; reversely, if opium or any remedy which checks the functional excretions be taken before or at the same time, even small doses of mercury may salivate. Salivation is manifested by a coppery or metallic taste, by soreness of the gums, tenderness of the jaws and teeth when pressed together or closed with force, excessive secretion and flow of saliva, even dribbling from the mouth; swollen, red, ulcerated gums; swollen, coated, salvy tongue, taking the imprint of the teeth; and a foul "mercurial" breath. In grave cases, spongy, bleeding, sloughing gums, loosened teeth, swelling of the face and neck, and even gangrene of the mouth, may result. There is accompanying constitutional depression, fever, pain, and sleeplessness. Revised by W. PEPPER.

Sal'lust (*Gaius Sallustius Crispus*): historian; b. 86 B. C. at Amiternum, in the country of the Sabines, of a wealthy plebeian family; elected *tribunus plebis* in 52; expelled from the senate in 50 by the censors on account of the dissipated and scandalous life he led; reinstated in the senatorial dignity in 49 by being elected quæstor by the aid of Cæsar, to whose party he belonged, and whom he as prætor accompanied to Africa in 46; was appointed proconsul of Numidia, and returned to Rome loaded with riches; formed the magnificent *Horti Sallustiani* on the Quirinalis, and lived in luxurious retirement, devoting himself to the study of history. D. at Rome, 34 B. C. Of his *Historiarum Libri Quinque* only fragments are extant, but his *Bellum Catilinarium* and *Bellum Jugurthinum* have been preserved, and are much appreciated. Editions by Gerlach (3 vols., Basel, 1823–31), Dietsch (2 vols., Leipzig, 1859), Kritz (3 vols., 1828–53); English translations by Sir H. Steuart (1806), by Watson (1852), and by J. R. Mongan (1864). New fragments of the histories were discovered in 1886 by E. Hauler in an Orleans palimpsest; see *Wiener Studien* (viii., p. 315, and ix., p. 25), and the edition of H. Jordan (Berlin, 1887); also *Sallusti historiarum reliquiæ*, ed. B. Maurenbrecher (fasc. i., Leipzig, 1891; fasc. ii., 1893).
Revised by M. WARREN.

Salma'sius, CLAUDIUS (*Claude de Saumaise*): classical scholar; b. at Semur-en-Auxois, Côte-d'Or, France, Apr. 15, 1588; studied at Paris and Heidelberg; embraced Protestantism; was appointed professor at the University of Leyden in 1631. The ambition of his wife, theological controversies, and above all the scandal caused by his *Defensio regia pro Carolo I.* (1649), which called forth the memorable reply of Milton, induced him to accept a flattering invitation from Queen Christina of Sweden (1650). The climate did not agree with him, and the inhabitants of Leyden urged him to return, because "their university could as little be without him as the universe without the sun." He left Stockholm in 1651, but died Sept. 3, 1653, at Spa. Salmasius is one of the great encyclopædists of his time, the high esteem in which he was held being well attested by Balsac's famous saying, "Non homini sed scientiæ deest quod nescivit Salmasius"; but, unlike his illustrious contemporaries, Scaliger, Casaubon, and Lipsius, his immense erudition was not kept under control, and in consequence his numerous works present a confused mass of learned detail, accumulated without regard to methodical arrangement and clearness of exposition. As a text critic, Salmasius never occupied any high rank. In 1606 he discovered in Heidelberg the Greek *Anthology* of Kephalas, only the so-called *Anthologia Planudea* having been known up to that time. His most famous works are his *Plinianæ exercitationes in Solinum* (1629) and a critical edition of the *Scriptores Historiæ Augustæ* (1620), to which may be added the learned treatises *De lingua hellenistica* (1643), *De usuris*, and *De re militari Romanorum* (1657). See Fr. Crenzer, *Opuscula II.* (pp. 65–75); Saxe, *Onomasticon IV.* (pp. 1888 ff.).
ALFRED GUDEMAN.

Salmon [viâ O. Fr. from Lat. *sal'mo*, *salmo'nis*, salmon; cf. *sali're*, to leap]: a name given to several species of the genus *Salmo* of the Atlantic, characterized by anadromous habits (that is, by their ascending from the sea into fresh waters to breed), as well as to the species of the genus *Oncorhynchus* of the Pacific. The species belonging to the genus *Salmo* have only about eleven rays to the anal fin,

The Atlantic salmon.

while those of the genus *Oncorhynchus* have fourteen to eighteen. All of these agree essentially in habits. Their natural home is the salt water, for there they obtain their food and rapidly increase in size; toward autumn they ascend rivers, as near as possible to the source, to spawn. During their sojourn in fresh water they almost entirely abstain from food and alter considerably in appearance; this divergence from the normal form is most apparent in the male. The snout becomes attenuated and more or less hooked, and the lower jaw is modified in a similar manner; the body becomes emaciated, and the skin decked with glowing hectic colors. In the salmon of Europe and Eastern America this is temporary, and the males in considerable proportion descend to the sea, revive, and assume their pristine vigor and form. Some of the species of the genus *Oncorhynchus* of the Pacific coast become so abnormally developed that after spawning they die, and their carcasses are left by myriads in the waters they have traversed.

Salmo salar is common to the cold waters of Europe and North America. In the U. S. it is nowhere abundant except in some rivers of Maine, although in British America there are a number of streams in which it is found in large numbers. It is generally believed that in former times, and when the country was discovered by Europeans, the species was found farther S., and Hendrik Hudson, in the journal of his ascent of the river which bears his name, records "great stores of salmon in the river." It is tolerably certain, however, that the fish called by him *salmon* was the weakfish (*Cynoscion regalis*), of the family *Sciænidæ*, having no relation to the *Salmonidæ*. The salmon-rivers of Canada are controlled by the Government and let for private use.

The extreme young is banded, and also has red spots. In this state it was long known under the name of *parr*, and supposed to represent a distinct species of the family. Other names are samlet, salmon-fry, and pink. When about a year old, and when the spots have disappeared and it becomes of a bright silvery color before going to the sea, it is called a *smolt*; after its return from the sea into fresh water it is designated as a *grilse*; and finally, on its second return from the sea, it is known as a *salmon*.

Oncorhynchus quinnat is the common salmon, king-salmon, or quinnat, of California and farther N.; it is a much deeper fish than the Eastern species, and is, further, at once distinguishable by the greater number of anal rays—fifteen or sixteen generally. This species will live and flourish in much

warmer waters than the Eastern species, and attempts have been made to introduce it into the streams of the Eastern U. S. It has also been attempted, on a small scale, to introduce the Atlantic species into Pacific waters. The humpback (*O. gorbuscha*) and the blueback (*O. nerka*) are also commercially important. An extensive business has been developed in the canning of these salmon, and this is conducted on a large scale on the Columbia river and in Alaska. For statistics of salmon-fishing, see FISHERIES. See also FISH-CULTURE and PISCICULTURE. Revised by J. S. KINGSLEY.

Salmon, GEORGE, D. D.: mathematician and theologian; b. in Dublin, Ireland, Sept. 25, 1819; was educated in Trinity College, Dublin, and graduated in 1839; became a fellow in 1841; took orders in 1844; was made Regius Professor of Divinity in 1866, and was appointed provost of Trinity College in 1888. He is a fellow of the Royal Society, has obtained honorary degrees from Oxford, Cambridge, and Edinburgh Universities, and is a correspondent of the academies of Berlin and Copenhagen, and of the Institute of France. Besides a number of memoirs in the mathematical journals, he has written treatises on *Conic Sections*, *The Higher Plane Curves*, *Modern Higher Algebra*, and *The Geometry of Three Dimensions*. These have passed through many editions and been translated into the principal European languages. In theology Dr. Salmon has written *College Sermons* (1861); *The Reign of Law* (1873); *Non-miraculous Christianity* (1881); *Gnosticism and Agnosticism* (1887); *Introduction to the New Testament* (4th ed. 1890); and *Infallibility of the Church* (1888). R. A. ROBERTS.

Salmond, STEWART DINGWALL FORDYCE, D. D.: educator; b. at Aberdeen, Scotland, June 22, 1838; educated at the University and Free Church College of Aberdeen and University of Erlangen, Bavaria; Assistant Professor of Greek in the University of Aberdeen 1861–64, and examiner in Classics 1864–67; minister of the Free Church, Barry, Forfarshire, 1865–76; since 1876 Professor of Systematic Theology and New Testament Exegesis in Free Church College, Aberdeen. Besides contributing frequently to periodicals, Dr. Salmond translated with notes for the Ante-Nicene Library the writings of *Hippolytus* (Edinburgh, 1868–69); *Julius Africanus*, *Theognostus*, and minor writers (1869); *Thaumaturgus*, *Dionysius of Alexandria*, and *Archelaus* (1871); two volumes of *Augustine's Works* (1873), all the above revised and re-edited in New York; *Commentary on the Epistle of Peter* in *Schaff's Popular Commentary* (Edinburgh and New York, 1883); *Commentary on the Epistle of Jude* in *Pulpit Commentary* (London and New York, 1889); edited the *Bible Class Primers*, for which he wrote *The Life of the Apostle Peter*, *The Shorter Catechism*, *The Life of Christ*, *The Parables of our Lord*, *Our Christian Passover*, *The Sabbath* (Edinburgh, 1880–94); wrote *The Christian Doctrine of Immortality* (Edinburgh, 1894); since 1891 has been editor of *The Critical Review of Theological and Philosophical Literature* (Edinburgh).
C. K. HOYT.

Salmo'neus (in Gr. Σαλμωνεύς): in Grecian mythology, son of Æolus, the founder of the Æolic race. He emigrated from Thessaly to Elis, where he founded the city Salmone. He boasted himself the equal of Zeus, usurped his functions, and attempted to imitate the thunder and lightning. He was therefore slain by the bolt of Zeus, who also destroyed Salmone. J. R. S. S.

Salmon'idæ [Mod. Lat., named from *Sal'mo*, *Salmo'nis*, the typical genus, from Lat. *sal'mo*, salmon. See SALMON]: one of the most important families of fishes, containing the salmon, trout, whitefishes, etc., alike famous for their gameness and for their food qualities. All have an elongate, fusiform body covered with moderate or small cycloid scales, and having a distinct lateral line. The head is conical in outline, lacks barbels, and is covered with a naked skin. The upper jaw is composed of inter-maxillary and supra-maxillary bones, and the teeth are large and conical in the *Salmones*, small or wanting in the whitefishes (*Coregonus*). The branchiostegal rays are numerous, and pseudobranchiæ are present. The true dorsal fin is at about the middle of the body, and a small adipose dorsal occurs far behind. The caudal fin is square or concave on the end, never convex. The stomach is siphonal, and 15 to 200 pyloric cæca are present; the large simple air-bladder is connected with the alimentary canal. No oviducts are present, but the eggs are discharged into the body-cavity, from which they are directly extruded through the porus genitalis.

The family thus limited contains about eighty species arranged in ten genera, of which *Salmo*, *Oncorhynchus*, *Salvelinus*, and *Coregonus* are the most important. The first three mentioned form the *Salmones* of the older authors, and contain the forms commonly known as salmon, trout, and charr, the limitations of the genera being upon minute characters, and those of the forms to which the common names are given extremely vague. The genus *Oncorhynchus* includes the Pacific coast salmon, five species in all. The genus *Salmo* includes the salmon of Europe and Eastern North America, and the true trout as well, while *Salvelinus* contains the red-spotted trout or charr. *Oncorhynchus* and *Salmo* agree in most features, notably in having the whole vomer covered with teeth, while they differ in that *Salmo* has fourteen or less rays in the anal fin, while in the Pacific salmon the number is greater than fourteen. *Salvelinus*, of which the brook-trout of North America may be taken as an example, has teeth only on the head of the vomer. Those members of the genus *Salmo* which normally live in fresh water are the true trout. J. S. KINGSLEY.

Salmon-trout: See TROUT.

Salm-Salm, FELIX, Prince: soldier; b. at Anholt, Prussia, Dec. 25, 1828; educated at the cadet school in Berlin; became an officer in the Prussian cavalry, and subsequently served in the Austrian army; served in the U. S. army during the civil war; was at one time in command of a regiment, and afterward post-commander at Atlanta, Ga., with the rank of brigadier; went to Mexico at the close of the war; became aide-de-camp and chief of the household to the Archduke Maximilian, with whom he was captured at Querétaro; was released soon after the execution of the latter; entered the Prussian service as major of the Fourth Regiment of grenadiers of the royal guard, and was killed at the battle of Gravelotte, France, Aug. 18, 1870.—He married in 1862, Mlle. AGNES LE CLERCQ, a native of Baltimore and an actress by profession. She accompanied him in Mexico, and acquired celebrity by her heroic efforts to procure the pardon of Maximilian or to effect his escape. She accompanied her husband during the Franco-German campaign up to his death. She published portions of her own and of her husband's diaries in Mexico, and issued in 1875 an interesting volume, *Ten Years of My Life*.

Saloff, BASILE, de: civil engineer; b. in Russia, Oct. 21, 1839; graduated in 1858 from the Institute of Ways of Communication, and entered directly the Russian Corps of Engineers of Ways of Communication; was engaged upon the construction of the railways of the Grande Company until 1862; was then sent abroad and took the course at the École des Ponts et Chaussées in Paris. From 1863 to 1871 he was Professor of the Course of Seaports in the Institute of Ways of Communication; in 1872 became president of the technical commission on railways; in 1873 councilor of state and member of the jury of the Universal Exposition of Vienna; in 1877 was elected director of the Grande Company of Russian Railways and president of the Maritime Canal of St. Petersburg, which position he held until the completion of the canal in 1885. In 1887 he became director-general of railways; in 1889 member of the councils on railways and of the council of engineers.
WILLIAM R. HUTTON.

Salol: a substance sometimes called the salicylate of phenol, introduced into medicine in 1886. It is a compound of salicylic and carbolic acids in the proportion of 60 per cent. of the former to 40 per cent. of the latter. It occurs as a white, crystalline powder, with a faint odor and a slightly soapy taste, and when taken in the body is not dissolved in the stomach, but in the alkaline pancreatic juice of the duodenum. It has been used in the treatment of rheumatism and allied affections with some success, and also as an intestinal antiseptic in cholera and other disorders of the alimentary canal. H. A. HARE.

Salomon', LOUIS ÉTIENNE FÉLICITÉ: general and politician; b. at Aux Cayes, Haiti, 1820. He was a Negro; was one of Soulouque's ministers, and commanded his army from 1855 to 1859, when Soulouque was deposed and Salomon fled from the island. After various attempts to incite revolts he returned to Haiti in 1879, and was elected president, governing until Aug., 1888, when he was deposed by a revolution. The republic during this period was unusually prosperous. D. in Paris, Oct. 19, 1888. H. H. S.

Salomon Islands: See SOLOMON ISLANDS.

Salo'na: the ancient capital of the Roman province of Dalmatia, and a city of great importance in both commercial

and military respects. The Emperor Diocletian was born here, and 3 miles to the S. W. he built in 303 A. D. the famous palace, covering 8 acres, to which he retired after his abdication. The city and the palace were destroyed in 641 by the Avars, but on the site of the palace and out of its ruins arose the modern town of Spalato—*Salonæ Palatium*. See SPALATO. Revised by M. W. HARRINGTON.

Saloni'ca [Turk. *Selanik*, anc. Θεσσαλονίκη, Thessalonica, whence the modern name]: city; capital of the Ottoman vilayet of Saloniea, which nearly corresponds to the ancient Macedonia (see map of Turkey, ref. 4–B). It occupies a most advantageous site on the Ægean, rising amphitheatrically on Mt. Kortiaseh from the northeast shore of a fine harbor of the Gulf of Salonica. It was rebuilt on the site of a city named Therma by Cassander, who named it Thessaloniea in honor of his wife, the sister of Alexander the Great; after the battle of Pydna (168 B. C.) it became capital of the Roman province of Macedonia; 15,000 citizens were massacred by order of Theodosius (390); it was pillaged by the Saraeens (904); taken by the Marquis of Montferrat (1204), who founded the empire of Salonica; and conquered by the Ottomans (1430). The massacre of two foreign consuls by a Mussulman mob on May 6, 1876, contributed to bring on the Russo-Turkish war. As the chief station on the Via Egnatia, which connected the eastern provinces with Rome, it was to St. Paul a center for the dissemination of Christianity, and to it he addressed two epistles. It was called for centuries the Orthodox City, and was largely instrumental in the conversion of the Bulgarians and Slavonians. Along its narrow and crooked streets many architectural monuments are seen. Among them are a hippodrome; a colonnade built by Nero; an arch of triumph with the names of the seven politarchs; an arch of Constantine, erected after his victory over Licinius; many churches, little subsequent to Constantine, exceedingly rich in mosaics, as St. George or the Rotunda (Orta Sultan Osman Djami), St. Demetrius (Kassim Djami), St. Sophia or the cathedral (Aya Sophia); also the mediæval city walls, built on cyclopean foundations. Salonica is the terminus of a trans-European railway, of several highways which traverse the entire vilayet, and, next to Constantinople, is the chief outlet to the commerce of European Turkey. Many European and Ottoman steamship lines touch here regularly. The bazaar is a rambling, antique building, but the scene of great activity. Pop. (1890) 122,000, of whom more than half are Jews, the rest being chiefly Greeks and Ottomans. The inhabitants are industrious and enterprising, and maintain good schools, literary societies and clubs, and a museum. Saloniea has manufactories of morocco leather, silk and cotton, and it exports grain, cotton, wool, hemp, skins, opium, wine, and especially tobacco, that called Yenidji being esteemed the finest raised in Turkey.

E. A. GROSVENOR.

Salop: See SHROPSHIRE.

Salpa [Mod. Lat., from Lat. *sal'pa* = Gr. *σάλπη*, a kind of stockfish]: a genus of *Tunicata* in which the body is barrel-shaped, with an opening at either end. They are found floating freely in the ocean. In the life-history there is an ALTERNATION OF GENERATIONS (*q. v.*), first noticed by the poet Chamisso. In one generation the individuals are free, and inside of each grows a long coil of embryos. This escapes later, and, remaining entire, forms the chain stage in which the salpæ, placed side by side, form a chain or band, each individual containing an egg which is to grow into one of the single or solitary forms. For structural features, see TUNICATA. See also Brooks, *The Genus Salpa* (Baltimore, 1893). J. S. KINGSLEY.

Salset'te: an island of British India (area, 240 sq. miles; pop. about 110,000), connected with the island of Bombay by a causeway and a stone bridge, and famous for the immense rock-cut cave-temples found at Kenery in the center of the island and at several other places. There are many rice-fields and palm-trees. The island was held by the Portuguese from early in the sixteenth century till 1739.

Salsify, Oyster-plant, or **Vegetable Oyster** [*salsify* is from Fr. *salsifis* < O. Fr. *sercifi*; cf. Ital. *sassefrica*; *sasso* (< Lat. *sa'xum*), rock, stone + Lat. *frica're*, rub]: a European plant (*Tragopogon porrifolius*) of the family *Compositæ*. It is cultivated for the roots, which are long, tapering, and have, when properly cooked, a taste somewhat like that of the oyster. The root is highly nutritious. The plant is frequently known as vegetable oyster. The goat's-beard (*T. pratensis*), with yellow flowers, is an introduced weed in eastern parts of the U. S. Revised by L. H. BAILEY.

Sal Soda: See SODA.

Salt [O. Eng. *sealt*: O. H. Germ. *salz* (> Mod. Germ. *salz*): Goth. *salt*; cf. O. Bulg. *solĭ*, O. Ir. *salann*, Lat. *sal*, Gr. ἅλς, salt]: chloride of sodium (NaCl). The salt of commerce contains various saline admixtures, due to the peculiarities of the source used for manufacture; their quantity depends also on the method of manufacture. Natural sources of pure salt are unknown; crystals of pure salt may be obtained from a well-developed rock-salt. The presence of common salt in the water of the ocean, of various lakes and springs, as well as its occurrence as an exudation of the soil in several localities of the Orient, is mentioned in the earliest historical records, although under different names.

The idea regarding the chemical constitution of pure salt has changed during the progress of chemistry. The present view was for the first time experimentally demonstrated by Sir Humphry Davy in 1810: he produced pure salt by burning sodium in chlorine gas. Chemically pure salt is usually produced by neutralizing pure sodium carbonate with pure hydrochloric acid, evaporating the solution to dryness, and fusing the residue. Its use is chiefly confined to the chemical laboratory. The salt of commerce is obtained from sea-water, brines, and rock-salt.

Sea-water.—The water of the ocean is a weak and, comparatively speaking, impure brine. It contains from 3½ to 4 per cent. of saline matter, of which about three-fourths is chloride of sodium and about one-fourth other salts, viz.: chloride of magnesium and the sulphates of calcium, magnesium, sodium, and potassium. Sea-water varies little in composition and concentration. It represents the main source of supply for the manufacture of salt in France, Portugal, Spain, Italy, the West Indies, and Central and South America, and a small portion of the supply for the U. S.; it is also largely used for the production of salt in Holland, Belgium, and England, being frequently employed for the solution of rock-salt of an inferior color.

Rock-salt.—Whenever, during the geological epochs, a larger or smaller body of salt water was cut off from the main ocean, and was subsequently placed under favorable climatic conditions for its evaporation and the subsequent preservation of its saline residue, then a salt-deposit, commonly called rock-salt, was produced. Sometimes several independent deposits occur, one above the other, interstratified with the rocks of the same geological basin. The celebrated salt-deposit of Stassfurt, Germany, is worthy of special notice on account of the large quantities of potassium compounds within its surface layers. The various saline constituents of the ocean are arranged in this deposit in an order which corresponds closely with the degree of their solubility in water. The majority of rock-salt deposits consist only of part of the constituents of the ocean which served for their production. The rock-salt occurs either in densely aggregated masses of cubical crystals, or in compact masses having a conchoidal fracture. It is in some instances colorless and transparent, yet more frequently either red, yellow, or blue, rarely green. Its most common admixtures are either sulphate of calcium and the chlorides of calcium and magnesium, or the sulphates of calcium, magnesium, and sodium, and the chloride of magnesium. Rock-salt deposits consist frequently of alternating layers of salt and gypsum. These various layers are due to successive periods of evaporation. Colorless and dry rock-salt deposits, when easy of access, are directly mined with advantage, and the salt obtained by that process is subsequently brought into a desirable form for domestic use. Colored salt-deposits, or those which suffer from an excess of water, or which contain a large percentage of the above-mentioned foreign saline admixtures or clay, or finally those which are located at great depths, are usually dissolved while in the mine, and their solutions treated like brine for the manufacture of salt. Rock-salt deposits have been noticed in every part of the globe. Among those recently discovered in North America are those upon Petite Anse island, Vermilion Bay, Louisiana, at Goderich, Province of Ontario, Canada, in Western New York, and in Michigan.

Brines.—Brines are either artificial or natural; that is, they are prepared either by dissolving rock-salt or they are the natural or chance solutions of saline deposits by means of subterranean currents of water. Natural solutions of rock-salt furnish brines at Saltville, W. Va., Goderich, Ont., and in New York and Michigan. The value of a brine for the manufacture of salt does not entirely depend on either the concentration or relative proportion of pure salt and of

foreign saline admixtures, but on the kind of the impurities; sulphate of calcium and sodium, within proper limits, are far less objectionable than a corresponding amount of the deliqueseent and bitter-tasting ehlorides of ealcium and magnesium. The salt manufaetured in the U. S., with the exception of that obtained from sea-water, is produced from artificial and natural brines.

A sample of salt which contains from 1 to 1½ per eent. of foreign saline admixtures, consisting almost exelusively of sulphate of calcium, may be regarded as of very fair quality; while if it contains but half that amount of the chlorides of ealeium and magnesium, or of the carbonates of calcium and magnesium, it would be considered objeetionable, at least for table and dairy purposes. The peculiar fitness of any kind of salt for the different domestic applications—meat-paeking, dairy, or table use—depends not only on a fair ehemieal eomposition, but also in some degree on its suitable physical or mechanical eondition.

There are two kinds of eommon salt in commerce—(1) coarse salt, ineluding salt made by solar heat and rock-salt crushed to suitable size, and (2) eommon fine or boiled salt, obtained by artifieial heat, and thus by more rapid evaporation. Both have their speeial eommercial value.

Coarse Salt.—The coarse qualities of salt are manufaetured from sea-water and from brines. In Franee, Spain, Portugal, Italy, the West Indies, and along the North Amerieau shores of both the Atlantie and Paeifie Oceans, nearly all the coarse salt made from sea-water is produeed in basins along the seashores; several of them plaeed at different levels are conneeted to admit of a systematie working of the saline solutions in their different stages of concentration. In Ohio, Virginia, Miehigan, New York, Nebraska, and Kansas, where coarse salt is obtained from natural brines, wooden vats, protected by wooden covers, are used; for the frequency of rain-showers throughout the more favorable portion of the year and the low temperature at night during the spring and autumn interfere seriously with the successful evaporation, and thus with the economical manufacture in open basins. A short description of the extensive coarse-salt works at Onondaga, N. Y., may serve as an illustration. The brine in its fresh state, colorless and highly charged with carbonic acid, is filled into shallow vats, and kept there until most of the carbonic acid has eseaped and the protoxide of iron has been fully oxidized and settled down as brown sesquioxide of iron. The saline liquid is then drawn off to a lower set of vats, where it is left for evaporation until crystals of salt appear; during this period the excess of sulphate of calcium is separated. The brine, completely saturated with salt, is ready for salt-making, and consequently removed from the separated impurities to another lower set of vats, where, by mere solar heat, the separation and accumulation of a coarsely crystallized salt takes plaee. The salt is from time to time gathered, while the remaining mother liquor is discharged as soon as it reaches a concentration of 28°–30° Baumé. A good coarse or solar salt must be of a neutral reaction, hard, large, white or colorless, and produce a clear solution in water. Its use is largely confined to the packing of pork and beef for the general market.

Common Fine Salt, or Boiled Salt.—The finer granulated qualities of salt are obtained by direct or indirect application of artificial heat to iron pans, iron kettles, or wooden vats. In Europe almost all the fine salt is manufactured in systems of large shallow iron pans. These pans are usually from 15 to 17 inches deep, and vary in size from a length of 20 feet and a width of 16 feet to a length of 60 feet and a width of 35 feet. In many of the salt-works of the U. S. hemispherical cast-iron kettles, of from 120 to 150 gal. capacity, are used. The better class of brines may be successfully worked in cast-iron kettles. Inferior brines—particularly those which eontain larger percentages of the ehlorides of ealcium and magnesium—as a general rule give the best results by a slow process of evaporation, for the salt-crystals are produced in that case at a slower rate, more perfeetly developed, and less liable to inclose much of the inferior mother liquors. The European system of manufacturing eommon fine salt and the American mode of produeing it in wooden vats by means of steam-heat aim at the removal of certain impurities in a separate vessel and the making of the salt in another, while in the kettle system the entire operation is earried out in one vessel. In the European system the saturation of the brine is at first carried on at a moderate heat in an open pan, eommonly called the fore-heater. As soon as the salt begins to appear, and the iron and a part of the sulphate of lime have been separated, the clear salt-piekle is drawn into a lower pan for the manufaeture of salt. In the kettle system from fifty to sixty kettles are placed in a double row along flues with two independent fireplaces and one eommon chimney. The kettles near the fireplaees are protected by suitable interrupted arches against exeessive heat, while high chimneys, supported by blowers, aid in eonveying the heat along the row of kettles. The brine, before being turned into the kettles, has been kept in large wooden tanks for settling. An iron pan with an upright handle, eovering the central bottom part of the kettles, remains in each one of them until the salt begins to form, when the pans are carefully withdrawn. On the skillful handling of the pan, which contains the separated gypsum and oxide of iron, depends largely the eolor and, to some extent, the general quality of the finished produet. The salt formed is well stirred by means of a long-handled iron ladle, and thereby washed in the remaining pickle before it is removed into baskets, whieh rest for effieient drainage upon sticks over one part of the kettles. The ehemieal eomposition of the fine salt depends largely on the quality of the mother liquor from which it has been gathered and the degree of drainage it has had. The general physical eondition, as size, hardness, etc., depends in part on the eharaeter of the brine which served for its production, and on the rate of boiling during its manufaeture; the lower the temperature and the less motion of the piekle, the larger the erystals. The normal size of the salt-crystals obtained from any brine is readily redueed by adding either quicklime, glue, fat, rosin, or soap in small quantities to the boiling water. This praetiee is not to be eommended, as an entire removal of these substanees is praetieally impossible. A good common fine salt ought to be of a neutral reaction, clear white, of a pure agreeable saline taste, of a gritty feeling between the fingers, and soluble in from five to six parts of water without leaving a residue. The common fine salt, being in an advantageous mechanical eondition and readily soluble in water, finds a general application for family requirements.

Salt a Promoter of Animal Life.—Its value in this respeet was always well reeognized; the oldest writings, saered and profane, refer to it by using its name frequently in a figurative sense; it had entered as an ingredient, with an emblematical meaning, in the Jewish dispensation; heathen authors spoke in praise of it; Pythagoras calls it a substanee dear to the gods; Homer calls it divine; Plutareh speaks of it as a symbol of the soul. The Arabs use it as an emblem of hospitality, and the Abyssinians earry pieees of salt with them to offer for tasting to those they wish to meet as friends. Numerous analyses have established the fact that the sodium compounds, and chloride of sodium in partieular, represent the main portion of the soluble inorganic substanees of the ashes produeed in the combustion of a mammal's body. It has been proved that the human system in its normal eondition contains a certain amount of salt, and that the same is true of every domestieated animal. It has also been aseertained that salt forms an important part of the soluble saline inorganic compounds of various secretions, as perspiration, mucus, and urine, and that the kidneys in particular are the organs which dispose of any excess eonsumed. As salt furnishes by far the largest portion of the sodium eompounds which the higher animals eonsume, it is believed that the main portion of these compounds found in the animal system is derived directly from the salt consumed. It is believed that the chloride of sodium is partly deeomposed in the animal system, for the stomaeh in its normal eondition contains always some free hydroehloric aeid. The serum of the blood of herbivorous animals resembles closely human blood in its mineral eonstituents; it contains at least three parts of sodium to one of potassium, although these animals live on a food in whieh potassium largely predominates; the bile contains almost exelusively sodium eompounds; while the juiee of the flesh of herbivorous as well as earnivorous animals contains almost exclusively chloride of potassium. It is under these circumstances, most likely, that the potassium of the vegetable food eontinually decomposes the chloride of sodium by forming chloride of potassium, which is subsequently constantly and eopiously secreted, partieularly in the urine, while the sodium combines with the phosphoric aeid and the various peculiar organie aeids, which are previously combined with potassium, etc., or were formed in the course of the assimilation of the food. The benefieial effect of eommon salt as an ingredient of the diet of live stock, eows, sheep, etc., is fully recognized, in consequence of earefully conducted experi-

ments by leading agricultural chemists. Boussingault proved that those cows which had been fed with an addition of salt to their food did not yield more milk, or contain more fat, or show increase in weight of flesh, yet they looked more healthy and vigorous; in fact, their whole exterior had been highly improved as compared with animals which had been fed with the same food without an addition of salt. Liebig came to the same result; he found in the case of two oxen which were to be stall-fattened, one of which received its food with the addition of a dose of 1 oz. of salt per day, while the other one did not receive any, that the latter soon looked bristly, dull, inactive, and sickly, while the former remained smooth-skinned, lively, and vigorous. The well-recognized superior quality of meat from the cattle and sheep raised upon the marsh-meadows along the seashores of Northern Germany, Holland, Belgium, England, and other countries has been ascribed in a large degree to the fact that their food—the marsh-grasses—is frequently salted by the spray of the oceanic waters.

Salt a Promoter of Vegetable Growth.—The use of common salt as a manure for promoting the growth of farm-crops originated at an early date in the history of agriculture. Modern researches do not prove common salt to be valuable as a general fertilizer, but point out its various modes of action, and thereby tend to restrict its use to special kinds of soil and of crop, for it has been noticed that the use of salt frequently exerts not only a decided influence on the chemical composition and physical condition of the soil, but also on the character, i. e. composition, of the plants raised under its influence. All recommendations of careful observers agree in advising the use of but small quantities at a time (from 300 to 400 lb. per acre), applied in a well-diffused form, and only at intervals of years. Numbers of analyses of current farm-crops have shown that a large majority of species of plants growing along the seashores or in the vicinity of saline springs contain much smaller quantities of sodium than potassium compounds. As a natural disintegration of rocks and soil renders, in all probability, sodium as well as potassium compounds accessible as plant-food, there is far less reason, as a general rule, to expect an exhaustion of the soil in sodium compounds as soon as in potassium compounds. These circumstances explain the position which sodium compounds, and chloride of sodium, its most diffused form in lands under cultivation, occupy in a rational system of supplying plant-food to farm-crops. They are considered of secondary importance as plant-food. Nessler has shown that the presence of salt in the soil interferes with a ready combustion of tobacco-leaf, favoring its charring; in the case of the beetroot it has been proved (Grouven) that it increases the percentage of soluble saline compounds in the juice to a considerable degree, and thus reduces their value for the manufacture of sugar. The fact that larger quantities of salt destroy the common flora, and that it merely supports a vegetation of its own, becomes at once manifest to those who glance at the vegetation in the immediate vicinity of salt-springs and marine inlets. Its reputation as a valuable aid in the production of farm-crops rests largely on its action on the physical and chemical condition of the soil. It increases the capacity of the soil to absorb and retain moisture by imparting to it in some degree its own high hygroscopic quality, an influence most desirable in a dry season. An application of from 400 to 500 lb. per acre as a top-dressing on dry grasslands and pasture is frequently followed by good results. It aids in diffusing the existing resources of plant-food (potash and phosphoric acid). Exhausted and worn-out lands derive but little benefit from its periodical use beyond an increased power to retain moisture. Its use is largely confined to the raising of forage-crops.

Salt for Meat-packing.—The object of the meat-packer consists not only in securing the preservation of pork and beef for a reasonable time, but also in securing its palatable condition and as far as possible in retaining its natural color. Practice recommends the use of the coarse and hard qualities of salt for meat-packing for the following reasons: They dissolve gradually and contract the meat by degrees to a desirable firmness; they keep the salt pickle within a moderate concentration; they can not enter mechanically into the meat and thus overcharge it, and may therefore be applied in sufficient excess, so as to compensate for the losses of pickle by leakage, etc., without endangering the tenderness and flavor prematurely. Common fine salt answers for a short period of keeping very well, and is consequently used in the packing of meat for immediate consumption. Fifty to fifty-six pounds of coarse salt are usually taken for salting down one barrel of meat: the bottom and the top of the barrel are always carefully covered with a layer of coarse salt. The purer the salt the better the quality of the meat. A salt which contains large quantities of foreign saline admixtures, particularly of chloride of calcium and chloride of magnesium, imparts a pungent and disagreeable taste, and injures also the color of the meat, for these saline compounds have an unpleasant taste, and, being at the same time in a higher degree hygroscopic, they cause a more copious discharge of juice from meat, which renders the latter of a paler color and of a harder texture; the color of packed meat is frequently improved by an addition of niter, which if used on a small scale is harmless. In the U. S. the coarse salt made from brines and from sea-water is used, besides the English coarse and fine salt, the salt from Turk's island, and other localities in the West Indies. Texas meat-packers are trying the superior rock-salt of Petite Anse, La. A good rock-salt is well fitted for the purpose, yet on account of its great hardness it has to be broken up in smaller pieces than common solar salt. For the packing of fish a fine grade of coarse salt is used.

ANALYSES OF SALT.

CONSTITUENTS.	Rock-salt, Petite Anse, La.	Solar salt, Onondaga, N. Y.	Solar salt, Michigan.	Turk's island, West Indies, coarse solar salt.	Solar salt, Ohio.	Solar salt, Nebraska.
Chloride of sodium	98·88	96·004	95·831	96·76	97·512	98·13
Sulphate of calcium	0·782	1·315	0·316	1·56	.....	0·25
Chloride of calcium	0·004	0·092	0·356	*	0·234	*
Chloride of magnesium	0·003	0·089	0·140	0·14	0·089	0·08
Moisture	0·330	2·500	3·344	0·90	2·130	1·20

* Not stated.

Salt for the Dairy Business.—The dairy business has attained such commanding proportions that the amount of salt required in its operations amounts to millions of bushels. The peculiar nature of the dairy products of the U. S. calls for the best qualities of salt in the markets. A good dairy salt ought to be of a neutral reaction and of a pure saline taste, free from pungent after-taste; it ought to be of a properly reduced granulated size, dissolving readily in water, free from any offensive odor, without any stain in color, and, what is of not less importance, free from colored specks. The better qualities of the English "common fine salt," "Ashton's brand," etc., were at first used almost exclusively by the dairymen of the U. S., partly because the exporters of provisions in the seaport-towns dealt also largely in foreign salt.

A common fine or boiled salt is in every instance the result of more rapid evaporation, and thus most liable to be affected in its composition by the retention of impure mother-liquors. Washing processes have been devised by which fine salt designed for dairy purposes is freed from its obnoxious features. Dairy salt is manufactured in the U. S. from the coarse (or solar) and from common fine salt; if made from the former kind, it must be ground finer, for both ought to be in such a state of division as to readily dissolve when worked into the butter or the curd; both kinds ought to be used by weight and not by measure. The English brand is somewhat more bulky than the brands of the U. S., and that portion of the product of the U. S. which has been obtained from boiled salt is lighter than that produced from solar salt; in composition there need be scarcely any difference if made with equal care. The quantity of dairy salt that ought to be used in butter and cheese depends somewhat on the amount of moisture retained by either substance when ready for salting; to have a fully saturated solution of salt left is the real object. The best authorities advise the use of 1 oz. of salt (the best dairy) to 1 lb. of butter, and 1 lb. of it for every 100 lb. of curd.

ANALYSES OF SALT.

CONSTITUENTS.	Common fine salt, Onondaga.	Common fine salt, Michigan.	English, Ashton's salt, dairy and table.	Onondaga dairy salt.
Chloride of sodium	95·353	90·682	97·652	97·831
Sulphate of calcium	1·355	0·805	1·430	1·263
Chloride of calcium	0·155	0·974	trace.	trace.
Chloride of magnesium	0·136	0·781	0·060	0·037
Moisture	3·000	6·752	0·760	0·700

The Uses of Salt in the Industrial Arts.—Chloride of sodium is the most prominent source of the supply of both of its constituent elements, sodium and chlorine, for industrial purposes. It furnishes directly or indirectly the main bulk of soda called for in the various branches of chemical manufacturing industries of the world. On a liberal supply of common salt rests largely the success of the chemical industries of any country. Cheap salt in connection with an ample supply of coal and sulphur is the foundation of the great alkali-trade of England and of other European countries. This circumstance is in a controlling degree due to the important discovery of Leblanc, a French scientist, at the close of the eighteenth century. He pointed out the means by which common salt can be converted into carbonate of sodium, soda-ash, and sal-soda. His process consists in the conversion of chloride of sodium by means of sulphuric acid into sulphate of sodium, and the subsequent treatment of the latter with coal and carbonate of calcium at a high temperature. The successful introduction of this process by James Muspratt and others since 1823 caused improvements in the economical manufacture of sulphuric acid and the production of large quantities of hydrochloric acid as a cheap by-product. A more recent discovery aims at the direct conversion of chloride of sodium by means of bicarbonate of ammonium into bicarbonate of sodium and chloride of ammonium (Schloessing, Solvay, etc.). Both processes are successfully in operation. The comparatively low cost of the soda obtained by these methods, as compared with that of potash, has caused in many instances the substitution for the latter of the cheaper sodium carbonate in the interest of economy. The cheaper soda-ash obtained from chloride of sodium has taken the place of the more costly soda-ash obtained formerly from the ashes of sea-plants. Soap-manufacture, paper-manufacture, and glass-manufacture are among its largest consumers. As a cheap source of hydrochloric acid common salt furnishes the means for a more economical production of the chlorides of the heavy metals, as iron, zinc, tin, etc., so important in various directions. Chloride of sodium and sulphuric acid in connection with dioxide of manganese serve for the production of the element chlorine used for the manufacture of bleaching materials, as hypochlorite of calcium (bleaching-lime), hypochloride of sodium, etc., substances noted also for their value as disinfectants.

The total salt product of the U. S. in 1893 was 11,816,772 barrels of 280 lb., as against 11,698,890 barrels in 1892. The value in 1893 was $4,054,668, against $5,654,915 in 1892, the decrease being due to the decline in price. The total production of 1898 was as follows: Table and dairy, 2,198,339 barrels; common fine, 8,583,128; common coarse, 873,671 barrels; packers', 379,635; solar, 3,077,024; rock, 2,183,801; milling, 156,579 barrels; other grades, 160,457; total, 17,612,634 barrels. CHARLES A. GOESSMANN.

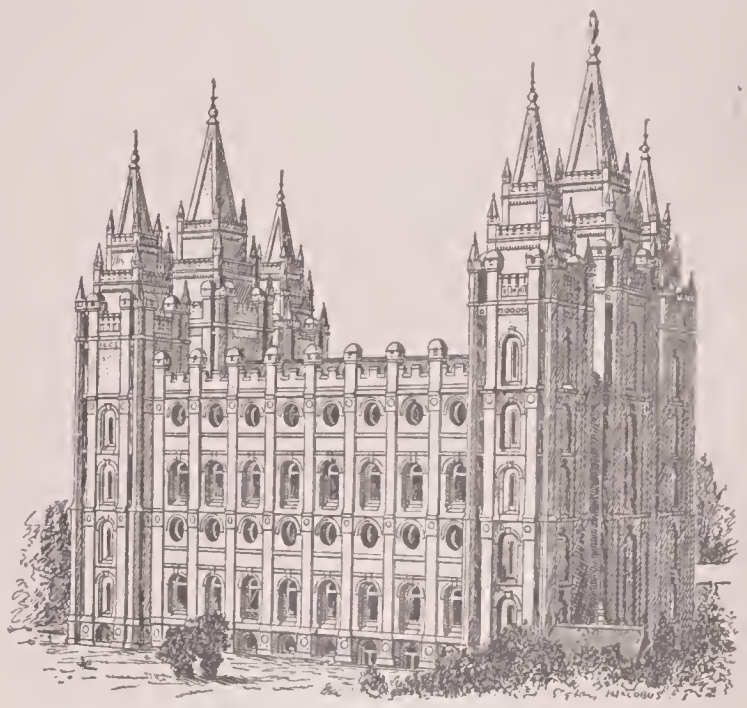
Salta: a northern province of the Argentine Republic, bordering on Bolivia and Chili, and nearly inclosing the province of Jujuy. Area, 45,000 sq. miles. The western part is traversed by the Andes and their sub-ranges, with intervening fertile valleys; the eastern part is included in the plains of the Gran Chaco. Agriculture is the principal occupation; the most important crops are maize and sugar-cane. Silver, copper, etc., exist, it is said, in large quantities, but are little mined. Earthquakes are often destructive. Pop. about 118,000.—Salta, the capital, is in a valley, 3,900 feet above the sea (see map of South America, ref. 7–D). It was founded in 1582, is well built, and has a national college and other public institutions; the trade with Bolivia is important. Pop. about 17,000. H. H. S.

Saltillo: sȧl-teel'yō: capital of the state of Coahuila, Mexico; situated in a valley, 5,204 feet above the sea; on the Mexican National Railway, near the boundary of Nuevo Leon (see map of Mexico, ref. 4–F). The trade of the state centers here, and the town has important manufactures of cotton cloths. Pop. about 20,000. H. H. S.

Salt Lake: See GREAT SALT LAKE and LAKES.

Salt Lake City: city; capital of Utah and of Salt Lake County; on the Great Salt Lake and Hot Springs, the Rio Grande Western, the Union Pac., and the Utah Cent. railways; 712 miles W. of Denver, Col., 931 miles E. of San Francisco, Cal.; altitude, 4,335 feet (for location, see map of Utah, ref. 3–M). It is in the Salt Lake valley, at the base of the Wasatch Mountains; has an area of 12 sq. miles; is laid out in blocks 660 feet square, and contains about 100 miles of streets 132 feet wide. These streets are bordered by streams of water brought from the mountains, and with many varieties of shade-trees. Liberty Park, containing 110 acres, is the principal park, but the city owns also 6,000 acres, a large part of which is suitable for park purposes. Other attractive suburban localities are Fort Douglas, 3 miles distant, and Calders Park, both reached by electric railway. Hot and warm springs of valuable curative properties are within the city limits. The chief natural attraction of the locality is GREAT SALT LAKE (*q. v.*), 11 miles distant. There are 85 miles of electric railway.

Notable Buildings.—The city is the headquarters of the Mormon Church or Church of Jesus Christ of Latter-day Saints. The church buildings of this sect occupy 10 acres



The Great Temple, Salt Lake City.

in the heart of the city, and consist of the Great Temple (a massive structure of gray granite; forty years in course of construction; estimated to have cost $4,000,000; dimensions, 186 by 99 feet; tallest spire, 220 feet in height, surmounted by the *Angel Moroni*, a hammered copper figure 12½ feet high), the Tabernacle (cost $300,000: a vast auditorium seating close upon 7,000; roof egg-shaped, and self-supported; has in certain places remarkable acoustic properties; contains one of the largest organs in the world, now, April, 1901, in process of rebuilding), and the Assembly

Tabernacle, Salt Lake City.

Hall (a granite structure of attractive architecture; seats, 2,500; used for overflow meetings, Sunday-school work, and general purposes). Other interesting buildings are the Lion, Bee-hive, and Guardo houses (former residences of Brigham Young, and now used for church offices and the residence of President Lorenzo Snow); the Salt Lake theater, erected in 1862; city and county building, completed in 1894, at a cost of $900,000; the Commercial, McCornick, Dooly, Mercantile, Progress, Scott-Auerbach, Wasatch, and Zion's Co-operative Mercantile Institution blocks; ten large and fine school-houses; the Templeton and Knutsford hotels; and two large private hospitals and the Utah peniten-

tiary. A fine large block is now building for church offices, on corner south of Temple block.

Churches, Schools, etc.—All leading religious denominations are well represented, and many fine church edifices have been erected. The public-school system is equal to any in the U. S.; 15 public-school buildings, aggregating in cost $750,000, were erected in 1893–94–96. In 1891 the city contained 8 libraries with 37,000 volumes, and in 1901 there were 3 daily, 3 semi-weekly, 9 weekly, 4 semi-monthly, and 7 monthly periodicals.

Finances and Banking.—The receipts of the city government from all sources during 1900 were $857,664.54; expenditures, $646,729.35. The city tax rate is 7¼ mills; the assessed valuation in 1900 was $32,000,000. The city has gas and electric light works, and owns a water system valued at $2,000,000. The bonded municipal debt in 1901 was $2,798,000. In 1901 there were 3 national banks with combined capital of $1,100,000, 3 State banks with capital of $550,000, 4 private banks, 1 foreign bank with a capital of $500,000, and 3 savings-banks with capital of $450,000.

Business Interests.—Manufacturing is extensively carried on. The city is headquarters for mining men, and is the mining center of Utah and adjoining States. It is the dépôt for agricultural products, and the distributing-point for a large agricultural area under a perfect system of irrigation. The census returns of 1890 showed 149 manufacturing establishments (representing 45 industries) with a combined capital of $2,658,676, employing 1,997 persons, paying $1,276,219 for wages and $1,665,877 for materials, and turning out products valued at $3,864,402.

History.—The city was founded by Brigham Young (*q. v.*) July 24, 1847. Until 1870 the population was almost entirely Mormon, but the development of mining and other industries induced a large immigration. The beauty of the city and its environment, the presence of hot springs and the Great Salt Lake, and the rare climatic and scenic advantages, make Salt Lake City an attractive place for tourists. Pop. (1880) 20,768; (1890) 44,843; (1901) 53,531.

William Nelson.

Salto: a town of Uruguay; on the river Uruguay, at the head of navigation for large vessels; opposite Concordia in the Argentine Republic (see map of South America, ref. 7–E). It is connected by railway with Montevideo and the Brazilian frontier; is the shipping-port for the trade of the upper Uruguay, including the western part of Rio Grande do Sul; and is the center of a rich grazing district. Pop. about 12,000. It is the capital of the department of Salto, which has an area of 4,940 sq. miles and a population of 32,000, almost entirely employed in the grazing industry.

H. H. S.

Salton Lake: a temporary lake, caused by an overflow of the Colorado river into a depressed area in the Colorado Desert. The bed of the lake is N. and a little W. from the head of the Gulf of California, and W. of the Colorado river in California, and probably was once occupied by the Gulf waters. The lake was formed in the early summer of 1891, when the river was unusually high, and remained fairly constant several months, when it began to shrink slowly. The spot has large deposits of salt, which changed the fresh waters of the river into salt water in the lake. See Colorado Desert.

M. W. H.

Sal'tonstall, Gurdon: Governor of Connecticut; great-grandson of Sir Richard Saltonstall; b. at Haverhill, Mass., Mar. 27, 1666; graduated at Harvard 1684; ordained minister of New London, Conn., Nov. 25, 1691; was distinguished as an orator, and took so active a part in politics that he was made Governor of Connecticut 1707, and held that post until his death Sept. 20, 1724. He bequeathed £1,000 to Harvard College to educate students for the ministry.—His son, Gurdon, b. at New London, Conn., Dec. 22, 1708, graduated at Yale College 1725; became brigadier-general of Connecticut forces 1776; was cashiered for misconduct in the Penobscot expedition 1779; died at Norwich, Sept. 19, 1785. —Dudley, nephew of Gen. Saltonstall, b. at New London, Sept. 8, 1738, became a commodore in the Continental navy, and died in the West Indies in 1796.

Revised by G. P. Fisher.

Saltonstall, Sir Richard: colonist; b. at Halifax, England, in 1586; nephew of Sir Richard, who became lord mayor of London 1597; emigrated to Massachusetts as assistant governor to Winthrop 1630; was associated with Phillips in the foundation of Watertown 1630, but went back to England the following year, and never returned to Massachusetts. In 1651 he wrote a letter to the Massachusetts ministers Cotton and Wilson remonstrating against the persecution of the Quakers. D. in England about 1658. Through his sons, who settled in Massachusetts, he was ancestor of the Saltonstalls of New England.—Richard, b. at Woodsome, Yorkshire, England, in 1610, was matriculated at Emmanuel College, Cambridge, 1627; was an early settler of Ipswich, Mass.; was assistant governor 1637; befriended the regicides Goffe and Whalley, and protested against the introduction of Negro slavery into the colony. He returned to England in 1670. D. at Hulme, Apr. 29, 1694.

Saltonstall, Richard: jurist; b. at Haverhill, Mass., June 14, 1703; graduated at Harvard 1722; was a representative from Haverhill as early as 1728; was frequently a member of the general court and of the executive council; was a scientific and practical farmer, and also learned in the law; was chairman of the commission for settling the boundary-line between Massachusetts and New Hampshire 1737, and was judge of the superior court nearly twenty years (1736–55). D. Oct. 20, 1756.

Saltpeter, or **Nitre** [*saltpeter* is (by analogy of *salt*) from Fr. *salpêtre*, from Lat. *salpe'træ*, liter., rock-salt; *sal*, salt + *pe'træ*, gen. of *pe'tra*, rock, stone]: a compound in chemistry called potassium nitrate (KNO_3), that has long been known and occurs widely distributed in nature, though in relatively small quantities. When refuse animal matter undergoes decomposition in the soil under proper conditions, the nitrogen contained in it passes into the form of a nitrate, and as potassium is generally present, the particular nitrate formed is saltpeter. The change is brought about by the action of certain microbes which exist in the soil, and are especially abundant and efficient in warm countries. It is in such warm countries that saltpeter earths are found. In Bengal the saltpeter earth of the villages is collected by a special caste, the Sorawallahs, into loosely aggregated heaps. From these the salt is obtained by scraping off the uppermost layers, which show a white efflorescence. The process of nitrification is carried on artificially on a large scale in the so-called "saltpeter plantations." In these, refuse animal matter, more especially manure, is mixed with earthy material, wood-ashes, etc., and piled up. These piles are moistened with the liquid products from stables. After the action has continued for two or three years the outer crust is taken off and extracted with water. The solution thus obtained contains, besides potassium nitrate, calcium and magnesium nitrates. It is treated with a water-extract of wood-ashes or with potassium carbonate, by which the calcium and magnesium are precipitated as carbonates. Much of the saltpeter in the market is made from sodium nitrate by treating it with potassium chloride, advantage being taken of the fact that sodium chloride is less soluble in water than potassium nitrate. Saltpeter crystallizes in long rhombic prisms of a salty taste. When dissolved in water it causes a lowering of temperature. It is used in the manufacture of fireworks. Its chief use, however, is in the manufacture of gunpowder.

Ira Remsen.

Saltpeter, Chili: a salt known in chemistry as sodium nitrate ($NaNO_3$). It is also called cubic nitre, because it crystallizes in rhombohedrons resembling a cube. It occurs abundantly in Northern Chili, especially in Tarapaca, and to some extent in Southern Peru. The natural salt contains, besides the nitrate, sodium chloride, sulphate, and iodide. Sodium nitrate is very similar to potassium nitrate, but it can not be used in place of the more expensive potassium salt in the manufacture of gunpowder, because it becomes moist in the air, and does not decompose as quickly as potassium nitrate. It is used extensively in the manufacture of nitric acid and of potassium nitrate; it is also the most important source of iodine. In commerce the salt is known simply as nitrate. It is largely exported from Chili to Europe for use as manure. In 1900 the total product was estimated at 1,475,000 tons. For this purpose the native salt is rendered marketable by a process of solution and crystallizing. In its action it is comparable with calcium or potassium nitrates.

Ira Remsen.

Salt Range, or **Kalabagh Mountains**: a mountain group of the Punjaub, India; extends westerly from the west bank of the Jhilam to the Suleiman Mountains, with a break in its continuity where it yields a passage to the Indus. It is only 2,500 feet high, but its bold peaks and steep, wild precipices, consisting of granite, gypsum, and layers of almost perfectly pure rock-salt (which has been mined from

time immemorial), are completely without vegetation, and present a forbidding aspect. Alum, iron ore, coal, gypsum, and limestone abound, and gold-dust is found in the sands of the rivers. Revised by M. W. HARRINGTON.

Salt Rheum: See ECZEMA.

Salt River: a Kentucky affluent of the Ohio. Defeated politicians are said to be "sent up Salt river," from an incident in the life of Henry Clay, who in 1832 heard the news of his defeat for the presidency as he landed from a passage up this stream. See *American Notes and Queries*, vol. i., pp. 8–9. M. W. H.

Salts: in chemistry, a large class of compounds formed by the action of acids upon bases. The general character of this action, and the relation of the salts to the acids and bases are discussed under the titles ACID (*q. v.*) and BASE (*q. v.*).

Normal Salts.—The simplest salts are those formed by the substitution of one atom of a univalent element for one atom of hydrogen. Such salts are sodium chloride, NaCl, silver chloride, AgCl, potassium chloride derived from hydrochloric acid, HCl, potassium nitrate, KNO_3, sodium nitrate, $NaNO_3$, silver nitrate, $AgNO_3$, derived from nitric acid, HNO_3. The next class of salts includes those which are formed by the substitution of one atom of a bivalent base-forming element for two atoms of hydrogen. Examples are calcium chloride, $CaCl_2$, zinc chloride, $ZnCl_2$, magnesium chloride, $MgCl_2$, from hydrochloric acid, HCl; barium nitrate, $Ba(NO_3)_2$, calcium nitrate, $Ca(NO_3)_2$, mercuric nitrate, $Hg(NO_3)_2$, all derived from nitric acid, HNO_3. In each of these cases the salt is plainly formed from two molecules of the acid:

$$\begin{matrix}\mathrm{HCl}\\ \mathrm{HCl}\end{matrix} + \mathrm{Mg}\!<\!\begin{matrix}\mathrm{OH}\\ \mathrm{OH}\end{matrix} = \mathrm{MgCl_2} + 2\mathrm{H_2O},$$

$$\begin{matrix}\mathrm{HNO_3}\\ \mathrm{HNO_3}\end{matrix} + \mathrm{Ba}\!<\!\begin{matrix}\mathrm{OH}\\ \mathrm{OH}\end{matrix} = \mathrm{Ba(NO_3)_2} + 2\mathrm{H_2O}.$$

Next come salts formed by the substitution of one atom of a bivalent base-forming element for two atoms of hydrogen in a dibasic acid, such as sulphuric acid, H_2SO_4. Examples are calcium sulphate, $CaSO_4$, copper sulphate, $CuSO_4$, etc. Similarly, there are salts containing trivalent elements such as aluminium, iron, etc. Examples of this kind of salts, derived from monobasic acids, are aluminium chloride, $AlCl_3$, ferric chloride, $FeCl_3$, ferric nitrate, $Fe(NO_3)_3$; from dibasic acids, aluminium sulphate, $Al_2(SO_4)_3$, ferric sulphate $Fe_2(SO_4)_3$; from tribasic acids, aluminium phosphate, $AlPO_4$; ferric phosphate, $FePO_4$, derived from phosphoric acid, H_3PO_4. All the salts mentioned thus far are alike in this respect—they contain no hydrogen. The substitution of the base-forming element for the hydrogen is complete in each case. Such salts are called *normal salts*, and sometimes, though less correctly, *neutral salts*.

Acid Salts.—If the substitution of the base-forming element or elements for hydrogen is not complete, then plainly some of the hydrogen of the acid must remain and the product may in such case be both acid and salt. It may be called either a *salt-acid* or an *acid salt*; the latter, however, is the name adopted by chemists. Monobasic acids can not form acid salts. Thus if a certain quantity of hydrochloric be divided into two equal parts, one of the halves exactly neutralized with, say, sodium hydroxide, and the other half added, it will be found that the only substances present in solution are sodium chloride and hydrochloric acid. By evaporation the hydrochloric acid and water can be driven off, and the residue will consist of the sodium chloride which was formed by neutralizing half of the hydrochloric acid. Similar results would be obtained if nitric instead of hydrochloric acid were used. If, however, to a certain quantity of sulphuric acid only half the quantity of a base required for its neutralization be added, a product is formed which is quite different from that formed when the neutralization is complete. This new product is an acid salt. Thus if the base be potassium hydroxide, the acid salt is acid potassium sulphate, or mono-potassium sulphate. Its composition is represented by the formula $HKSO_4$, and it is derived from sulphuric acid by the substitution of one atom of potassium for one atom of hydrogen. It has acid properties, and has therefore the power to form salts in the same way as an acid. By further action of potassium hydroxide, the remaining hydrogen atom is replaced by potassium, and the normal salt is thus formed. Or this second hydrogen atom may be replaced by a different base-forming element, and thus a mixed normal salt formed, as, for example, sodium-potassium sulphate, $NaKSO_4$. Other acid salts are acid sodium carbonate, $HNaCO_3$, commonly called bicarbonate of soda; acid calcium phosphates, $HCaPO_4$ and $Ca(H_2PO_4)_2$, which are contained in the preparation known as Horsford's acid phosphate, etc. An acid salt is therefore one that is formed from a polybasic acid by the substitution of a base-forming element for one or more, but not all, of the hydrogen atoms.

Basic Salts.—These are, as the name implies, the opposite of acid salts. A basic salt is both base and salt. Bases are monacid and polyacid, as acids are monobasic and polybasic. When a monacid base, as potassium hydroxide, is neutralized, the act is complete as far as that part of the base is concerned which is acted upon. With a polyacid base the case is different. Thus bismuth hydroxide, $Bi(OH)_3$, is a triacid base, and it can be neutralized in three stages by treatment with an acid. The action with nitric acid is represented in the three following equations:

$$\mathrm{Bi}\!\left\{\begin{matrix}\mathrm{OH}\\ \mathrm{OH}\\ \mathrm{OH}\end{matrix}\right. + \mathrm{HNO_3} = \mathrm{Bi}\!\left\{\begin{matrix}\mathrm{NO_3}\\ \mathrm{OH}\\ \mathrm{OH}\end{matrix}\right. + \mathrm{H_2O}.$$

Basic salt.

$$\mathrm{Bi}\!\left\{\begin{matrix}\mathrm{OH}\\ \mathrm{OH}\\ \mathrm{OH}\end{matrix}\right. + 2\mathrm{HNO_3} = \mathrm{Bi}\!\left\{\begin{matrix}\mathrm{NO_3}\\ \mathrm{NO_3}\\ \mathrm{OH}\end{matrix}\right. + 2\mathrm{H_2O}.$$

Basic salt.

$$\mathrm{Bi}\!\left\{\begin{matrix}\mathrm{OH}\\ \mathrm{OH}\\ \mathrm{OH}\end{matrix}\right. + 3\mathrm{HNO_3} = \mathrm{Bi}\!\left\{\begin{matrix}\mathrm{NO}\\ \mathrm{NO_3}\\ \mathrm{NO_3}\end{matrix}\right. + 3\mathrm{H_2O}.$$

Normal salt.

The salts obtained in the first two reactions represented are still basic, a part of each molecule of the base used being unacted upon. These products are basic salts. There are many such salts known. Thus white lead (see LEAD) is a basic carbonate.

Double Salts.—This name is given to compounds formed by the union of two ordinary salts. Thus there are double chlorides formed by the union of two chlorides, as potassium-platinum chloride, $PtCl_4 2KCl$; double fluorides, as potassium-silicon fluoride, $SiF_4.2KF$; double sulphates, as alum or potassium-aluminium sulphate, $K_2SO_4.Al_2(SO_4)_3.24H_2O$, etc. It appears probable that some of these double salts are in fact derived from acids more complex than is assumed in the ordinary formulas. Thus it is known that the so-called double fluorides are derived from an acid of the formula H_2SiF_6, called fluosilicic acid, and that potassium-platinum chloride is derived from a similar acid of the formula H_2PtCl_6, called chlorplatinic acid, and probably all the other double chlorides and fluorides, and the analogous double bromides and iodides, are to be referred to similar acids. Double sulphates are generally derived from two molecules of sulphuric acid. Thus alum is formed from sulphuric acid by the substitution of one atom of trivalent aluminium for three atoms of hydrogen in two molecules of the acid, the remaining hydrogen being replaced by potassium, as shown in the formula—

$$\begin{matrix}\mathrm{SO_4}\!<\!\begin{matrix}\mathrm{H}\\ \mathrm{H}\end{matrix}\\ \mathrm{SO_4}\!<\!\begin{matrix}\mathrm{H}\\ \mathrm{H}\end{matrix}\end{matrix}$$

Two molecules of sulphuric acid.

give

$$\begin{matrix}\mathrm{SO_4}\!<\!\mathrm{K}\\ \mathrm{SO_4}\!<\!\Big\}\,\mathrm{Al.}\end{matrix}$$

One molecule of alum.

The prevailing theory in regard to the constitution of chemical compounds is competent to explain most of the double salts now known.

Haloid Salts.—This name is given to salts like sodium chloride, NaCl, or common salt, and is derived from ἅλς, sea-salt. The haloid salts, also called halides, are the chlorides, bromides, iodides, and fluorides, with which, further, the cyanides are frequently classed. IRA REMSEN.

Salt Sea: See DEAD SEA.

Saltus, EDGAR EVERTSON: novelist; b. in New York, June 8, 1858. He was educated at Yale College and in Europe and at the Columbia Law School. He has published a life of *Balzac* (1884); *The Philosophy of Disenchantment* (1885); and *The Anatomy of Negation* (1886), a popular statement of the pessimistic philosophy of Schopenhauer and Hartmann; also *Mr. Incoul's Misadventure* (1887), *The Pace that Kills*, and other novels. H. A. B.

Salutes [from Lat. *saluta're*, wish health to, greet, salute, deriv. of *sa'lus*, *salu'tis*, safety, health; cf. *sal'vus*, safe, sound, well]: in the army and navy, honors paid to officers

of higher rank or authority by raising or touching the hat, dropping the point of the sword, presenting arms, firing cannon or small-arms, manning yards, dipping the colors, etc. In the personal salute with cannon the number of guns fired depends upon the rank of the person saluted. In the U. S. the President receives 21 guns, the Vice-President 19, the members of the cabinet, the chief justice, the Speaker of the House of Representatives and Governors within their own State or Territory, 17 guns. The general receives 17 guns, lieutenant-general or major-general commanding 15, major-general 13, and brigadier-general 11 guns. Besides these personal salutes there are the national salute of 21 guns, the salute to the Union of one gun for each State, and the old Federal salute of 13 guns. These are fired in honor of certain days and occasions.

In the personal salutes is seen the survival of the custom of the saluter placing himself unarmed in the power of the saluted. The touching or removal of the cap, dropping the point of the sword, presenting arms, firing cannon and small-arms, manning yards, etc., symbolize the removal of the helmet, giving up the weapon, unloading the firearms, exposing the crews, abandoning the guns, etc.

JAMES MERCUR.

Saluzzo, saă-loot'sō: town; in the province of Cuneo, Italy; 42 miles by rail S. by W. of Turin (see map of Italy, ref. 3–B). The cathedral, semi-Gothic and of the fifteenth century, the Church of St. Martin and St. Bernard, of St. Domenico, etc., all contain objects of interest. In one of the public squares there is a fine monument erected to Silvio Pellico, who was born here. The ancient castle of the Marquises of Saluzzo is used as a prison. Saluzzo manufactures silk, leather, and hats. Pop. 9,716.

Revised by M. W. HARRINGTON.

Salvador, Span. pron. saăl-vaă-dor' (often, but incorrectly, called *San Salvador*, from its capital): a republic of Central America; bounded N. W. by Guatemala, N. and N. E. by Honduras, and S. by the Pacific, the Gulf of Fonseca separating it from Nicaragua on the E. Area, 7,255 sq. miles; pop. (1891) estimated, 777,895; it is thus the smallest but the most thickly settled republic in America. The main Cordillera of Central America runs along the northern frontier. Parallel to this, and about 30 miles farther S., another mountain chain, attaining nearly 8,000 feet, crosses from E. to W., and is continued into Nicaragua; this chain is entirely of volcanic origin, and contains nearly thirty active or quiescent craters. The space between the two mountain ranges is an irregular basin or plateau, 2,000 feet in average elevation, and varied by low mountains; this is the finest and most thickly settled part of Salvador. S. of the volcanic range a strip of low land, partly alluvial, fringes the Pacific. The coast is about 200 miles long, partly rocky, but not high. The only very good harbor is formed by the Gulf of Fonseca; the commercial ports are La Union on the gulf, La Libertad, and Acajutla. The principal river is the Lempa, which drains the plateau and is partly navigable; there are several beautiful lakes, including Cuija, on the Guatemala frontier, and Ilopongo. Volcanic and seismic disturbances are very frequent; in the central range eruptions from one or more peaks are almost constantly going on. Slight earthquakes are so common as to be hardly noticed, and severe ones occur at intervals; San Salvador has been ruined no less than eight times. The climate is hot and often unhealthful on the coast, warm on the plateau, temperate in regions above 3,000 feet, where most of the towns are located. Rains are less abundant than in other parts of Central America, though the climate is by no means dry. The rainiest months are from May to October, and in July and August there are frequent torrential showers and thunder-storms. Considerable tracts of forest remain, and are rich in cabinet woods, balsam, etc. The land, especially that formed by disintegrated volcanic tufa, is very fertile, and most of the inhabitants are engaged in agriculture. The most important crops are coffee, indigo, tobacco, sugar, and, for home consumption, maize, beans, and rice. Large herds of cattle are pastured in some districts. Gold and silver are mined on a small scale. About 5 per cent. of the population are classed as whites, 55 per cent. as Indians, and the remainder as mixed races, with a few Negroes; some of the Indians retain their own language and customs, but all are submissive and, nominally, Roman Catholics. As elsewhere in Central America, the educated and intelligent class is small, but controls all the wealth and power. The government is a centralized republic; the president is elected for four years, and congress consists of a single house elected for one year. The fourteen departments are essentially governed from the capital. The state religion is the Roman Catholic; other creeds are tolerated, but are almost unknown. There are about 900 public and private schools, with 35,000 pupils; the state maintains a university with faculties of sciences, arts, law, medicine, etc. The only railway runs inland from Acajutla (53 miles in 1893), but others are planned; the common roads are nearly all bad. There is a fairly good telegraph system, and cable communication with the U. S. The principal exports, in the order of their importance, are coffee (about half of the total), indigo, sugar, and silver; the average annual value of the exports in 1894 was about 6,000,000 *pesos*. The value of the recorded imports is little over half as much, but the figures are probably defective. Nearly one-third of the entire trade is with the U. S.—principally California—and the proportion is increasing. The monetary standard is the silver *peso* or dollar, equal to $96\frac{4}{10}$ cents of U. S. silver in intrinsic value. Few national coins are in circulation; those of Europe, the U. S., Mexico, Peru, etc., are freely used. The metric system of weights and measures is legalized, but the old Spanish ones are still in general use. The external debt, payable in gold, was in 1893, about $1,500,000, and the interest is promptly met; the internal debt, partly funded, is about 7,500,000 *pesos*. Salvador or Cuscutlan was conquered by Jorge de Alvarado in 1528, and during the colonial period it was a province of Guatemala. From 1823 to 1839 it was a state of the Central American Confederation. By a treaty made at Amapala, June 20, 1895, Salvador united with Nicaragua and HONDURAS (*q. v.*) to form the "Greater Republic of Central America." See SALVADOR in the Appendix. See Guzman, *Topografía física de la República del Salvador*; Squier, *The States of Central America* (1858); Reyes, *Vida de Morazán* (1883); Bancroft, *History of the Pacific States: Central America* (1882–87).

HERBERT H. SMITH.

Salvage [from O. Fr. *salvage*, liter., a saving, deriv. of *salver* > Fr. *sauver* < Lat. *salva're*, save, deriv. of *sal'vus*, safe]: the compensation due for the relief of a vessel, or of property or persons therein, from an impending peril of the sea, by the voluntary exertions of those who are under no legal obligation to render assistance, resulting in the ultimate safety of the object of such relief.

It is not necessary that the peril be immediate. It is enough that it is probable, as where the motive power of a steamer ceases, or a sailing vessel is dismasted. Fire, endangering a vessel afloat, is a marine peril. Recapture from pirates or the public enemy is relief from a sea peril, and, if lawful, will be rewarded with salvage. Recapture by a ship of a neutral power is unlawful.

The crew or passengers of the relieved vessel are not entitled to salvage, as a rule, because in case of a common danger it is the duty of every one on board the ship to give every assistance he can, by the use of all ordinary means in working and pumping the ship, to avert the danger. Yet if one of the passengers or crew renders services outside and beyond his legal duty he may recover salvage. (*The Connemara*, 108 U. S. 352.) Members of a fire department, who act in the performance of a legal duty in saving a vessel, are not entitled to salvage.

The services must be successful to some extent, for if the property is not saved, or in case of capture is not retaken, no salvage is earned. More than one set of salvors, however, may contribute to the result; and all who materially contribute to the saving of the property are entitled to share in the reward, in proportion to the nature, duration, risk, and efficiency of the service rendered.

The amount of salvage to be awarded is largely a matter of fact and discretion in each case; and an appellate court rarely varies the amount given upon the trial. In determining salvage compensation, admiralty judges consider (1) the labor expended by the salvors; (2) the promptitude, skill, and energy which they display; (3) the value of the property employed by the salvors, its risk, and their personal risk in rendering the service; (4) the value of the property saved and its risk. Salvage is not to be confounded with PRIZE (*q. v.*). The latter is more like a gift of fortune, conferred without regard to the loss of the owner, who is a public enemy, while the former is a reward for saving the property of the unfortunate, and should not exceed what is necessary to insure the most prompt, energetic, and daring effort of those who are able to furnish relief.

(*Murphy* vs. *Ship Suliote*, 5 Fed. R. 99.) All property relieved by the salvors' services must contribute to their compensation in proportion to its value; and they have a first lien on such property, which may be enforced by proceedings In Rem (*q. v.*), or they may proceed *in personam* against the owners.

In apportioning the salvage among those engaged in rendering the relief service, regard will be had to the risk incurred and the responsibility borne by the various claimants. For example, if the cargo of the salving vessel was not exposed to danger, its owner will not be entitled to share; while the master of such vessel will be compensated generously, as it is his duty to plan and direct the services. After the ship-owner and master are provided for, the balance is divided generally among the navigating members of the salving crew, in proportion to their wages. In a recent case, however, non-navigating members, such as stewards and cooks, were allowed half-shares according to wages, although they had not taken an active part in the relief service, on the ground that they were bound to take such part if ordered by the master. *The Spree*, 1893, Probate 149.

Salvage service may be rendered under a contract. If this is fairly entered into, the parties are bound by its terms. Under such a contract the salvage may be payable, although the services have been fruitless. See Marvin, *Wreck and Salvage* (Boston, 1858); Newson, *Salvage, Towage, and Pilotage* (London, 1886). Francis M. Burdick.

Salvandy, săl'văn'dee', Narcisse Achille, Comte de: politician and author; b. at Condom, Gers, France, June 11, 1796; was in the army 1813–14; wrote, besides a number of political articles, *Don Alonzo, ou l'Espagne* (1824; 7th ed. 1858); *Islaor* (1824); *Histoire de Pologne avant et sous le Roi Jean Sobieski* (1827–29; 5th ed. 1855). After the Revolution of 1830 he sided with the Doctrinaires; was made ambassador to Madrid (1841–43) and Turin (1843–45), and Minister of Public Instruction 1837–39 and 1845–48. D. at Graveron Castle, Eure, Dec. 15, 1856.

Salvatierra, săl-vă-ti-ăr'ră: a town of the state of Guanajuato, Mexico; on the river Lerma; about 23 miles by rail S. of Celaya (see map of Mexico, ref. 6–G). It has cotton-factories of some importance, and is growing rapidly. Pop. (1889) 10,300.

Salvation: See Christianity and Atonement.

Salvation Army: a religious body with a military organization, now perhaps the largest and most powerful missionary agency in existence. It comprises 7,296 stations and outposts and 15,300 officers in 47 countries. It circulates 50,000,000 copies of its 55 weekly and monthly journals, and the annual circulation of its books and pamphlets is estimated at 4,000,000. The total sum raised annually by the army is about $5,000,000.

The object of the army, in the words of its general, is "to effect a radical revolution in the spiritual condition of the enormous majority of the people of all lands; . . . to alter the whole course of their lives, so that instead of spending their time in frivolity and pleasure-seeking . . . they shall spend it in the service of their generation and in the worship of God." It had its beginning in the work of the Rev. William Booth, later its general, as an evangelist among the degraded poor of the East End of London. In 1865, having severed his connection with the Methodist body in order more fully to devote himself to revival work, absolutely alone, unaided by any individual or fund, attracted only by the misery and need of the people, he began work by holding open-air meetings—the first one under cover being in a tent in the Friends' burial-ground in Whitechapel. This tent was subsequently destroyed in a gale, but the East London Mission was then sufficiently well established to warrant the renting of a hall. The work began to attract the attention of wealthy philanthropists, Samuel Morley, M. P., being conspicuous among its earliest and most constant friends. The rapidity with which the work extended was unparalleled, and its local character was soon lost. In 1869 its name was changed to the Christian Mission, and branches were formed in various parts of England, Scotland, and Wales. In 1880, with the opening of France, it began its international career. The devoted band of volunteer workers has been rewarded by accounts of remarkable conversions, and of reformations of vile and reckless characters who could not have been reached by any other existing agency. In some cases whole communities were reclaimed. In organizing the mission Mr. Booth had naturally followed Methodistic lines—converts were formed into classes, with leaders; these into leaders' and elders' meetings, with secretaries, treasurers, etc. Stations were united under evangelists, and local councils manipulated the funds. Conferences were composed of these materials, and in the speed of the movement time was wasted in calling the body together, and then its action was often too slow. After much deliberation it was unanimously decided by the conference to place the directing, controlling power in the hands of one man—Mr. Booth. In 1878 the name of the mission was changed to the Salvation Army, and a complete military system adopted. Military titles superseded the churchly nomenclature, and a deed-poll enrolled in the British High Court of Chancery constitutes the general of the army the trustee of its entire funds and property in Great Britain. In this deed-poll "only those doctrines were included that appeared necessary to salvation, only those regulations which should serve as a skeleton for whatever additions differences of time and nationality might demand. Only those fundamental objects were enacted which were to be the unchangeable pursuit of the Salvation Army so long as a single sinner remained to be saved." Thus its theology is of the simplest. The work in hand is "to subdue a rebellious world to God." This is to be accomplished by the instrumentality of holy men using the means used by the first apostles, and these means will be made effective by the cooperation of the Holy Ghost, given through and because of the atonement of Jesus Christ. On these lines the ranks are recruited from converts whose frequent lack of scholarship does not debar them from positions of usefulness and trust. Among the early features of the movement were training-homes, from which have graduated some of the most efficient officers. There are upward of forty of these training-homes in existence. With only these objects in view it appears strange that in each of the countries occupied by the army it has had to face universal prejudice and antipathy, which have found expression in systematic restriction and persecution. Through these it has invariably made its way to a position of respect. Nowhere has it had more bitter opponents than in its own home, England. From some of the roughest mobs there, however, army-corps have been recruited. Undoubtedly the apparently irreverent methods pursued by the army are frequently the cause of this opposition, as those in command hesitate at nothing in order to win the attention of the class they aim to reach, displaying wonderful ingenuity in their devices. In Sweden, to gain the students in the University of Upsala, a sensation poster in Latin was circulated with fine effect; while in a district in London a woman officer hired a cab, filled it with musical instruments, trimmed it and herself with streamers, and mounted to the top with a tambourine. Naturally a large number followed to the barracks. In foreign countries the soldiers adopt, so far as possible, the ways of the people, and their ordinary garb conforms to the customary dress of the poorest native. A decided feature from the beginning has been the army's music. It appropriates with the utmost freedom tunes with which all are familiar; and all sorts of musical instruments are used in the meetings and in the open-air parades.

In the army women are not barred by their sex from any position. They compose about half the officers in charge of corps. Though the discipline is strictly military the service is entirely voluntary, any one being at liberty to retire at any time. Having given satisfactory evidence of conversion and signed the articles of war, in which he promises, for love of Christ, to live for God and the army, be obedient to lawful orders, and lead a pure life, a recruit is expected to become an active worker. His tastes, circumstances, and adaptations are well considered, and scope is given for all his talents to find employment. The principle of self-support is applied to every corps, division, and territory. No salaries are guaranteed, and no officer receives more than is required for the supply of actual wants. Gen. Booth's private income is derived from other sources, and he has never drawn any salary or allowance from the army funds.

The memoir of Mrs. Booth, "the mother of the Salvation Army," *The Life of Catherine Booth* (New York and London, 1893), contains a history of the movement which embodied her life's work. All her children are actively engaged in "the war." William Bramwell, the eldest son, is chief of staff at the international headquarters, 101 Queen Victoria Street, London, England. Emma, the second daughter, is joint commander of the forces in the U. S., with headquarters in New York; Herbert, the third son, is

in charge of the Australasian forces. The eldest daughter, Catherine, is in charge of the Dutch work, with the title of *La Maréchale*, and two daughters, Eva and Lucy, are in command of Canada and France respectively. Other notable names identified with the army's progress are those of Commissioners Booth-Clibborn, Booth-Tucker, Booth-Helberg, Railton, Hanna Ouchterlony, Howard Carleton, Cadman, Coombes, Ridsdell, Higgins, and Dowdle.

The auxiliary league is composed of persons who, not necessarily indorsing every method used by the army, yet sympathize in its desire to reclaim the fallen and to save the lost, and who are precluded from taking any other part in it by pressure of other duties or ill health. Many persons of influence and position in this way assist in removing prejudice and encouraging the work.

In Oct., 1890, Gen. Booth published *In Darkest England, and the Way Out*, a book in which he dealt with and solved the problem of destitution and crime from the standpoint of the Salvation Army, through which alone it would be practicable to carry out such a scheme as he proposed. Five million dollars would be required, by the general's estimate, to put the whole in working order, but half a million would be sufficient to start it. On Jan. 30 following Gen. Booth publicly signed a deed of trust for the half million dollars, and two parts of the plan—the City Colony and the Farm Colony—are in successful working order and self-supporting, and negotiations are well under way (1894) for the third—the Over-the-sea Colony. Should the plan be fully carried out, the general declares that in England in twenty years no man or woman willing to work would be unemployed. Perhaps in no country has the Salvation Army made more rapid strides, or taken deeper hold, than in the U. S. On Mar. 10, 1880, Commissioner George Scott Railton, in company with seven illiterate yet earnest young women, landed at Castle Garden, New York. After a time the work was very prosperous, but unfortunately, owing to the unfaithfulness of one in its command, a secession took place in Oct., 1884, which resulted in the loss of the official organ, property, and many officers. Commissioner Frank Smith followed in office and was in command some three years, during which a hard struggle was experienced. Commander and Mrs. Ballington Booth took command of the work in the U. S. in Apr., 1887, and since 1890, in particular, the progress of the movement has been rapid. In the early part of 1896 Mr. and Mrs. Ballington Booth, having been ordered from headquarters in London to another field of operations, refused to obey, resigned their commissions, seceded from the army, and started an independent "American" movement of their own. In Mar., 1900, the army was established in 620 cities and towns, having 735 corps and outposts. Five-eighths of the officers are by birth or naturalization citizens of the U. S. In Mar., 1900, there were 2,709 officers. The official organ is the *War Cry*, and there is a monthly magazine known as *The Conqueror*.

Revised by F. DE L. BOOTH-TUCKER.

Salvator Rosa: an anglicized form of the name. See ROSA, SALVATORE.

Salvia'nus: presbyter of Marseilles: an important Christian writer of the fifth century; b. probably at or near Treves; author of several works, of which the following are extant: 1. *Ad Ecclesiam*, in four books, a tractate against avarice, published under the pseudonym of *Timotheus*; 2. *De Gubernatione Dei*, composed between 439 and 451, in eight books, in defense of God's constant providence; 3. Nine letters. Salvianus's Latinity is excellent for the period, and bears evidence of a study of Lactantius, but he is diffuse and very rhetorical. Of the vices of his time he gives a most vivid picture. Best editions by C. Halm (Berlin, 1877), and F. Pauly (Vienna, 1883). M. WARREN.

Salvini, săl-vee'nĕ, TOMMASO: tragedian; b. in Milan, Italy, Jan. 1, 1830. His father and mother were actors. Young Salvini showed a rare talent for acting, and he was placed under the tuition of Gustave Modena, and about 1847 joined the Ristori troupe, and achieved success. In 1849 Salvini took an active part in the war of Italian independence, and became the friend of Mazzini, Garibaldi, and Saffi, with whom he was taken prisoner at Genoa. Retiring to Florence he devoted a year to professional study, preparing among others the *rôles* of Othello, Saul, Hamlet, and Orosmanes. His theatrical tours in Italy, Spain, and Portugal were a series of ovations. In 1872 Salvini visited South America, where he was received with equal enthusiasm, and in 1873–74 he made a tour of the U. S., giving 128 performances, as well as twenty-eight in Havana, Cuba. In 1881–82 he again visited the U. S., and made a third tour in 1885–86, since which he has retired from the stage, and lives in Florence. Salvini also acted in Great Britain, Germany, Austria, and Hungary, producing everywhere a profound impression. B. B. VALLENTINE.

Salzburg: capital of the duchy of Salzburg, Austria; 195 miles by rail W. by S. of Vienna (see map of Austria-Hungary, ref. 5–D). It is picturesquely situated at the foot of the Noric Alps, on both sides of the Salza, which here rushes forth from a narrow defile and winds through the city toward the Inn. The city is old, with crooked and narrow streets, but it contains many fine monuments and edifices built of white marble. It is surrounded with walls pierced by twenty gates, of which the most remarkable is the Sigismund Thor, 425 feet long, hewn through the Mönchsberg. It has a fine cathedral (1614–34), a Benedictine monastery with a library of 65,000 volumes and 900 MSS., a botanical garden, a college, a theological seminary, a medical school, a museum of antiquities, and a public library with 82,000 volumes and 1,400 MSS. After 798 Salzburg was the seat of archbishops who became noted for their ecclesiastical severity. In 1498 the Jews were expelled, and in 1732 30,000 Protestants were compelled to leave their homes. Salzburg has manufactures of paper-hangings, musical instruments, lead-pencils, mirrors, and type, several oil-mills and factories for spinning and weaving cotton, and carries on an active trade with Vienna and Bavaria. Pop. (1891) 27,644.

Salzkam'mergut: district of the Austrian province of Upper Austria, between Salzburg and Styria; remarkable for the beauty of its scenery and for its salt-works. It comprises an area of 255 sq. miles, with 19,000 inhabitants. On account of the alpine character of the district, agriculture is almost impracticable; the inhabitants are mostly engaged in cattle-rearing and dairy-farming, and in the manufacture of salt. The most striking feature of the scenery is the lakes, inclosed by forest-clad mountains. The highest peak, Hoher Priel, reaches an elevation of 7,931 feet. The most celebrated of the lakes is Traun, formed by the river Traun. The richest salt-works are those of Ischl and Hallstadt.

Salzmann, CHRISTIAN GOTTHILF: See the Appendix.

Samana' Bay: a deep indentation in the eastern end of the island of Santo Domingo (Dominican Republic), West Indies. It is 37 miles long and 12 wide, with two entrances, which could be easily defended by forts; it forms a very large and fine harbor, perfectly safe except in the rare event of a cyclone from the E. The principal ports are Sabana la Mar on the south side and Santa Bárbara de Samaná, on the north. Although it lies near the route from New York to the Isthmus of Panama, the U. S. Congress refused to ratify a treaty for its purchase in 1870.

HERBERT H. SMITH.

Samar: one of the Visaya group, Philippine islands, East Indies; area, 5,167 sq. miles; pop. (1887) 185,386 inhabitants, most of whom are mestizoes. The mountains of this island are higher and wilder than those of the other islands. The capital is Catbalonga, on the west coast. The principal articles in which trade is carried on are wax, cabinet woods, palm oil and mat-work. Revised by M. W. HARRINGTON.

Samara, să-mă'ră: government of European Russia; bounded E. by the Kirghiz steppes and W. by the Volga. Area, 58,321 sq. miles. It is very fertile and well adapted to agriculture, but thinly peopled. Pop. (1897) 2,761,851.

Samara: capital of the government of Samara, European Russia; on the Volga (see map of Russia, ref. 7–H). It has an extensive trade in grain, fish, caviare, tallow, and hides. Pop. (1897) 91,659.

Samarang': town of Java, East Indies; the capital of the Dutch residency of Samarang; on the northern coast of the island, at the mouth of the river Samarang (see map of East Indies, ref. 8–D). It is tolerably well built, and has an important trade, though its climate is unhealthful and its harbor shallow, and in the wet season even unsafe. Sugar, rice, and pepper are extensively cultivated in its vicinity, and it is the entrepôt for the products of the central part of the island. Pop. 71,440, of whom 3,600 are Europeans.

Sama'ria [from Lat. *Samari'a*=Gr. Σαμάρεια, from Heb. *Shōmᵉrōn*]: an ancient city of Central Palestine, 6 miles N. W. of Shechem, and about half-way between the Mediterranean and the Jordan. It was founded 923 B. C. by Omri, the sixth of the nineteen kings of the northern kingdom of Israel, who

made it his capital, and called it after the name of the man (Shemer) of whom he bought the hill on which the city was built (1 Kings xvi. 24). This hill, oblong and flattened, swells up to the height of some 300 feet out of a basin about 5 miles in diameter, surrounded on every side by mountains still higher. The Mediterranean is in full view from the top of the hill. "It would be difficult," says Dr. Robinson, "to find in all Palestine a situation of equal strength, fertility, and beauty combined. In all these particulars it has very greatly the advantage of Jerusalem." The city shared in the stormy fortunes of the upper kingdom. Twice it escaped capture when besieged by the Syrians. In 722 B. C., after a siege of two years, begun by Shalmaneser of Assyria, it was taken by his successor, Sargon, who put an end to the kingdom of the ten tribes. Repeopled by Esarhaddon, it was next captured by Alexander the Great (332 B. C.), and again by John Hyrcanus (109 B. C.). It was splendidly rebuilt by Herod (40–4 B. C.), who named it *Sebaste*, in honor of his patron, the Emperor Augustus. The modern Arabic *Sebustieh* is simply a corruption of the Greek name. Nearly 100 limestone columns still standing attest the magnificence of the Herodian city. The partially ruined church of St. John, now a mosque, dated probably from the twelfth century. In the fourth century it was claimed that John the Baptist had been buried there, as well as the prophets Elisha and Obadiah. The modern village, on the southeast shoulder of the hill, contains about sixty houses. The people (from 400 to 500) are noted for their rudeness and insolence to travelers. Samaria was also the name of one of the three provinces into which Western Palestine was divided by the Romans. Its boundaries are given by Josephus (*J. W.*, iii., 3, 4). Revised by S. M. Jackson.

Samar'itans [from Lat. *Samarita'nus*, Samaritan, a Samaritan, from Gr. Σαμαρείτης, a Samaritan, deriv. of Σαμάρεια, Samaria]: the ancient inhabitants of the province of Central Palestine. After the destruction of the kingdom of Israel in 722 B. C., in the first year of Sargon, King of Assyria (2 Kings xvii. 6; xviii. 11), Central Palestine was left desolate and uninhabited except by a remnant of the poorer classes and fugitives (2 Chron. xxxiv. 6, 9: Jer. xli. 5), until the removal thither by Sargon in 722, and again in 715 B. C. (2 Kings xvii. 24), and Esarhaddon in 680 (Ezra iv. 2–10), of colonists from Babylon, Syria, Arabia, and other Eastern lands. Hence the people became an exceedingly mixed race, the main body, however, being of the Aramaic stock. Every tribe at first worshiped its own god, but being plagued by the wild beasts, they united in the worship of the God of the land, being instructed thereto by a priest sent to them from the exiles by the King of Assyria, who restored the worship at Bethel (2 Kings xvii. 24–41). When the Jews returned to Jerusalem (536 B. C.), the Samaritans desired to unite with them in their work, but were rejected by Zerubbabel, owing to their corrupt religion and their mixed or heathen origin (Ezra iv. 3). Henceforth, the Jews and Samaritans entertained the most bitter hatred of each other. This was intensified by the secession of one of the sons of Joiada, the son of Eliashib, the high priest (Neh. xiii. 28), son-in-law of Sanballat, the Samaritan governor (called by Josephus, *Ant.*, xi., 7, 2, Manasseh, the brother of Jaddua, the high priest). Under the leadership of this priest and others of the Jews, who with him were expelled on account of their refusal to separate themselves from their heathen wives, the worship was reorganized (409 B. C.) on the basis of a copy of the Pentateuch that Manasseh carried with him. Gerizim was made the center of worship, in accordance with the tenth commandment added by the Samaritans to Ex. xx. and Deut. v., and a temple was erected there, probably in the time of Alexander the Great, which continued until it was destroyed by John Hyrcanus (129 B. C.; Josephus, *Ant.*, xiii., 9, 1). The Samaritans shared the fortunes of Palestine during the constant wars between Egypt and Syria, and also under the Roman dominion. They were severely chastised by Pilate for their rebellious spirit, then again by Vespasian and others, until finally, in the reigns of Zeno and Justinian, on account of outrages committed against Christians, they were almost totally destroyed. A remnant clung to their holy place, dwelling in Nablus, the successor of the ancient Shechem, or dispersed in Alexandria, Cairo, Damascus, Aleppo, etc., where they retained the religion of their fathers. And thus they continued during the Mohammedan rule, dwindling until at present they are limited to a community of from 100 to 200 souls at Nablus. They were lost sight of by the learned world until the sixteenth century, when Joseph Scaliger opened a correspondence with them. They then gained an interest that they have since retained, owing to their ancient copy of the Pentateuch, and their religious rites and doctrines, as well as their language and literature.

The Samaritan Pentateuch.—The original MS. is in the synagogue at Nablus. This, it is claimed, was received by tradition from Abisha, the great-grandson of Aaron, whose name is inscribed upon it. It is mentioned by Cyril of Alexandria, Eusebius, Jerome, Procopius of Gaza, etc., among the Fathers, but was lost sight of subsequently until 1616, when Pietro della Valle procured a copy of it at Damascus, which was then published in the Paris Polyglot of 1645, and subsequently in Walton's Polyglot of 1657. At once a hot dispute arose as to its value, which continued for two centuries—Morinus, Houbigant, Poncet, and Hassencamp exalting it above the Masoretic text; Hottinger, Ravius, J. D. Michaelis, and Tychsen advocating the superiority of the latter. Gesenius, in his work *De Pent. Sam. Origine* (1815), was the first to compare the two texts thoroughly. His results have been generally accepted by modern scholars—that while the text is an independent one in its origin, it has yet been improved by the Samaritans in order to avoid obscurities and in the interest of their own religion, at times betraying an ignorance of Hebrew grammar and exegesis. It has many features of resemblance to the LXX. (Gesenius calculates them at more than 1,000), which have attracted the attention of scholars, so that on the one side Hottinger, Hassencamp, Eichhorn, and Kohn have contended that the LXX. had been translated from the Samaritan, and on the other side Grotius, Usher, etc., that the Samaritan was made from the LXX. But these views are impossible, and have been abandoned by most recent scholars, who give the text an independent authority. It was, then, either with the LXX. derived from a common older MS. of Jerusalem, as Gesenius, Nutt, and others, or, as the differences between them are quite numerous, they are based on independent original MSS., the original of the Samaritan text having been brought from Jerusalem by Manasseh. The text has been published since Walton by Blayney (Oxford, 1790) in Hebrew square characters, and the variations from the Masoretic text have been noted in the appendix to Petermann's *Versuch einer hebräischen Formenlehre nach der Aussprache der heutigen Samaritaner* (Leipzig, 1868; also *Deutsch. Morg. Gesells.*, v. 1). The text has been discussed in Smith's *Bib. Dict.* by Deutsch, and in Kitto's *Cyclop.* (3d ed.) by Samuel Davidson, as well as by those mentioned above.

The Samaritan religion is based on the Pentateuch, and differs from that of the Jews in the rejection of the rest of the Old Testament, and in their regarding as the tenth commandment the obligation to worship God on Mt. Gerizim. Their religion is monotheistic, the name יהוה being lost, and *Shéma* (the name) substituted for it. They believe in the existence of good and evil spirits, עזאזל (Lev. xvi. 10) being interpreted as a "devil," and the נְפִילִים of Gen. vi. 4 as "evil spirits." They believe in the Messiah (John iv. 25), on the basis of Deut. xviii. 15, as a prophet, who is like Moses, but not greater than Moses, who remains for all time the greatest. The Shiloh passage, Gen. xlix. 4, they refer to Solomon, in whose time the seepter departed from Judah. The Messiah will appear 6,000 years after the creation, and enter into judgment of the world on Mt. Gerizim. Here they find all the sacred places of the past and future. Here Adam was created; here the ark rested; here Adam and Noah erected their altars, Abraham offered Isaac, and the heavenly ladder appeared to Jacob, etc. They do not offer sacrifices, on account of the destruction of the temple, but keep the feasts of the Pentateuch, circumcise their boys on the eighth day, and observe the Sabbath in their synagogues like the Jews. The Samaritans had their sects after the analogy of the Jewish sects, called Essenes, Sebuæans, Gorthenians, and Dositheans, mentioned by Epiphanius, *Adv. Hæres.*, i., 11, fourth century. For these, and a full description of their present customs in the keeping of the feasts, see Petermann, art. *Samaria*, Herzog's *Realencyklopädie*; Stanley's *Jewish Church*; and Nutt's *Samaritan History, Dogma, and Literature* (London, 1874).

The Samaritan language is a mixture of the Aramaic and Hebrew, in many cases having side by side the two forms; e. g. the article of the Hebrew and emphatic state of the Aramaic; the relatives אֲשֶׁר and ד; the Niphal and Ithpe'el, Aphel, and Hiphil; the plurals in ים and ין, ות—

and ֫—. The letters are twenty-two in number, their order being the same as in Hebrew, but their *form* is like the ancient Hebrew and Phœnician, and not like the square character adopted by the Jews subsequent to the Exile. In pronunciation they are the same as Hebrew, except the gutturals, which are all quiescent and interchange readily with one another, being exceedingly weak. The vocabulary is essentially the same as the Hebrew and Chaldee, although many words have been introduced from Arabic, Latin, and Greek. See Uhlemann, *Inst. ling. Samarit.* (Leipzig, 1837); Nicholls, *Grammar of the Samaritan Lang.* (London, 1858); Petermann, *Brevis Ling. Samarit. Gr.* (Berlin, 1873).

The Samaritan literature is limited in extent. (1) The *Samaritan Targum* is ascribed by tradition to Nathanael the high priest, who died 20 B. C. There is no reason to doubt that it was composed about the same time as the Targum of Onkelos, with which it has many points of agreement, although certainly an entirely independent version. The translation is exceedingly literal and close, even where the sense was not clear to the translator. (Cf. Winer, *De Versionis Pent. Samaritanæ indole* (Leipzig, 1817); Petermann, *Pent. Samarit.*, fasc. i. Genesis (Berlin, 1872); Brüll, *Samarit. Targum zum Pent.* (Frankfort, 1875), in Hebrew square characters. Cf. also *Fragments of a Samaritan Targum*, with an introduction by Nutt (London, 1874), and *Krit. Studien über manuscript. Frag. des Sam. Targ.*, von Brüll (Frankfort, 1875).) This Targum is also printed in the great Paris and Walton Polyglots. The Samaritans had also a Greek version, mentioned by some of the Fathers as τὸ Σαμαρειτικόν, which has been lost; also an Arabic version, which they still possess. (2) *Chronicles.*—First in importance is the Samaritan Chronicle, or book of Joshua, composed probably in the thirteenth century, taking some of its material from the Hebrew book of Joshua, but adding thereto much of a legendary character, showing that the Jews were from the time of Eli apostates and their oppressors, continuing the narrative until about 350 A. D., where it concludes abruptly. It was published by Juynboll (Leyden, 1848), with Latin translation and commentary. There is also the chronicle *El Tholodoth* (The Generations), professedly by Eleazar ben Amram (1142 A. D.), and then continued by many others until 1859, giving the calculation of sacred times, the age of patriarchs, list of high priests until the present. It was published by Neubauer in *Journal asiatique* (1869). Then comes the chronicle of Abulfath, in the middle of the fourteeenth century, a digest of the two previous works, with fresh legendary material, published by Vilmar (Gotha, 1865). Other minor works, corresponding with the Jewish Hagada literature, are found. (3) *Liturgies and Hymns.*—Nutt (p. 143) says that there are nineteen volumes of these in the British Museum, besides those known in the *Carmina Samarit.* of Gesenius (Halle, 1824) and *Karme Shomeron* of Kirchheim (Frankfort, 1851.) Petermann publishes specimens in his *Gram.* and *Chrest.* The present Samaritans have two collections, called *Durrân* (String of Pearls) and *Defter* (Book). These hymns and prayers belong to widely different periods. The earliest are ascribed to the angels. Heidenheim has published many of them in his *Vierteljahrsschrift.* (4) There are also commentaries, theological tracts, and a few recent grammatical works, written in Arabic. See the article *Samaria* in Herzog's *Realencyk.*, by Petermann; Smith's *Dict.*, by Deutsch; Kitto, *Cyclop.* (3d ed.), by Davidson; and Nutt, *Samaritan Hist., Dogma, and Literature* (London, 1874). C. A. Briggs.

Samarkand', or **Samarcand** (probably the ancient *Maracanda*): capital of the province of Serafshan; comprising the southern part of Russian Turkestan; situated at an elevation of 2,154 feet above the level of the sea, 8 miles S. of the river Serafshan (see map of Asia, ref. 4–D). By the Arabian poets of the Middle Ages it is described as a paradise on account of its beautiful surroundings, and under the dynasty of the Sassanides (833–1000 A. D) it flourished as a home for learning and all the arts of peace. It lost much by the occupation of Genghis Khan in 1219, but it rose again toward the close of the fourteenth century, when Timur made it the capital of his immense empire, and adorned it with architectural monuments of all kinds—the tomb of Kasim-bin-Abbas, the mosque of Timur, the citadel, Timur's tomb, the Medresse, etc. By the Mohammedans of Central Asia the city is still considered the principal seat of Mohammedan learning, and its eighty-six mosques and twenty-three colleges attract numerous pilgrims and students. In 1868 it was seized by Russia, with the whole district of the Serafshan. The Transcaspian Railway has been completed to Samarkand. Pop. in 1889, according to Curzon, 40,000, of whom 6,000 were in the European quarter; pop. (1897) 54,900. Revised by M. W. Harrington.

Samar'rah: town; in the vilayet of Mesopotamia; on the left bank of the Tigris; 62 miles N. W. from Bagdad (see map of Turkey, ref. 7–J). It was founded by the Caliph Motassem (836) with frightful extravagance. The stables of the caliph could contain 100,000 horses. The city is revered by the Shiïte Mussulmans, and annually attracts great numbers of pilgrims. Pop. 8,000. The ruins of ancient Opis and of the Median wall, which extends for several miles along the river, are close by. E. A. G.

Sambation [through Heb. from Gr. σαββατικὸς πόταμος]: a river said by Oriental folk-lore to flow during the week, but to rest on the Sabbath. It is first mentioned by Pliny (*Hist. Nat.*, xxxi., 2). Josephus (*Bell. Jud.*, vii., 5, 1) reverses the order, and says it flows only on the Sabbath. In the Midrash and later Jewish saga it is connected with the reported dwellings of the ten lost tribes (*Jew. Quart. Rev.*, i., p. 20, *seq.*). It is useless to attempt to identify the river, but the belief had its origin in the many intermittent springs in Palestine, and in the wish to make nature witness to the holiness of the Sabbath. There existed another saga on a river which flowed sand and stones (Bar Hebræus, in *Mittheil. d. Acad.-Orient. Ver. zu Berlin*, iii., 38), which, because of its name (*Nahar ḥōl*, Sand or Week river), was confounded with the Sambation (*All. Zeit. d. Judenth.*, May 20, 1892, p. 247; *Zeit. f. Assyr.*, viii., p. 273). Similar traditions exist in the East. See also Neubauer, *Geogr. du Talmud* (1868, p. 33); Brüll, *Jahrbücher f. Jüd. Gesch.* (i., p. 64); *Zeit. f. Volkskunde* (ii., p. 297). Richard Gottheil.

Sambre, sänbr: a small river of Europe which rises in the department of Aisne, France, flows in a N. E. direction, and joins the Meuse at Namur in Belgium after a course of about 100 miles. It is navigable for a great part of its course, and forms an important part of the system of canals in Northern France and Belgium.

Sam'isen [Jap., liter., the three pleasing threads]: the most popular of Japanese musical instruments. It consists of a neck or finger-board 2½ feet long, and a square drum (7¾ by 7 inches), rounded off at the corners and covered with parchment. There are three strings of silk, which the player strikes with a broad pecten, 8¼ inches long, of wood, ivory, or tortoise-shell. The parchment covering the drum is of cat-skin, and is double at the point where the player strikes. The instrument is held by the left hand, close to the left shoulder, transversely, so that the drum comes under the right arm. The drum receives the first blow from the pecten or *bachi*, and thus two vibrations are set up. In the fingering the nails are made to press the strings. The instrument is said to have been introduced from Loochoo about 1560. J. M. Dixon.

Sammon'icus, Quintus Serenus: a Roman poet of the third century A. D., whose didactic poem, *De Medicina*, in 1,115 hexameters, is a collection of medical receipts drawn largely from the elder Pliny; correct in versification, but dull and prosaic. Edited by Ackermann (Leipzig, 1786), and in Baehrens's *Poet. Lat. Minores*, vol. iii., pp. 102–158. M. W.

Sam'nites [from Lat. *Sam'nis*, plur. *Samni'tes*, a Samnite, deriv. of *Sam'nium*, for older *Sabi'nium*, name of their country, deriv. of *Sabi'nus*, Sabine]: a people of Sabine origin occupying Samnium, the territory of Central Italy S. of the Sabines (*q. v.*). Like the latter, they were a confederation of tribes, but their organization seems to have been more perfect than that of the parent race. They gradually moved beyond the natural boundaries of their territory, and occupied points on the Adriatic, and in the territory of Campania and Lucania, coalescing with the Oscan peoples who inhabited this region. In the northern part of Campania they came in contact with the Romans, and thus was inaugurated the long series of wars which resulted in Rome's conquest of the whole of Southern Italy (272 B. C.). The Samnites probably found the Oscan language in the original territory which they occupied, as well as in Campania, but as their own (the Umbro-Sabellian dialect) was so closely related to it, the mingled product does not seem to have differed much from the original Oscan.

G. L. Hendrickson.

Samnium: See Samnites.

Samo'a: group of fourteen volcanic islands of Polynesia, N. E. of the Fiji islands; lying nearly E. and W. between

the parallels 13° 31′ S. and 14° 30′ S. and lon. 172° 45′ W. and 168° 9′ W. It consists of three larger islands—Savaii (area, 659 sq. miles, Upolu (340 sq. miles), and Tutuila (54 sq. miles)—and the smaller Manua group to the eastward. Total area, 1,701 sq. miles. Pop. 34,000. Upolu is the most populous, containing 16,600 inhabitants, and on its northern shore is Apia, the principal port and capital of the group. The volcanoes are quiescent, though native tradition relates an eruption on Savaii, and in 1866 Olosenga, one of the eastern group, had a submarine explosion close to its shores, accompanied by a shower of ashes. The climate is tropical, the rainfall (occurring in December to April) reaches sometimes 135 inches, the soil is very fertile, the vegetation luxuriant, the aspect picturesque. The natives are of pure Polynesian race, gay, kind, pleasure-loving, indolent, fairly intelligent, devoted to agriculture and fishing. They are all nominal Christians, about two-thirds being Protestants, the remainder Roman Catholics. In 1891 there were 235 British-born subjects on the islands, about 90 Germans, and a few of other nationalities. The chief products are copra, cotton, and coffee. In 1892 considerable plantations of cacao were made. U. S. coins are the recognized medium of exchange. The archipelago was discovered in 1722 by Roggeveen. Bougainville visited the islands in 1768 and named them Navigator Islands. They are in direct steam-communication with New Zealand, Australia, and California. The dates used on the islands, formerly derived from the East, were in 1892 changed to those from the West, July 5 of that year being changed to July 4.

Formerly the islands, with the exception of Tutuila, which had independent chiefs, were governed by the royal houses of Malietoa and Tupua. In July, 1881, by an agreement between Germany, Great Britain, and the U. S., Laupepa became king of all Samoa, and Tamasese vice-king. These two chiefs frequently changed places until, Aug. 25, 1887, the Germans proclaimed Tamasese king, and Laupepa was deported to the Cameroons. Mataafa, the chief of the loyalist party and a relative of the exiled king, made war against Tamasese. The Germans, after an encounter (Dec. 13, 1888) resulting from an attempt to disarm Mataafa's forces, proclaimed martial law. A truce was finally arranged with Mataafa pending diplomatic negotiations. At a conference in Berlin between representatives of Germany, Great Britain, and the U. S., Samoa was declared (June 14, 1889) independent and neutral; the Samoans were secured in their right to elect their king and govern themselves according to their native laws and customs; and a supreme court was created to secure the rights of foreigners. Laupepa was re-elected king by the people Nov. 9, 1889. By the treaty signed Apr. 19, 1890, Apia was converted into a municipal district, or international port, and placed under a municipal magistrate. By the Anglo-German agreement of 1899, accepted in Jan., 1900, by the U. S., Great Britain and Germany renounced in favor of the U. S. all rights over the island of Tutuila and the other islands E. of 171° lon., the islands W. of that meridian being assigned to Germany. See Robert Louis Stevenson, *A Footnote to History, Eight Years of Trouble in Samoa* (1892). MARK W. HARRINGTON.

Samos: a mountainous island of the Ægean Sea; separated by the Strait of Kutchuk Boghas, 1¼ miles wide, from the promontory of Mt. Mycale, at whose foot the fleet of Xerxes was defeated on the day of the battle of Platæa (479 B. C.). It is 34 miles long, 13 miles broad, with area of 289 sq. miles. The island is exceedingly fertile, producing in abundance wheat, olives, grapes, and fruit of superior quality, but its orange, lemon, and pomegranate groves were almost ruined by the rigorous winter of 1849, and have been only partially restored. The mountains, lined with forests of oak, cypress, and pine, are rich in marble and silver, lead and copper ores. Mt. Kerki, the loftiest peak, is 5,223 feet high, the summit usually covered with snow. In grand picturesqueness and variety of scenery, Samos is unsurpassed among the Ægean islands. The tunnel, mentioned by Herodotus, which supplied the ancient seaport with potable water, exists in good preservation. In all ages the Samian sailors have been famous for intrepidity and skill. In classic days the island was wealthy and flourishing. Sometimes independent, but constantly attacked, it often changed masters, until in 1453 it was conquered by the Ottomans, and the inhabitants exterminated. Abandoned during a century, it was repopulated in 1587. It took an heroic part in the Greek revolution (1821–27), and asserted its independence, but was handed over to the Ottomans by the allied powers on conclusion of peace. Since Dec. 11, 1832, it has been a principality, paying an annual tribute of 30,000 piasters, and governed by a Christian prince appointed by the sultan. The inhabitants, almost exclusively Greeks, are industrious, enterprising, and ambitious. Vathy, the real capital (pop. 7,675), was among the first places in the East to introduce the electric light. Chora, the residence of the governor, is a miniature European town. The annual exports, mostly agricultural products, amount to $4,000,000. Pop. of the island (1889) 43,901, residing in thirty-one towns and villages. E. A. GROSVENOR.

Sam'othrace: island in the Ægean Sea; N. W. of the Dardanelles; belongs to Turkey. Destitute of harbors, it is really a wooded mountain, 30 miles in circuit, rising to the height of 5,240 feet. Its peak, Mt. Saoce, whence, according to Homer, Neptune watched the battles of the Greeks and Trojans, is visible from the plain of Troy. The island was the center of the ancient Cabiric worship, monuments of which are still seen. An earthquake, Feb. 14, 1893, destroyed most of the buildings on the island and many lives. Pop. 1,800. E. A. GROSVENOR.

Samoyeds': a people of Northern Russia, in Europe and Asia, from the White Sea on the W. to Cape Chelyuskin on the E., along the Arctic Ocean, and to a considerable but varying distance inland. They appear to be allied to the Lapps and Finns, but are more degraded than either. They are small, filthy, indolent, and much addicted to intoxication, but peaceable and harmless. The herding of reindeer and the collection of fish and furs afford them subsistence. They are said to number 20,000, of whom one-fourth are European. They speak several dialects. Their country is one of the coldest and most desolate of inhabited lands. They are nominal Christians, but preserve much of their old worship. Revised by M. W. HARRINGTON.

Samphire [for earlier *sampire*, from O. Fr. *Saint Pierre* in *herbe de Saint Pierre*, samphire, liter., Saint Peter's grass]: an umbelliferous plant, *Crithmum maritimum*, growing on cliffs near the sea in Europe. It is a choice salad-herb and makes a very fine pickle. It is extensively raised in English market-gardens. The golden samphire is *Inula crithmoïdes*, a composite seacoast plant resembling samphire, growing in the same situations and having the same uses. Marsh-samphire is *Salicornia herbacea*, a chenopodiaceous salt-marsh plant of Europe and North America. Revised by CHARLES E. BESSEY.

Sampi: an ancient Greek numeral sign (ϡ) for 900. In form it undoubtedly represents the so-called "Dorie *sam*" (Ϻ), a symbol inherited from the Phœnician alphabet, and originally indicating a sibilant distinct from *sigma*. The old Greek local alphabet seldom made use of both signs, but generally decided in favor of one or the other. Some of the Asiatic-Ionic towns, notably Halicarnassus and Teos, used the *san* in the form Ϸ to denote the sound *ts* (or *sh*), otherwise commonly written with double sigma (*-σσ-*). That the symbol was generally regarded even in Asia Minor as a supernumerary is shown by its place after *omega* (800) in the scale of numerals which originated in Miletus. The name *sampi* is due either to the fancied resemblance of the later form to the letter *pi* (π), or, if the name is really old, more probably to the position of the letter after *pi* in the original (Phœnician) alphabet. BENJ. IDE WHEELER.

Sampson, EZRA: clergyman and editor; b. at Middleborough, Mass., Feb. 12, 1749; graduated at Yale College 1773; became pastor of the Congregational church at Plympton, Mass., Feb., 1775; was chaplain in the army at Cambridge 1775–76; removed to Hudson, N. Y., 1796; was there associated with Harry Croswell in the editorship of *The Balance*, one of the first literary journals established in the U. S., 1801–04; contributed essays for many years to *The Connecticut Courant*, which he edited 1804; became judge of Columbia County 1814, but soon resigned. D. in New York, Dec. 12, 1823. Author of *Beauties of the Bible* (1802); *The Sham Patriot Unmasked* (1803); *The Historical Dictionary* (1804), which passed through several editions; and *The Brief Remarker on the Ways of Man* (1817; new ed. 1855). Revised by G. P. FISHER.

Sampson, WILLIAM T.: See the Appendix.

Samson [from Heb. *Shim'shōn*, liter., like the sun, deriv. of *shemesh*, sun]: one of the Hebrew judges, whose history is related Jud. xiii. 2–xvi. 31. Few narratives in the Bible have been studied so carelessly as this. The opening formula (Jud. xiii. 2) shows that it is a story like those in

Jud. xvii.–xviii. and xix.–xxi. The author took pains to divide the story into two parts. The first part (xiii. 2–xv. 20) gives an account of the birth and the wild youth of Samson, up to the time when, after the battle of Lehi, "he became judge of Israel, in the days of the Philistines, twenty years." The second part (xvi.) gives an account of the last few weeks or months of his life, when he relapsed into folly, and perished thereby, "he having been judge of Israel twenty years." Samson is the son of the Danite Manoah of Zorah (xiii. 2), living in Mahaneh-Dan (xiii. 25, xvi. 31; comp. xviii. 11–12). To his mother, long barren, the birth of a son was announced by an angel (comp. Luke i. 7, 13). He is a Nazirite by birth (xiii. 5, 7, xvi. 17; comp. 1 Sam. i. 11), a different thing from being a Nazarite temporarily by vow (Num. vi. 2–21). Through his passion for a Philistine woman, he providentially becomes involved in a series of personal quarrels with the Philistines. In these, though he is not blameless, he has the sympathy of the reader. One exploit leads to another, until he becomes judge. No details of his career as judge are given. In his youth, however, the Philistines ruled Israel (xiv. 4), and Israel, judging by the conduct of the men of Judah (xv. 10–13), was in an abject condition; while in his later years the Philistines kept their own side of the border (xvi.). The inference is inevitable that the twenty years of his administration were a success, and fulfill the promise made before his birth (xiii. 5). Many imagine that he was merely a local judge, but, if language means anything, the statement that he "judged Israel" indicates that he was chief magistrate of the nation. Ussher assumes that the twenty years of Samson followed the forty years of Eli, and dates them B. C. 1140–1120. It is more probable that Samson belongs to the time of Philistine oppression, some decades earlier (Jud. x. 7). Revised by W. J. Beecher.

Samson, George Whitefield, D. D.: theologian and critic; b. at Harvard, Mass., Sept. 29, 1819; graduated at Brown University 1839, at Newton Theological Institute 1843; was for many years pastor of a Baptist church at Washington, D. C., and president of Columbian College, 1859–71; president of Rutgers Female College, New York, 1871–86. D. in New York, Aug. 8, 1896. He traveled in Europe and the East 1848, publishing a series of letters and essays on Italy, Egypt, Palestine, and Sinai; was also author of several theological pamphlets and critical essays on art; *To Daimonion, or the Spiritual Medium* (1852), reissued in an enlarged form under the title *Spiritualism Tested* (1860); *Outlines of the History of Ethics* (1860); *Elements of Art Criticism* (1866); *Physical Media in Spiritual Manifestations* (1869); *The Atonement as assumed Divine Responsibility* (1878); *Bible Revisers' Greek Text* (1880); *Bible Wines* (1883); *Idols of Fashion and Culture* (1887); *Tested Truths as to Relations of Capital and Labor* (1890); *Guizot's Harmony of Historic, Philosophic, and Religious Instruction in French Colleges* (1891); *Classic Test of Authorship, Authenticity of Authority applied to the Old and New Testament Scriptures* (1893).

Samsun' (anc. *Amisus*): town; in vilayet of Trebizond, Asia Minor; a port of large importance on the Black Sea; northern terminus of several trans-Anatolian commercial routes (see map of Turkey, ref. 4–G). It exports wool, silk, sheepskins, goatskins, wax, gums, opium, grain, fruit, wine, valonea, and tobacco. Pop. (1889) 14,500. E. A. G.

Samuel [from Heb. *Sh^{e}mū'ēl*, for *sh^{e}mū^{ac}a'ēl*, heard of God]: a Hebrew judge, lawgiver, and prophet, whose history is recorded in the first of the two biblical books of Samuel; b. at Ramathaim Zophim, in Mt. Ephraim, probably in the twelfth century B. C.; was consecrated by his mother, Hannah, to the service of Jehovah as a Nazirite before his birth; brought up in the household of the chief priest, Eli, at Shiloh; received in childhood a divine message foreboding the downfall of the family of Eli; assumed the judgeship of Israel about twenty years after the death of Eli, at which time he headed a successful expedition against the Philistines; resided at Ramah (probably the same as Ramathaim Zophim); visited annually the three principal sanctuaries, Bethel, Gilgal, and Mizpeh, and made his sons deputy judges, but in consequence of their misconduct was commissioned by Jehovah to accede to the popular clamor for a king; to which end he anointed Saul as first monarch of Israel, and on his disobedience to a divine command anointed the youthful shepherd David in his place. He died shortly before the close of the reign of Saul, and his spirit was successfully invoked by the "witch of Endor" to announce to Saul the fatal result of the battle in which he lost his life. Samuel is regarded as the father of prophecy. This does not mean that there had been no prophets before him, but that he gave organized form and increased power to the prophetic activity in Israel. The "companies" of prophets of his own time and the "sons of the prophets" of later times probably owed their origin to him. In connection with prophetic training he gave an impetus to literary and musical culture, thus making possible the great development of these that characterized the reigns of David and Solomon.

The chronology of the life of Samuel is obscure, and great differences of opinion exist. Probably, however, he was a grown man at the death of Eli (1 Sam. iii. 19–iv. 1); then for twenty years he made his influence felt as a prophet, neither he nor Samson, nor any other man, being at that time judge of Israel (vii. 2); then for perhaps eighteen years he was judge (vii. 6, *seq.*), chief magistrate of Israel; then Saul was made king, and Samuel, being thus outranked, was no longer chief magistrate, though he continued to be judge till his death (vii. 15). His administration was brilliantly successful, though the accounts of it are very brief. Israel became independent of the Philistines (vii. 13–14). He settled the Amorite question, which had been a source of trouble from the time of Joshua (vii. 14). He organized the administration of justice (vii. 16–17). Though his sons failed to walk in his footsteps, he handed over to his successor a strong and prosperous nation.

Revised by W. J. Beecher.

Samuel, The Books of: called in the LXX. and Vulgate the first and second books of Kings. The books of Judges and Samuel, either with or without Ruth, are a connected whole, evidently formed, to a large extent, by the process of combining earlier writings. The Talmud attributes the series to the prophet Samuel, with supplementary work by the prophets Nathan and Gad. This can not be correct in the sense that Samuel personally wrote the larger part of these books, but it is probably correct in the sense that the work was initiated by him, and dominated throughout by his spirit. In 1 Chron. xxix. 29 we are told that the affairs of King David, first and last, "with all his reign and his might, and the times which passed over him and over Israel and over all the kingdoms of the countries," are written "upon the words of Samuel the seer, and upon the words of Nathan the prophet, and upon the words of Gad the observer." Evidently, the sources thus described are either a collection of the writings whence the present series, Judges, Ruth, and Samuel, was compiled, or else that series itself, the second alternative being the more probable.

Scholars hold various opinions as to the time when the books of Samuel were composed in their present form, but really there is no reason for dating them later than the lifetime of Nathan, that is, some time in the reign of Solomon. All the many alleged reasons for assigning to them a later date fade out when closely examined.

In any case, the books of Samuel are not continuous, as a literary work, with the books of Kings, though the latter take up the history at the point where the former leave it. The author of Kings habitually names his sources (1 Kings xi. 41, xiv. 19, e. g.), passes a sentence of formal approval or condemnation on each ruler (2 Kings xvi. 2, 3, e. g.), gives his chronology in a formulated system, while the author of Samuel habitually does none of these things. And many additional particulars might be cited to show that the authors of the two series were men very dissimilar in their point of view and their literary habits.

In their contents the books of Samuel are a history of David and his reign, with a preliminary account of the calamities that preceded Samuel, the brilliant administration of Samuel himself, the establishing of the kingdom, the reign of Saul, and especially Saul's relations to David.

Samuels, Arthur Warren: See the Appendix.

Samurai, sȧ'mo͝o-rī' (literally, guard): the name given to Japanese warriors under the feudal *régime*. Before the Tokugawa shogunate the name included even the shogun and daimios. The samurai were a class apart, numbering in 1870 about 400,000 families, intermarrying among themselves, and having a peculiar code of honor, etiquette, and morality. The privilege of wearing two swords, withdrawn in 1876, gave them the name of "two-sworded men." The modern police and gendarmerie and the officers of the army and navy are of samurai stock. J. M. Dixon.

Sanaa': city; capital of the Ottoman vilayet of Yemen, in Arabia. It is situated 7,120 feet above the level of the

sea, and is surrounded by arid mountains (see map of Persia and Arabia, ref. 10–E). The climate is healthful, though the air is exceedingly rare and dry. It seldom rains, sometimes not for several years, but excellent and abundant water is supplied by wells. Snow falls in winter. The city is inclosed by brick walls, is well built with stone houses, two, three, and four stories high, and has public squares and a fine hospital. The bazaars are well stocked, and a thriving trade is carried on in coffee, indigo, gum arabic, aloes, and skins. Mohair and camel's-hair carpets are made. Sanaa was important before the time of Mohammed, its temple rivaling the Kaaba. Since 930 it has been the capital of Yemen. In 1872, being hard pressed by the Bedouins, it entreated the protection of the Ottomans, and has since formed part of their empire. Pop. 50,000, of whom 35,000 are Arabs and 11,000 Jews (1889). E. A. Grosvenor.

San An'gelo: town; capital of Tom Green co., Tex.; on the Concho river, and the Gulf, Col. and S. Fé Railway; 227 miles W. of Temple, 446 miles N. W. of Galveston (for location, see map of Texas, ref. 3–F). It has an elevation of 2,000 feet above sea-level; is the center of the stock-raising and wool-growing region of the State; is surrounded by irrigated farms on which much celery is raised; and is a sanitarium for consumptives. There are 3 national banks (combined capital $300,000) and 3 weekly papers. Pop. (1890) 2,615; not returned separately in 1900. Editor of "Standard."

San Anto'nio: city; capital of Bexar co., Tex.; on the San Antonio and the San Pedro rivers, and the International and Gt. N., the San Ant. and Aransas Pass, and the S. Pac. railways; 75 miles S. W. of Austin, 250 miles N. by W. of Brownsville (for location, see map of Texas, ref. 5–G). It is the largest city in the State; is on a level and fertile plain with a range of limestone hills near by; has an abundant supply of water for manufacturing and domestic purposes from the rivers, the old Spanish acequias, and several artesian wells; and is the site of a U. S. military post, permanently established in 1875. It has an excellent climate, with a remarkably even temperature, and a dry air. The city has over 150 miles of water-mains, over 125 miles of cement sidewalks, over 75 miles of paved streets, and over 75 miles of electric street-railway. There are 13 iron and 4 wood bridges over the river, several large public parks, a U. S. Government building, new county court-house (cost nearly $1,000,000), several hospitals, gas and electric-light plants, and a number of fine halls belonging to secret societies and social clubs.

Churches and Schools.—San Antonio contains 40 church buildings, the most imposing of which is the Roman Catholic Cathedral of San Fernando (present building erected 1868–73, and incorporating parts of an earlier church edifice, where Santa Anna had his headquarters in 1836). The largest Protestant church is St. Mark's (Protestant Episcopal). The city is the seat of a Roman Catholic bishopric and of the Protestant Episcopal bishopric of Western Texas. San Antonio has public-school property valued at $1,000.000, a school population of over 12,000, 8 public-school buildings for white pupils and 3 for colored, and over 30 private schools. Besides its share in the great public-school fund of the State, the city has a fund of its own of over $100,000. There are two academies for boys, St. Mary's College, St. Mary's Hall, Wolfe Memorial School, Ursuline convent and school, a young ladies' school, young ladies' seminary, and two business colleges.

Finances and Banking.—Since 1890 there has been a marked increase in the assessed valuations, which has enabled the city to undertake extensive public improvements. In 1894 the assessed property valuation was $32,000,000. The city revenue 1894–95 was $328,376; expenditure, $329,-402; bonded debt, $1,763,500 (of which $500,000 was for a new sewer system); floating debt, $225,000. In Sept., 1900, there were 5 national banks with combined capital of $825,-000, 5 private banks, and an incorporated bank.

Business Interests.—In 1890 the census returns showed 43 manufacturing establishments (representing 25 industries), with a combined capital of $1,648.392, employing 907 persons, paying $615,125 for wages and $831,185 for materials, and turning out products valued at $2,152,266. The industrial works include 9 carriage and wagon factories, 7 candy-factories, 6 soda and mineral water establishments, 5 mattress-factories, 4 brick and tile works, 4 cement-works, 4 tanneries, 3 breweries, 3 machine-shops, 3 ice-factories, and 3 marble-works. The city also has large interests in stock-raising and the shipment of cotton, wool, and hides.

History.—The city was founded in 1714. Among the points of special interest are the mission of San Antonio de Valero, better known as the Alamo, founded in 1720, for many years used as a fort, and the scene of Santa Anna's massacre of Texan patriots in 1836; the First or Mission Concepcion, founded in 1716, and the scene of a battle between Mexican and Texan troops in 1835; the Second or Mission San José de Agnayo, founded in 1720, and decorated by the Spanish artist Huica; and the Third or Mission San Juan Capistrano, founded in 1716, and the rendezvous of the Texans prior to their capture of San Antonio in 1835. The Alamo is the property of the State and is open to visitors. Pop. (1880) 20,550; (1890) 37,673; (1900) 53,321.

J. D. Whelpley, editor of "Daily Express."

San Antonio River: a stream that rises in Bexar co., Tex., flows S. E. 200 miles, and falls into the Gulf of Mexico at Espiritu Santo Bay. The city of San Antonio and the village of Goliad are upon its banks.

Sanball'at [Heb.; LXX. Σαναβαλλάτ, Σαναβαλάτ; from Assyr. *Sin-uballit*, the god Sin gives life]: in the book of Nehemiah, the head of the opposition which Nehemiah encountered in rebuilding the walls of Jerusalem. He is called a Horonite, and his daughter is said to have married the son of a high priest. Josephus (*Ant.*, xi., 7, 8) mentions an officer in Samaria bearing the same name, whose daughter was married to Manasse, brother of the high priest Jaddua, and founder of the schismatic temple on Mt. Gerizim. But Josephus places this Sanballat at the time of Alexander the Great, and has evidently confused the biblical person with some other. Richard Gottheil.

San Bernardi'no: city; capital of San Bernardino co., Cal.; on the Southern Cal. Railway; 60 miles E. of Los Angeles (for location, see map of California, ref. 12–G). It is in an agricultural, fruit-growing, and mining region, the center of the great San Bernardino basin and of the citrus belt. It has mountains on three sides and commands a fine view of Mt. San Bernardino, the loftiest peak of the Coast Range. The city is laid out attractively, with broad streets well paved and intersecting at right angles, and has an abundant supply of artesian water. The climate is mild and equable; malaria is unknown; fogs are seldom seen. Among the public buildings are a new court-house, cost $350,000, the Hall of Records, the public high school, St. Catharine's Academy, several commodious churches and public schools, and 4 hotels. There are 2 national banks with combined capital of $200,000, 2 State banks with capital of $110,000, a private bank, 2 building and loan associations, and 2 daily and 3 weekly newspapers. The city has important steam and street-railway communications, and contains the large shops of the Southern California Railway. Pop. (1880) 1,673; (1890) 4,012; (1900) 6,150. W. J. Beaver.

San Blas: town and port of the territory of Tepic, Mexico; on the Pacific coast, in lat. 21° 32′ 24″ N. (see map of Mexico, ref. 6–E). A sheltered bay just W. of it admits vessels drawing from 9 to 12 feet, according to the season; larger ships anchor in the open roadstead, and freight is discharged on lighters. This is the most frequented port between Acapulco and Mazatlan; a railway to Guadalajara is (1898) in course of construction. Intermittent fevers are prevalent after the rains, but yellow fever is nearly unknown. Pop. about 4,000. H. H. S.

San Blas, Cape: See Cape San Blas.

San Blas, Gulf or **Bay of**: a bay on the northern side of the Isthmus of Panama, which here (lon. 79° W.) has its narrowest part, forming the sub-isthmus of San Blas. This is only 31 miles wide, and the navigable estuary of the river Banyano reduces the distance to 18 miles. The proposed "San Blas Route" for a ship-canal was across this neck, but repeated surveys have shown that the high mountains render it impracticable. H. H. S.

San Bonifacio de Ibagué: See Ibagué.

Sanborn, Franklin Benjamin: author and philanthropist; b. at Hampton Falls, N. H., Dec. 15, 1831; graduated at Harvard; was prominent in the anti-slavery cause before the civil war; has been secretary of the American Social Science Association and of the Concord Summer School of Philosophy. In 1868 he joined the staff of *The Springfield Republican*. He published a *Life of Thoreau* (1882), and *Life and Letters of John Brown* (1885).

Sanborn, John Benjamin: See the Appendix.

Sanborn, Katharine Abbott: See the Appendix.

San Buena (bwā′nă) **Ventu′ra**: city; capital of Ventura co., Cal.; on the Pacific Ocean, and the S. Pac. Railroad; 60 miles W. N. W. of Los Angeles (for location, see map of California, ref. 12–E). Its legal name, as above given, is derived from a famous old Spanish mission; its post-office designation is Ventura. It contains the ancient mission building, public high school, 2 grammar schools, public library and reading-room (founded in 1874), Y. M. C. A. building, electric light, street-railway, water, and sewer plants, several hot springs, a State bank with capital of $100,000, a private bank, and a daily and 4 weekly newspapers. The principal industries are agriculture and fruit-growing. The equable climate and springs have made it a popular resort for invalids. Pop. (1880) 1,370; (1890) 3,869; (1900) 2,470.

EDITOR OF "VENTURIAN."

Sanchoni′athon [Gr. Σαγχουνιάθων, Σαγχωνιάθων = Phœnician, *Sakkūn-yāthōn*, Sakkūn has given]: name of a mythical Phœnician, who is said to have lived before the Trojan war, and to have written a history of the Phœnicians. Philo Herenius of Byblos (Gebal), b. 64 A. D., pretends to have translated this book into Greek, under the name Φοινικικὴ ἱστορία, or Τὰ Φοινικικά. Fragments of this work have been preserved by Eusebius (*De Prepar. Evang.*, bk. i., chaps. ix. and x.; bk. iv., chap. xvi.) and the Neo-Platonic philosopher Porphyry (*De Abstin.*, ii., 56). Sanchoniathon is also mentioned by Athenæus (*Deipnosophist.*, bk. iii., ch. c.), Theodoret (*Adv. Gentiles*, Disput. ii.), and Suidas (Müller, *Frag. Hist. Græc.*, iii., p. 561). The statement of Philo has been accepted by Grotius, Mignot, Ewald, Renan, Spiegel, and Thiele, but rejected by Dodwell, Meiners, and Hissman. Lobeck stands alone in assuming that the falsification is due to Eusebius. Modern scholars, while denying the existence of a Phœnician writer by the name of Sanchoniathon, believe that Philo has embodied in his work traditions which were current in his native city (Bunsen, Movers, Duncker, Rawlinson, Baudissin), though the whole has more or less a pseudepigraphic character (Baudissin, Pietschmann, von Gutschmid). The fragments extant seem to show that Philo culled from various sources. They contain two different so-called Phœnician cosmogonies, one beginning with πνεῦμα and χάος, the other with κολπία and βάαυ. Then follows an account of the rise of the human race (φῶς, πῦρ, φλόξ, giants, mankind), and of the beginnings of culture, drawn from three different sources. To this is added the mythical history of the city of Byblus. A still further fragment is preserved by Eusebius on τὰ ἐπιγραφόμενα Θωθείων ὑπομνήματα (according to Gutschmid's correction), which probably treated of the writings of the mythical Egyptian Thoth. The tendency of Philo's work, which contains Egyptian, Grecian, Phœnician, and Hebrew elements, is undoubtedly euhemeristic, and in its syncretism endeavors to prove the Phœnician origin of Greek religion. In 1836 Wagenfeld astonished the learned world with excerpts from what he claimed to be a newly found MS. of the whole of Philo's translation, *Sanchuniathons Urgesch. der Phönizier* (Hanover, 1836), but the whole was soon recognized as a fraud. See *Jahrb. für Theol.*, vii., pp. 95, *seq.*

LITERATURE.—The text is published in C. Müller, *Fragmenta Hist. Græcor.* (iii., p. 561, *seq.*); Orelli, *Sanchoniathonis Fragmenta* (Leipzig, 1826); transl. in Cory's *Ancient Fragments* (London, 1876, p. 1); Lenormant, *Beginnings of History* (New York, 1882, p. 524). See also Movers, *Die Phönizier* (i., pp. 117, *seq.*); Ewald, in the *Abhand. der Königl. Gesell. der Wiss. zu Göttingen* (1853, vol. v., p. 3); Renan, *Mémoires de l'Académie des Inscriptions* (1858, vol. xxiii., p. 241); Thiele, *Egyptische en Mesopotamische Godsdiensten* (Amsterdam, 1872, p. 440); Duncker, *Gesch. des Alterthums* (1874, vol. i., p. 259); Ed. Meyer, *Gesch. des Alterthums* (1884, vol. i., § 206); Baudissin, *Studien zur Semit. Religionsgesch.* (1876, vol. i., pp. 3, *seq.*); Pietschmann, *Gesch. der Phönizier* (1889, p. 136); Rawlinson, *Hist. of Phœnicia* (1889, p. 385); von Gutschmid, *Kleine Schriften* (1890, vol. ii., pp. 21, *seq.*); Gruppe, *Die Griech. Cultur und Mythen* (Leipzig, 1887, p. 347). RICHARD GOTTHEIL.

San Cristo′bal de los Llanos, or **Las Casas**: formerly *Ciudad Real*; capital of the state of Chiapas, Mexico; on a plain, about 6,700 feet above the sea (see map of Mexico, ref. 9–J). It was founded in 1528 on the site of an Indian village; subsequently it was famous as the residence of Las Casas when he was Bishop of Chiapas. Pop. (1892), with the immediate vicinity, 16,050. H. H. S.

Sancroft, WILLIAM, D. D.: archbishop; b. at Fressingfield, Suffolk, England, Jan. 30, 1616; educated at Bury School and at Emmanuel College, Cambridge, where he became fellow 1642; was deprived of his fellowship by the Long Parliament 1649; became chaplain to Bishop Cosin of Durham 1660, in which year he assisted, privately, in the revision of the Prayer-book; obtained from that prelate the rectory of Houghton-le-Spring and was prebendary in Durham Cathedral; was elected master of Emmanuel College, Cambridge, 1662; was promoted successively to the deaneries of York 1663, and of St. Paul's, London, 1664; spent large sums on the repair of St. Paul's Cathedral; was presented by Charles II. to the archdeaconry of Canterbury 1668, and to the archbishopric of Canterbury 1677. He attended Charles II. on his deathbed, and wrote the petition presented to James II. in 1687 against the Declaration of Indulgence. This petition was signed by himself and by six other prelates, for which they were committed to the Tower June, 1688, tried for misdemeanor before the king's bench, and acquitted June 29, 1688. Notwithstanding his grievances, he did not take part in the conspiracies against James; refused to take the oath of allegiance to William and Mary; was deprived of his see Feb., 1691; refused to recognize his deposition; retired to his native place, and attempted, with the aid of the numerous nonjuring clergy, to maintain an episcopal succession. D. at Fressingfield, Nov. 24, 1693. He was the author of several volumes of sermons, letters, and political essays. Many of his unedited MSS. are in the Bodleian Library, Oxford. Revised by W. S. PERRY.

Sanctification [from Lat. *sanctifica′tio* (deriv. of *sanctifica′re*, sanctify; *sanc′tus*, holy + *fa′cere*, make), trans. of Gr. ἁγιάζειν, hallow, make holy, deriv. of ἅγιος, holy]: the work of God's grace by which those who believe in Christ are freed from sin and built up in holiness. In Protestant theology it is distinguished from justification and regeneration, both of which lie at its root, and from neither of which is it separable in fact; inasmuch as the term justification is confined to the judicial act or sentence of God, by which the sinner is declared to be entitled, in consideration of what Christ has done in his behalf, to the favor of God, and of which sanctification is the efficient execution; and the term regeneration is confined to the initial efficient act by which the new life is imparted, of which sanctification is the progressive development. Both regeneration and justification are momentary acts, and acts of God in which the sinner is passive; sanctification, on the other hand, is a progressive work of God, in which the sinner co-operates.

The nature of sanctification, as well as its method and the relation of the divine and human factors in its prosecution, is differently conceived by the several types of theology.

1. The *Pelagian and Rationalistic view* excludes the action of the Holy Spirit altogether; and makes sanctification to be nothing more than continued right action, in the native powers of the free moral agent, by which he gradually conquers evil tendencies, and builds up a holy character.

2. The *Mediæval and Roman view* refuses to distinguish between justification and sanctification; and makes both justification and sanctification to be the cleansing from sin, and the infusion of gracious habits by the Holy Ghost for Christ's sake by the instrument of baptism, upon which subjective change the removal of guilt and the divine favor is conditioned. (*Counc. Trent*, sess. 6, can. 7.) It is therefore held to be progressive, and to be advanced by good works, which possess real merit, and deserve and secure increase of grace (*Counc. Trent*, sess. 6, can. 32); as well as by penances, prayers, fastings, etc., which satisfy God's justice and purify the soul. (*Counc. Trent*, sess. 14, ch. viii.; sess. 6, cans. 29 and 30.) If the believer dies before the process of deliverance from sin is perfected, he must complete it in purgatory, the pains of which are expiatory and purifying; and there he may be assisted by the prayers and masses and dispensing power of the Church on earth. (Bellarmin, *Purgator.*, ii., 9.) But it is possible, even before death, for a believer perfectly to conform to all the demands of God's law as graciously adjusted to this life (*Counc. Trent*, sess. 6, ch. xvi., can. 25); and it is even possible, out of love, to perform supererogatory service by obedience to the councils of Christ, which are advisory but not obligatory until voluntarily undertaken. These are voluntary poverty, celibacy and obedience to monastic rule; and they merit more than the mere salvation of the person, and contribute to the "treasury of merits" at the disposal of the Church, which is imputable at the discretion of those holding the jurisdiction to believers on earth or in purgatory not yet fully justified. Bellarmin, *De Monachiis*, chaps. vi. and vii.

3. The *Mystical* view of sanctification, though never embodied in any Church creed, has existed as a doctrine and as a tendency in all ages and among all Christian denominations. Christian mysticism more or less depreciates the dependence of the soul for light upon the objective revelation of the word of God, and the necessity of the means of grace and human effort, and emphasizes spiritual intuition, the regulative value of religious feeling, the physical communion of the soul with the substance of God, conditioned on quiet and passivity of mind. Such views gained great currency in the Church through the writings of the Pseudo-Dionysius, which were published in Greek in the sixth century, and translated into Latin by John Scotus Erigena in the ninth century. They qualified the teaching of many eminent evangelical Schoolmen, such as Bernard of Clairvaux, Hugo and Richard of St. Victor, and subsequently Thomas à Kempis. They were taught with great influence among the early Protestants by Schwenckfeld (1490–1561), Paracelsus (1493–1541), Weigel (1533–88), and Jacob Böhme (1575–1620); and among the Roman Catholics by St. Francis of Sales (1567–1622), Molinos (1640–97), Madame Guyon (1648–1717), and Archbishop Fénelon (1651–1715). The original Quakers held similar views, as is seen in the writings of George Fox (d. 1691), William Penn (d. 1718), and Robert Barclay (1648–90). A mystical conception is present whenever sanctification is conceived, not as the goal of effort, but as an immediate gift to the waiting soul.

4. *The evangelical doctrine of sanctification common to the Lutheran and Reformed Churches* includes the following points: (1) The soul after regeneration continues dependent upon the constant gracious operations of the Holy Spirit, but is, through grace, able to co-operate with them. (2) The sanctifying operations of the Spirit are supernatural, and yet effected in connection with and through the instrumentality of means: the *means* of sanctification being either *internal*, such as faith and the co-operation of the regenerated will with grace, or *external*, such as the word of God, sacraments, prayer, Christian fellowship, and the providential discipline of our heavenly Father. (3) In this process the Spirit gradually completes the work of moral purification commenced in regeneration. The work has two sides: (*a*) the cleansing of the soul from sin and emancipation from its power, and (*b*) the development of the implanted principle of spiritual life and infused habits of grace, until the subject comes to the stature of perfect manhood in Christ. Its effect is spiritually and morally to transform the whole man, intellect, affections, and will, soul and body. (4) The work proceeds with various degrees of thoroughness during life, but is never consummated in absolute moral perfection until the subject passes into glory.

In opposition to this doctrine a *theory of perfect sanctification in this life* has been taught from several distinct points of view, e. g.:

1. According to the principles of *Pelagianism*, a man is perfect who obeys the laws of God to the measure of his present natural ability, since the moral law is a sliding scale, adjusting its demands to the varying ability of its subject; and this is possible to every man.

2. According to the *Mystical* idea, perfection consists in absorption in the Divine essence, or, in a less extreme form, in the absorption of human desires and will into the divine will, in a disinterested love; and this may be attained by any one through persistent detachment from self and meditation on God.

3. According to the *Roman* or *Ritualistic* theory, perfection consists in perfect conformity to the law of God, graciously for Christ's sake adjusted to the capacities of the regenerated man in this life; and this perfection is attained by means of meritorious works and penances, prayers, fasts, acts of voluntary self-denial, and ecclesiastical obedience. Not only is this within the reach of men, but so is even the rendering of supererogatory service in the way of extra-legal self-denial from a principle of evangelical love.

4. The *Wesleyan* theory of perfection conceives that the satisfaction and merit of Christ have made it consistent with divine justice to offer salvation to men on easier terms than the old Adamic law of absolute perfection; and that perfection is attained when these lower terms have been complied with. "Christian character is estimated by the conditions of the gospel; Christian perfection implies the perfect performance of these conditions, and nothing more." Wesley's tract on *Christian Perfection*: *Methodist Doctrinal Tracts*; Dr. George Peck's *Christian Doctrine of Perfection*.

A. A. Hodge. Revised by B. B. Warfield.

Sand [O. Eng. *sand*: O. H. Germ. *sant* (> Mod. Germ. *sand*): Icel. *sandr* < Indo-Eur. *samdho-*. Cf. Gr. ἄμαθος, and perhaps Lat. *sa'bulum*, sand]: granular detritus with texture coarser than clay and finer than gravel. The name gravel is given only to accumulations of rock-fragments that have been rolled by currents until their angles are worn away, but sand-grains may be angular or rounded; in other respects a gravel is merely a coarser sand, and a sand a finer gravel. Sands are derived primarily from the disintegration of crystalline rocks; secondarily from the disintegration of sandstones which were themselves formed by the consolidation of pre-existent sands. As the grains which result from the breaking up of various rocks are transported by currents of water or air, they jostle against one another, and some of the blows thus given produce fracture. Some of the grains are also attacked by various reagents and gradually decomposed or dissolved. The blows tend to convert angular fragments into round and to reduce all fragments to smaller size. As large fragments strike harder blows than small, they are more rapidly reduced and more rapidly rounded, and the tendency to convert gravel into sand is correspondingly stronger than the tendency to comminute sand. Sand-grains whose material is hard and resists decomposition are practically indestructible. Streams, shore-waves, and winds—the principal agents for the transportation of sand—accomplish also its separation from gravel and clay. The best-rounded sands are those found upon deserts, where they are shifted to and fro by the winds. The most abundant material in sand is quartz, and next to it stands feldspar. Hornblende, magnetite, and garnet are of frequent occurrence, and sands freshly derived from crystalline rocks contain all the constituents of the parent rocks. Of the many industrial uses of sand, probably the most important are for the manufacture of mortar and artificial stone. For these purposes angular grains are preferable. See Rocks and Sandstone.

G. K. Gilbert.

Sand, George: the pseudonym under which Amantine Lucile Aurore Dupin (*Madame Dudevant*) published her celebrated novels and dramas. She was born in Paris, July 5, 1804, and educated first at the Château de Nohant, department of Indre, by her grandmother, Madame Dupin, a natural daughter of Marshal Saxe, and afterward (1817–20) in an Augustinian convent in Paris. In 1822 she married Baron Dudevant, formerly an officer in the army of Napoleon, to whom she bore two children, but in 1831 separated from him, determined to support herself by literary work; removed to Paris with her daughter, and assumed male dress in order to move about with greater freedom. In connection with Jules Sandeau she wrote *Rose et Blanche*, which was published in 1831 under the pseudonym *Jules Sand*, and the reception it found offered her an opportunity of publishing immediately after a novel written by her alone, *Indiana*, under the pseudonym *George Sand*, which she afterward retained. In 1832 *Valentine* made her name celebrated, and in 1833 her celebrity rose to sensation with *Lélia*. The book touched in a somewhat peculiar manner the very delicate question of love and conjugal fidelity. In company with Alfred de Musset she then made a journey to Italy, but at Venice they parted, and in 1836 he published *Confessions d'un Enfant du Siècle*, to which she answered in 1859 with *Elle et Lui*, which produced an immense sensation. The violent movement into which her mind was thrown by her relation to Musset is very apparent in her *Lettres d'un Voyageur* and *Jacques* (1834), and is still more visible in *André* and *Léone Léoni* (1835); but by degrees it subsided. In 1836 she was divorced from Baron Dudevant, and both her children went to live with her. About the same time began her intimate friendship with Chopin, which lasted until 1847, and to which are due the many beautiful passages on music which are found in her later books. To this period of her life (1835–41) belongs a series mostly consisting of minor novels—*Le Sécrétaire intime*, *Lavinia*, *Métella*, *Mattéa*, *La Marquise*, *Mauprat*, *La Dernière Aldini*, *L'Uscoque*, *Pauline*, etc.—in which her wonderful talent of artistic representation appears perfectly developed and in its full ripeness. They were published in the *Revue des Deux Mondes*, but in 1841 she quarreled with the editor, and *Horace* was rejected. She in the meantime had made the acquaintance of Lamennais, Michel the republican, Pierre Leroux the socialist, and influenced by them she became the spokesman of very advanced social and political, moral and religious views, which were promulgated in *Lettres à Marcie* (1837), *Spiridion* (1838), *Les Sept Cordes*

de la Lyre (1840), and especially *Horace* and *Consuélo* (1842), *La Comtesse de Rudolstadt* (1843), *Le Meunier d'Angibault* (1845), *Le Péché de Monsieur Antoine* (1846), etc. In *Jeanne* (1844) she returned to the purely artistic novel without any tendency, and there followed some of her most beautiful productions—*La Petite Fadette* (1849), *La Mare au Diable* (1846), *François le Champi* (1848), etc.—but in 1848 she plunged with enthusiasm into the very midst of the Revolution—wrote proclamations and founded newspapers. After the Revolution she wrote during a long period chiefly for the theaters, and some of her plays were very successful. They are, nevertheless, nothing but dramatized novels, without any genuine dramatic effect. She was most successful with the novel, more especially the descriptive and reflective novel, and in this genre even her latest books, *Mlle. la Quintinie* (1863), *Le Marquis de Villemer* (1864), *La Confession d'une Jeune Fille* (1865), *Cadio* (1868), are brilliant and powerful productions. D. June 8, 1876. Her collected works contain *Romans et Nouvelles* (84 vols.); *Mémoires, souvenirs, impressions, voyages* (8 vols.); *Théâtre* (4 vols.); *Théâtre de Nohant* (1 vol.); *Correspondance* (10 vols., 1882–84). Revised by A. G. Canfield.

Sandal-wood [*sandal* is from Arab. *çandal*, from Sanskr. *candana*, sandal-tree]: the agreeably aromatic and precious wood of several trees belonging to the genus *Santalum* and of one or two other trees. The original sandal-wood of India is yielded by *Santalum album*, a tree 25 feet high, with a trunk a foot in diameter. Three kinds or hues were known in Europe as early as the eleventh century—white, yellow, and red, of which the last-named may have been confounded with the inodorous wood of red sanders or Santal-wood (*q. v.*). After the discovery of the Sandwich islands a large part of the supply of the sandal-wood of commerce came from two or three species of *Santalum* peculiar to those islands, and later from *S. yasi* of the Fiji islands and from *S. austro-caledonicum* of New Caledonia: also from *Fusanus spicatus*, a tree of Western Australia of the same family. The high price this wood brings has caused the reckless extirpation of the tree from the more accessible stations, but in India the original sandal-wood tree is protected by the Government. It is employed as a perfume and for the fabrication of small articles—glove-boxes, caskets, etc. Much is consumed in India in the celebration of sepulchral rites and for medicinal purposes, where the powder, made into a paste with water, is used for making the caste-mark. The principal market is China, where it is most largely used for incense in temples, etc. The Malabar sandal-wood there brings three or four times the price of that of the South Sea islands. The wood yields 1 per cent. of a peculiar essential oil, on which the characteristic fragrance depends. This oil, largely extracted in some parts of India from the fresh wood, has been used in medicine as a substitute for copaiba. The famous and richly carved gates of the temple of Somnauth, supposed to be 1,000 years old, are of sandal-wood. See Sandalworts and Dyestuffs.
Revised by Charles E. Bessey.

Sandalworts: the *Santalaceæ*, a small family of apetalous dicotyledonous plants widely distributed over the world. It is most nearly related to *Loranthaceæ*, but incompletely, if at all, parasitic, according with that family in having its ovules and seeds destitute of integuments. The sandal-woods (see Sandal-wood) are far the most important representatives of the family. The European species are all herbs, as are the members of *Comandra*, the commonest North American representative; but the Alleghanies have two shrubby genera; one of these, *Pyularia*, oil-nut, has a large kernel abounding with acrid oil. The quandang-nut of Australia, however, is bland and edible. The Australian cherry (so called), with the stone on the outside, is the nut of an exocarpus, supported on an apparent succulent red berry, which is formed by an enlargement of the tip of the flower-stalk. Revised by Charles E. Bessey.

Sandarach [viâ O. Fr. from Lat. *sandaʹraca* = Gr. σανδαράκη, sandarach, realgar, an Eastern word, probably borrowed ultimately from India. Cf. Sanskr. *sindūra-*]: a gum-resin from a small coniferous tree, *Thuja articulata*, which grows in Barbary. It occurs in pale-yellow oblong grains or tears, covered with a fine dust, is transparent and brittle, with a vitreous luster on the fracture. According to Unverdorben and Johnston, it consists of three resinous acids. The α-resin forms a white or yellow powder slightly soluble in alcohol and not easily fusible, and is present in but small quantities. The β-resin forms about three-fourths of the whole, is light yellow, softens at 212° F., and is readily soluble in cold alcohol. The γ-resin is a light-yellow powder, soluble in boiling alcohol, and melts with difficulty, decomposing at the same time. In medicine, sandarach was formerly given internally, and used in making ointments and plasters. It is used as an incense and in varnishes. Its powder is rubbed on writing paper where erasures have been made, to prevent the spreading of ink. Ira Remsen.

Sanday, William: See the Appendix.

Sand Beach; now Harbor Beach: village; Huron co., Mich.; on Lake Huron, and the Flint and Pere Marquette Railroad; 70 miles N. of Port Huron, 120 miles N. by E. of Detroit (for location, see map of Michigan, ref. 6–L). Its site rises from the lake by a series of terraces; it has excellent natural drainage and a good system of waterworks; contains valuable mineral springs and large bath-houses; and has considerable dairy, salt, flour, lime, and lumber interests. The U. S. Government has constructed a costly harbor of refuge for the shipping of the Great Lakes. The village has a private bank and two weekly newspapers. Pop. (1890) 1,046; (1900) 1,149.
Editor of "Huron Times."

Sand-blast: a stream of sand propelled by the pressure of air or steam and used for cutting and engraving glass, stone, and other solid substances. The process was invented by Gen. Benjamin C. Tilghman, and was suggested by the well-known effect of wind-blown sand in destroying the transparency of glass. In practice, two kinds of work are performed by the sand-blast, called, respectively, heavy and light work. For the former a high pressure and a correspondingly great velocity are required; for the latter the pressure is light and the velocity low. Ordinarily, for light work, the necessary velocity is given to the sand by means of an air-blast produced either by a rotary fan or positive blower, or by the pressure of the atmosphere acting toward a vacuum maintained by a fan or a steam-jet. For simply depolishing glass or making the so-called ground glass, the current of air is conducted into a rectangular trough of any desired length, narrowed at the bottom to an opening an inch wide, and having its top perforated by small tubes for the admission of the sand. The glass is carried slowly across the opening of this jet, and about an inch below it, by means of a traveling apron. By this process glass is obscured with great rapidity, almost as soon as it is held in position. In order to engrave a design upon the glass, the parts which are to remain bright have to be protected with a composition or by blotting-paper, soaked in glycerin and glue, from which the desired pattern has been cut out.

For heavy work either air or steam may be used; but steam is more readily employed, and, as it cuts twice as fast as air under the same pressure, is generally preferred. The steam is used in a jet, technically called the blast-pipe or gun. As shown in the accompanying sectional drawing, it consists of a hollow bronze cylinder of about 1½ inches external diameter, having a lateral opening near its upper end (by which the steam enters), and tapering somewhat at its lower. Through the top of this cylinder an iron tube passes, secured by a stuffing-box. This is called the sand-tube; its exterior diameter is somewhat less than that of the opening through the cylinder, and it tapers with it at its lower end, though somewhat less rapidly, thus leaving a narrow concentric aperture for the passage of the steam. The exterior cylinder is prolonged beyond this concentric opening to form a socket for a supplementary or directing tube called the nozzle-tube (seen separately on the right). This tube, being the only portion of the blast-pipe which is exposed to wear, is made of sheet-steel, or sometimes of chilled iron. The sand used should be sifted so as to be of uniform size, and should be clean, hard, sharp, and dry.

Sand-blast.

The action of the gun is as follows: As soon as the steam is let on, it issues with great velocity from the annular opening in the jet, producing a partial vacuum in the sand-tube which it incloses, and consequently in the rubber tube which connects it with the sand-box above. On opening a sliding valve in the bottom of this sand-box a stream of sand is drawn through the tube into the jet of steam, and is forced by it through the nozzle-tube, striking at a high velocity the stone to be cut, which is placed about an inch distant from it. The waste steam, together with the fragments of the stone and sand, escape laterally, and if the gun be at rest a conical hole is gradually cut into the material. The angle which the sides of this cone make with each other varies, increasing with the hardness of the stone and diminishing with an increase of pressure in the blast. If it is desired to have the sides of the cut parallel, the gun is slightly inclined and slowly revolved about a vertical axis. The angle of inclination varies of course with the hardness of the stone and with the pressure of the steam employed.

For purposes of ornamentation in stone the sand-blast process has no rival. The method employed is simply to protect those portions of the stone which are not to be cut away with a suitable mat or template of rubber or other elastic material. Revised by R. A. Roberts.

Sand-crack: See Farriery.

Sand-dollar: See Cake-urchin.

Sandeau, sāṅ′dō′, Léonard Sylvain Jules: novelist and playwright; b. at Aubusson, department of Creuse, France, Feb. 19, 1811; studied law at Paris, but devoted himself subsequently to literature; wrote his first novel, *Rose et Blanche* (1831) in connection with George Sand, and published it under the pseudonym of *Jules Sand*. In 1853 he was appointed keeper at the Mazarin Library, and in 1858 was elected a member of the Academy. His most successful novel was *Mlle. de la Seiglière* (1848; as a drama 1851). His best comedy is *Le Gendre de M. Poirier*, written in connection with Émile Augier (1854). His novel *La Maison de Penarvan* (1858) has been transformed into a drama (1863). D. in Paris, Apr. 24, 1883. Revised by A. G. Canfield.

Sand-eel, or **Sand-lance**: any fish of the family *Ammodytidæ*. They are elongated, with a pointed snout, forked tail, and silvery body; they burrow in the sand, and are sometimes extensively employed as bait for other fishes. Species are found on the northern shores of all countries. The common American species is *Ammodytes americanus*. Revised by F. A. Lucas.

Sand′eman, Robert: religious leader; b. at Perth, Scotland, in 1718 or 1723; studied at Edinburgh; became a linen-draper; married a daughter of Rev. John Glas (or Glass), the founder of a sect called the Glassites; became an elder in the congregation; established in 1762 a congregation of the new sect at London, where they became known as Sandemanians; went to North America and established a society 1764, and settled in the following year at Danbury, Conn., where he died Apr. 2, 1771. He wrote a number of theological and controversial treatises. The Sandemanian Church maintains a feeble existence, chiefly at Dundee, Edinburgh, and Danbury, Conn., the membership not exceeding 2,000 persons. Among their leading peculiarities, besides several ascetic practices, are the weekly love-feast, eaten on Sunday, and the "kiss of brotherhood"; the washing of feet, formerly one of their practices, has been discontinued. They abstain from blood and everything strangled, and practice a kind of communism, so far as the members hold their property subject to the call of the church. Their ideas may best be learned from the writings of Sandeman. See also Andrew Fuller, *Strictures on Sandemanianism*, in twelve letters to a friend (Nottingham, 1810; 2d ed. London, 1811). See Glassites. Revised by S. M. Jackson.

Sandemanians: See Sandeman.

Sanderling: a species of sandpiper (*Calidris arenaria*), distinguished by the absence of a hind toe, occurring throughout the greater part of the world. It is 7½ to 8 inches long, of a very light gray above, white beneath, with the top of the head, during the breeding season, rufous. F. A. L.

Sanders: See Santal-wood.

Sanders, George Nicholas: b. at Lexington, Ky., Feb. 21, 1812; grandson of Col. George Nicholas Sanders, the proposer of the "Kentucky resolutions" of 1798; became at an early age an efficient Democratic orator and politician; was appointed by President Pierce to a European consulship, and by President Buchanan navy agent at New York; was a prominent supporter of Douglas in the campaign of 1860; resided in Europe during the civil war as a commissioner of the Confederate States, associated with Mason and Slidell; took part with Messrs. Clement C. Clay and James P. Holcomb in the peace conference with Horace Greeley at Niagara Falls July, 1864, and after the war settled at New York, where he died Aug. 12, 1873.

Sanders, or **Saunders**, Nicholas, D. D.: polemical writer; b. at Charlewood, Surrey, England, about 1527; educated at Winchester School and at Oxford, where he became fellow of New College 1548 and Shaggling Professor of Canon Law 1557; left England on account of the religious innovations of Elizabeth; was ordained priest at Rome 1560; accompanied Cardinal Stanislaus Hosius to the Council of Trent, where he gained great renown by his skill in disputation; went to Poland with Hosius; resided several years in Louvain, where he published (1571) his work *De visibili Monarchia Ecclesiæ*. In 1572 he was called to Rome by Pius V., and sent in the following year to Madrid, where he was for a long time active in organizing an expedition for the purpose of restoring Catholicism in England. This expedition he accompanied as papal nuncio in 1579. The undertaking failed, and Sanders, pursued by the English, died, in the early part of 1581, in a wood near Limerick, "of an Irish ague." (Hamilton, *State Papers*, ii., 306.) Sanders was styled by Anthony à Wood "the most noted defender of the Roman Catholic cause in his time." He was the author of *The Supper of our Lord* (Louvain, 4to, 1565), a work in defense of the "real presence," in reply to Jewell's *Apology* and Nowell's *Challenge*, and in turn answered by the latter in his *Confutation*; *The Rocke of the Churche* (Louvain, 1566), *A Treatise of the Images of Christ* (1567), directed against Jewell, and of several other polemical works, of which the best known was a Latin treatise against the English Reformation—*De Origine ac Progressu Schismatis Anglicani* (Cologne, 1585), which was several times reprinted and translated into French, and into English by David Lewis—*Rise and Growth of the Anglican Schism* (London, 1877). Revised by J. J. Keane.

Sanderson, John: author; b. near Carlisle, Pa., in 1783; became a teacher in, and subsequently one of the proprietors of, Clermont Seminary; prepared with the aid of his brother, James M., the first two volumes of the *Biography of the Signers of the Declaration of Independence* (1820); resided in Paris 1835–36; wrote an amusing and instructive work, *Sketches of Paris, in Familiar Letters to his Friends* (1838), which was republished in London under the title *The American in Paris* (1838), and translated by Jules Janin into French (1843); began a similar work, *The American in London*, of which portions were published in *The Knickerbocker Magazine*, and on his return to the U. S. became Professor of Latin and Greek in the Philadelphia High School (1836–44). D. in Philadelphia, Apr. 5, 1844. See Griswold's *Prose-writers of America*. Revised by H. A. Beers.

Sanderson, John Burdon: physiologist; b. at Newcastle-on-Tyne, England, Dec. 21, 1828; studied medicine in the Universities of Edinburgh and Paris, graduating M. D. at the former 1851; became a fellow of the Royal College of Physicians, London, 1863; practiced medicine in London from 1857 to 1870, where he was assistant physician and lecturer at Middlesex Hospital, and physician to the Brompton Consumption Hospital; in 1871 was made professor at the Brown Institute; in 1874 was elected Professor of Physiology in University College, and in 1882 accepted a call to the same chair in the University of Oxford. He is the author of numerous monographs on physiological subjects. S. T. Armstrong.

Sanderson, Robert, D. D.: bishop; b. at Rotherham, Yorkshire, England, Sept. 19, 1587; educated at Lincoln College, Oxford, where he became fellow 1606 and reader in logic in 1608; published lectures upon that subject, *Logicæ Artis Compendium* (1615), which passed through several editions; took orders in the Church of England 1611; became in 1619 rector of Boothby Pennell, Lincolnshire, which post he retained more than forty years; became prebend of Lincoln 1629 and rector of Muston 1633; was indebted to his great reputation as a casuist for the appointment of chaplain to Charles I. 1631, by whom he was made D. D. 1636, Regius Professor of Divinity at Oxford and canon of Christ Church 1642; was named by Parliament one of the Assembly of Divines convoked at Westminster 1643, but refused to sign

the Covenant, and had his living sequestered; attended the king as ecclesiastical councilor at Oxford, at Hampton Court, and in the Isle of Wight; was ejected from his professorship 1648, but restored 1660, and shortly after made Bishop of Lincoln, and took part in the Savoy Conference 1661. D. at Lincoln, Jan. 29, 1663. He was the author of several Latin treatises on cases of conscience, the obligation of an oath, etc., written for the guidance of Charles I., and other tracts, collected in his *Works* (Oxford, 1854; 6 vols.), edited by Bishop Jacobson. His *Life* was written by Izaak Walton. His sermons are masterpieces.

Revised by W. S. Perry.

Sanderson, Sybil: opera-singer; b. at Sacramento, Cal., in 1864; passed her childhood in San Francisco, and took her first lessons in singing under local teachers. In 1881 she went to Paris and entered the Conservatory; studied later under Jules Massenet, the opera-composer. On May 15, 1889, made her *début* in Paris in Massenet's *Esclarmonde*, which was composed for her. In the previous year she had appeared at The Hague as a test under the name of Ada Palmer. In 1890 she sang in Brussels, in 1891 in London, and in 1892 in St. Petersburg. In 1893 she created the *rôle* of Phryne in Saint-Saëns's opera of that name. In 1894 she was engaged for the Metropolitan Opera-house, New York, appearing there first on Jan. 16, 1895, in Massenet's *Manon*. Her voice is a clear, brilliant, high soprano. D. E. Hervey.

Sandersville: city; capital of Washington co., Ga; between the Oconee and the Ogeechee rivers, and on the Augusta Southern Railroad; 64 miles N. by E. of Macon, 135 miles N. W. of Savannah (for location, see map of Georgia, ref. 4–I). It is the center of a large cotton-growing region. Pop. (1880) 1,279; (1890) 1,760; (1900) 2,023.

Sand-grouse: a name applied on account of their habitat to the birds of the family Pteroclidæ (*q. v.*).

Sandham, Alfred: See the Appendix.

Sandham, Henry: See the Appendix.

Sandhopper, or **Beach-flea**: names given, in allusion to their power of leaping, to various amphipod crustaceans found under sea-wrack near the high-tide mark. Most of the many known species belong to the genus *Orchestia*, as the common species of the New England coast, *O. agilis*. They are known also as sand-fleas and shore-jumpers.

Orchestia agilis (magnified).

Sandhurst: village; in Berkshire, England; 33 miles W. S. W. of London (see map of England, ref. 12–J). It is the seat of the Royal Military College and the Staff College. See Military Academies.

Sandhurst, or **Bendigo**: city of Victoria, Australia; third in size in the colony; 90 miles N. of Melbourne, on Bendigo creek, 760 feet above the sea-level; an important railway junction (see map of Australia, ref. 8–H). It is well built, and contains many public edifices, a fine botanic garden, and five large reservoirs of water. It is in the center of a rich gold-bearing region, and the district produces highly esteemed wines and considerable quantities of cereals, especially barley. The mining industry gives employment to about 7,000 persons, and one of the mines, the Lansell, has reached a depth of over 2,500 feet, the deepest on the continent. The climate is hot and variable; a maximum temperature of 126° F. in the shade has been observed. The mean annual rainfall is 24 inches. Pop. (1891) 37,238.

Mark W. Harrington.

San Diego, -di-ā′gō: city; port of entry; capital of San Diego co., Cal.; on San Diego Bay and the National City and Otay, the San D., Cuyamaca and East., and the S. Cal. railways; lat. 32° 41′ N., lon. 117° 13′ W.; 480 miles S. E. of San Francisco (for location, see map of California, ref. 13–G). The bay, discovered by Cabrillo in 1542, is pronounced next in excellence on the Pacific coast to that of San Francisco. The first settlement was made in May, 1769, when Father Junipero Serra established here the first of the California missions, that of San Diego; but the present city dates in growth from 1867, when the new town was begun on the water front of the bay. The climate is mild and uniform, and the city is a popular resort for invalids. San Diego County is the principal honey-producing county in the State, and markets in the city large quantities of wheat, wool, honey, fruit, and live stock. The principal industry of the region is fruit and nut culture, inaugurated in 1869, and represented by over 2,000,000 trees. The city contains 3 public parks, one with 1,400 acres; U. S. custom-house; free public library (founded in 1882); public-school district library; county hospital; 16 public-school buildings; public-school property valued at about $300,000; Academy of Our Lady of Peace (Roman Catholic); board of trade and chamber of commerce; gas and electric lights; electric street-railways; water-works; 2 national banks with combined capital of $250,000, 3 State banks with capital of $280,000, and a private bank; and 3 daily, 5 weekly, and 4 monthly periodicals. There are flour and planing mills, large salt-works, factories for carriages and wagons, foundry and machine-shops, a tannery, and other industries. The assessed property valuation is about $14,000,000, and a bonded indebtedness, incurred for a water system and improved sewerage, of $868,500. On the peninsula on the opposite side of the bay and connected with the city by steam ferry is Coronado Beach, costing nearly $1,000,000. Pop. (1890) 16,159; (1900) 17,700.

A regular line of freight and passenger steamers plies between San Diego, Hongkong, and Yokohama. The Government has expended half a million dollars fortifying the bay, has established a marine quarantine station, and completed a stone breakwater more than a mile long. L. A. Wright.

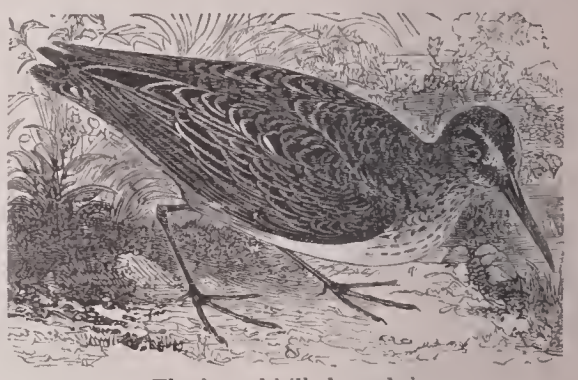
Sand-lance: See Sand-eel.

San Domingo: See Santo Domingo.

Sandpaper: paper one side of which is covered with glue, upon which sharp sand or powdered glass has been evenly sifted and is held by the glue when dry. It is made of many grades and degrees of fineness, and is used in smoothing the surface of wood, by the carpenter and joiner, when giving it its final finish.

Sand Piles: See Foundation.

Sandpiper: any one of several small birds of the family *Scolopacidæ*, that frequent sandy shores and utter a piping note. They have a bill about equal to the head in length, covered with a soft skin; the toes, four in number, except in *Calidris*, the hindmost being very small. They can mostly be distinguished from the true snipes by their shorter bills and uniformly colored tail-feathers. They are mainly birds of the northern hemisphere, and breed far north, occurring at times in great flocks during their fall migrations. They feed along the shore, picking up small crustaceans, molluses or insects, or probing for them in the mud. There are about twenty-five species, some of wide range, twenty of which occur in North America, although one or two, like the ruff (*Machetes pugnax*) and the spoon-bill sandpiper (*Eurynorhynchus pygmæus*), are stragglers from other regions. Among the most common is the spotted sandpiper (*Actitis macularia*), familiarly known as tip-up, which breeds in many parts of the U. S., often at some little distance from the water, and is not so gregarious as most species. The broad-billed sandpiper (*Tringa platyrhyncha*) is an Old World species. F. A. Lucas.



The broad-billed sandpiper.

Sands, Benjamin Franklin: rear-admiral U. S. navy; b. in Baltimore, Md., Feb. 11, 1811; entered the navy as a midshipman Apr. 1, 1828. Served on the east coast of Mexico during the war with that country; commanded the steamer Fort Jackson in both the Fort Fisher fights in the civil war; promoted rear-admiral 1871. He was long identified with the building up of the U. S. Naval Observatory. He served as an assistant in the very earliest days of that institution, and it was through his earnest efforts that it was equipped with what was then the largest telescope in the world. During his superintendency the observatory ranked among the highest of similar institutions. See Report No. 726, House of Representatives, 52d Congress, first session, Naval Observatory. D. at Washington, D. C., June 30, 1883. Revised by C. Belknap.

Sand-star: a name sometimes given to species of starfishes, of the orders *Asterioidea* and *Ophiuroidea*.

Sandstone: a rock consisting of grains of sand held together by some cementing material. Commonly the grains are chiefly of quartz; sometimes they are almost exclusively quartz; in a few instances feldspar predominates. The cementing material is usually calcite, iron oxide, clay, or silica. It may merely coat the grains or may fill all interstices. Sandstones are generally composed of parallel layers more or less readily separable, and a thick layer is sometimes divided by oblique planes, an arrangement known as cross-bedding or false bedding. The name *arkose* is applied to sandstone derived from the disintegration of granite or gneiss, with little rounding or sorting. Sandstone grades imperceptibly into *conglomerate* or cemented gravel, and into *breccia*, in which the cemented fragments are large and angular. A sandstone easily quarried and wrought is called a *freestone*, and sandstones are otherwise characterized, according to the nature of the cement, as calcareous, ferruginous, argillaceous, and siliceous. A quartzite is a siliceous sandstone with the interstices completely filled. Sandstone is one of the most important of all building materials, and is extensively employed in the manufacture of grindstones, whetstones, etc. See BUILDING-STONE, FLEXIBLE SANDSTONE, and ROCKS.

G. K. GILBERT.

Sandus'ky: city; port of entry; capital of Erie co., O.; on Lake Erie at the mouth of the Sandusky river, and on the Balt. and O., the Cleve., Cin., Chi. and St. L., the Columbus, Sand. and Hocking, the Lake Erie and W., and the Lake Shore and Mich. S. railways; also western terminus of Cleveland and Lorain and Sandusky and Interurban Electric Railway, and northern terminus of the Sandusky, Norwalk and Southern Electric Railroad; 61 miles W. of Cleveland (for location, see map of Ohio, ref. 2–F). The city is laid out regularly with broad streets, has one of the best land-locked harbors on the Great Lakes, and is supplied with gas, electric light, electric railways, sewerage, and water-work plants, the latter on the stand-pipe system. Steamboats connect the city with Cleveland, Detroit, Toledo, and the islands in Lake Erie. There are two popular summer resorts, Cedar Point, called "the Coney Island of the West," and Johnson's island, on which many Confederate prisoners were confined during the civil war. Put-in-Bay, Kelley island, Gibraltar, and Middle Bass and Pelee islands are easily accessible by water, and are favorite resorts for fishing-parties. The city contains 21 churches, 8 public-school buildings, 5 parochial schools, 4 national banks with combined capital of $550,000, and 3 daily and 4 weekly papers. The public buildings include a U. S. Government building, bonded warehouse, court-house, county infirmary, jail, Public Library, and the Ohio State Soldiers' and Sailors' Home, comprising 37 buildings of blue limestone (cost, exclusive of ground, $700,000) with accommodations for 1,600 inmates. Many of the public, business, and residence buildings are built of limestone from local quarries.

Sandusky is noted for its fresh-fish industry, which has an annual value of over $1,500,000; its wine production, which exceeds 2,000,000 gal. per annum; and for its extensive cultivation and shipment of grapes and peaches. It has large receipts of coal by rail and of iron ore, lumber, and fish by water. The principal manufactures are spokes, hubs, handles, carpenters' tools, engines, boilers, threshing-machines, cement, baskets for the grape and peach trade, and casks for wine shipments. There is also considerable shipbuilding. The fish industry is promoted by a large U. S. hatchery at Put-in-Bay. The city has important trade relations with Canadian ports, and exports large quantities of caviare, smoked sturgeon, isinglass, and fish oil. In 1900 the city had an assessed property valuation of $7,010,370; bonded debt (1901), $623,400. Pop. (1880) 15,838; (1890) 18,471; (1900) 19,636.

JNO. T. MACK.

Sand-wasp: a hymenopterous insect that digs in the sand, as of the families *Pompilidæ* and *Sphegidæ*. See HYMENOPTERA.

Sandwich: a seaport of Kent, England; at the mouth of the Stour, 2 miles from the sea; 12 miles E. of Canterbury (see map of England, ref. 13–M). It is one of the Cinque Ports, is surrounded by ancient fortifications, is irregularly built, and has several notable mediæval structures. In the eleventh century it was the most famous of all the English ports. The principal import is coal; principal exports, agricultural products. It forms with Deal a parliamentary borough. Pop. (1891) 2,796.

Sandwich: county-seat of Essex County, Ontario, Canada; on Detroit river, nearly opposite Detroit (see map of Ontario, ref. 6–A). It has a convent and Roman Catholic college, and mineral springs which make it a favorite place of resort. It is the oldest place in this part of Canada. French soldiers allied to the Algonquins and Hurons were stationed here as early as 1615. Actual colonization began in 1700 or 1701 under Mothe-Cadillac, and the place was then called Pointe de Montréal. Pop. about 1,200.

M. W. H.

Sandwich: city (incorporated in 1873); De Kalb co., Ill.; on the Chi., Burl., and Quincy Railroad; 58 miles S. W. of Chicago (for location, see map of Illinois, ref. 2–E). It contains a public high school, 2 private banks, and 2 weekly newspapers, and is chiefly engaged in the manufacture of agricultural implements. Pop. (1880) 2,352; (1890) 2,516; (1900) 2,520.

Sandwich: town; Barnstable co., Mass.; on Cape Cod Bay, and the N. Y., N. H. and Hart. Railroad; 60 miles S. of Boston (for location, see map of Massachusetts, ref. 5–K). It lost a large part of its original territory in 1884 by the setting off of the town of BOURNE (*q. v.*). It is a popular summer resort, and contains 10 public schools, a public library, a weekly newspaper, and manufactories of glass, jewelry, braids, and tags. Its banking business is done in Wareham or Yarmouthport. Pop. (1880) 4,242; (1890) 1,819; (1900) 1,448.

EDITOR OF "OBSERVER."

Sandwich Islands: the name given by Capt. Cook, after Lord Sandwich (fourth earl), to the group now called the Hawaiian islands. See HAWAII-NEI.

Sandy Hill: village; Washington co., N. Y.; on the Hudson river, and the Del. and Hudson Railroad; 52 miles N. of Albany, the State capital (for location, see map of New York, ref. 4–K). It derives good power from the river for manufacturing, has large lumbering interests, and contains stone-quarries, paper-mills and sawmills, iron furnaces, machine-shops, large bag-factory, wall-paper print-works, two national banks with combined capital of $100,000, a union school library (founded in 1867), and a weekly newspaper. Pop. (1880) 2,487; (1890) 2,895; (1900) 4,473.

EDITOR OF "HERALD."

Sandy Hook: a low, sandy peninsula in Monmouth co., N. J.; between the Atlantic Ocean and Sandy Hook Bay; beginning at the Navesink Highlands and extending N. about 6 miles; 20 miles S. of Manhattan (for location, see map of New Jersey, ref. 3–E). The sea has a few times cut through the neck, converting Sandy Hook temporarily into an island. Sandy Hook is less than a mile in extreme width, and has a beacon-light on its northern extremity and a light-house, 90 feet high, less than a mile S. It was formerly the terminus of a steamboat line which there connected with a railway to Long Branch, but it is now used exclusively for U. S. Government purposes. Here is the proving-ground where ordnance and armor-plate are tested, and here is also Fort Hancock, with batteries of modern rifled guns and mortars for defending the entrance to New York harbor.

Sandys, EDWIN, D. D.: archbishop; b. at Hawkshead, Lancashire, England, in 1519; graduated from St. John's College, Cambridge, 1539; took orders in the Church of England; embraced the principles of the Reformation; became vicar of Haversham and master of St. Catharine's College 1547, prebendary of Peterborough 1549 and of Carlisle 1552; vice-chancellor of Cambridge University 1553; preached a sermon in favor of the royal claims of Lady Jane Grey; was consequently deprived of the vice-chancellorship in July of the same year; was imprisoned in the Tower and the Marshalsea for refusing to proclaim Queen Mary; was liberated and allowed to proceed to the Continent May, 1554; returned at the coronation of Elizabeth 1558; was made Bishop of Worcester Dec. 21, 1559, and of London 1570, and Archbishop of York 1576; was one of the translators of the Bishops' Bible 1568. A malicious plot (1582) charged him with infamous conduct, but its author, Sir Robert Stapleton, was detected and punished. D. at the archiepiscopal palace of Southwell, July 10, 1588. A volume of his *Sermons* was published 1585, was repeatedly reprinted, and was edited for the Parker Society, with a *Biography*, by Rev. John Ayre (1841).

Revised by W. S. PERRY.

Sandys, Sir EDWIN: statesman; b. at Worcester, England, about 1561; studied at Christ Church, Oxford, under Richard Hooker; traveled extensively over Europe; was a supporter of the dynastic claims of King James I., by whom he was

knighted 1603 and employed in several important commissions; was a leading member of the second Virginia Company, of which he became treasurer 1619; was instrumental in securing a charter for the Pilgrims of the Mayflower and in establishing representative government in the colony of Virginia, thereby becoming obnoxious to the "Spanish party" at court, and was imprisoned, along with Selden, 1621, for having opposed the royal projects in Parliament. D. at Northborne, Kent, in Oct., 1629. He founded a lectureship on metaphysics at Oxford, and wrote at Paris, in 1599, *Europæ Speculum, or a Survey of the State of Religion in the Western Part of the World*, which passed through many editions. A volume of *Sacred Hymns* (1615), containing translations of 50 select Psalms, is attributed to him.

Sandys, George: English traveler and author; b. at Bishopsthorpe, York, in 1577; educated at St. Mary's Hall and Corpus Christi College, Oxford; traveled through various parts of the Turkish empire 1610–12; published a *Relation* of his journey (1615), with illustrations, often reprinted, and considered of great value by Orientalists; went to Virginia as colonial treasurer 1621; completed at Jamestown a translation of Ovid's *Metamorphoses* (1626), of which the first five books had previously appeared; built the first water-mill, and promoted iron-manufacture and ship-building in Virginia; returned to England 1624; printed poetical paraphrases of several books of the Old Testament, and translated from the Latin of Grotius the tragedy of *Christ's Passion* (1640); was for some years gentleman of the privy chamber to the king, and passed his latter years at Bexley Abbey, Kent, where he died in Mar., 1644. A *Life* was published by Rev. H. J. Todd, prefixed to a *Selection from Sandys's Metrical Paraphrases* (1839), and a complete edition of his poetical works, with introduction and notes, was published in 1872 by Rev. R. Hooper.

San Felipe de Linares: usually called Linares (*q. v.*).

San Felipe de los Andes, -fā-lee′pā-dā-lōs-aan′dās, or **de Aconcagua**, dā-ăă-kōn-kaa′gwăă: capital of the province of Aconcagua, Chili; in a valley at the foot of the Andes; 50 miles N. N. E. of Santiago, with which it is connected by railway (see map of South America, ref. 8–C). It has a considerable trade over the Andes with the Argentine Republic. Pop. (1895) 11,313. H. H. S.

San Fernan′do, formerly **Isla de Leon**: fortified maritime city of Spain; 9 miles by rail S. E. of Cadiz; on the low island of Leon (see map of Spain, ref. 20–C). It is a modern town with an arsenal, an observatory, hospitals, and barracks for troops. The population consists chiefly of Government employees, and the only industry is the extraction of salt from the neighboring tidal marshes. Pop. about 27,000. M. W. H.

Sanford: city; Orange co., Fla.; on Lake Monroe, an enlargement of the St. John's river, and the Jack., Tam. and Key W., the San. and Ind. Riv., the San. and St. Petersb., and the Sav., Fla. and West. railways; 125 miles S. of Jacksonville (for location, see map of Florida, ref. 4–J). It is at the head of large steamer navigation on the river; is an important shipping-point for oranges and for early vegetables and fruit consigned to Northern markets; and contains 10 churches, 2 public schools, railway car-shops, machine-shops, wood-turning mills, cigar and fruit-preserving factories, a national bank (capital $50,000), an incorporated bank (capital $31,000), and a weekly paper. It was founded by Gen. H. S. Sanford in 1870. Pop. (1890) 2,016; (1900) 1,450.
Editor of "Gate City Chronicle."

San Francis′co: city, metropolis, and chief seaport of California; coextensive with San Francisco County; on the end of a peninsula 6 miles wide and 20 miles long, separating the south arm of San Francisco Bay from the Pacific Ocean, and on the N. Pac. Coast, the San Fran. and N. Pac., and S. Pac. railways (of which only the last named has a line running directly into the city); lat. 37° 48′ 26·6″ N., lon. 122° 24′ 39·6″ W. (see map of California, ref. 7–B).

Site, etc.—Its area is 42 sq. miles, including, besides the entire end of the peninsula across to the ocean, Goat island, with 141 acres, 2 miles E. of the peninsula; Alcatraz island, with 30 acres, 1 mile N. of the peninsula; and the Farallones, six rocky islets, 24 miles off shore in the ocean. Nearly half the area consists of high rocky hills, rising in several points to 800 feet above the sea. The site has much level land, but a large part of this has been supplied by art, the original inequalities of the surface having been graded away. The harbor is part of a bay 50 miles long and 5 miles wide, deep, landlocked, and most beautiful. The city water-supply is from Pilarcitos and Calaveras creeks, from 20 to 40 miles distant, where it is caught in large reservoirs; and artesian water is found at depths varying from 120 to 160 feet, though from many wells water must be raised by pumping. The city is laid off in rectangular blocks, separated by wide streets, which in the north run with the cardinal points of the compass, and in a portion of the south with the semi-cardinal points. Market Street, which separates the two main surveys, 125 feet wide and 3 miles long, is one of the most important and imposing business streets in the world. Among remarkable features are the peninsular position, fronting to the W. on the Pacific Ocean, to the E. on the bay, and to the N. on the Golden Gate; the wooden architecture in the residence district; the hilly site; the excellent system of cable and electric cars in every direction; Chinatown; the fruit-market, wonderful in variety and abundance of its supplies; the wharf for Italian fishing-boats; the Seal Rocks, with their sea-lions at the entrance of the harbor; Sutro Heights, a pleasure-garden kept open to the public by Adolph Sutro; the Sutro bath-house; the numerous large hotels; and the peculiar climate, which permits the fuchsia and geranium to blossom in the open air of midwinter while it compels the wearing of overcoats in midsummer. Golden Gate Park has an area of 1,050 acres, with abundant evergreen vegetation of beautiful form and color, excellent drives, commodious and elegant buildings for public entertainment, creditable statuary, a highly varied site, a steep hill 900 feet high on the S., and a magnificent ocean beach and surf at its west end.

Climate.—There is almost unbroken coolness of temperature by breezes fresh from the ocean every day. The annual death-rate for each 1,000 inhabitants is 20, a proportion exceeded in most other seaport cities of equal size.

Buildings.—The city-hall, a fine-looking structure, with a high dome, has cost over $5,000,000. It is the largest building of the city in ground plan. Its material is brick, covered in front with stucco. The branch mint has an imposing front of gray limestone in the Greek style of architecture. The Palace Hotel, of brick, seven stories high, cost with its site $3,000,000, and is one of the largest and most famous hotels of the world. Other notable buildings are the Academy of Sciences, the Pioneer Hall, both endowed by James Lick; the Cooper Medical College and Lane Hospital (in adjoining buildings); the Hopkins Art Institute, given to the State by E. F. Searles; the Mills building, twelve stories, of brick and stone, with a framework of steel, erected at a cost of $1,000,000; and several other high buildings of similar construction. The prevalent style of architecture is highly ornamental, with a great multitude of bay-windows designed to catch as much sunlight as possible. Many of the houses, recently built or now in process of construction, are of beautiful stone.

Institutions.—As an important seaport San Francisco has a large custom-house, a national marine hospital, a national military post (the Presidio), and on the northern border of the peninsula, and also on Alcatraz and Goat islands, extensive fortifications. The city has a large number of churches and educational and philanthropic institutions. The Mechanics' Institute has property valued at more than $1,000,000; the Academy of Sciences had an endowment of about $600,000 from the estate of James Lick, and the Lick Mechanical Art School one of $540,000.

Government.—The city council (consisting of a board of eighteen members, known as the board of supervisors) and the chief executive officers, including mayor, auditor, treasurer, assessor, sheriff, recorder, county clerk, public administrator, and coroner, act under a new charter. The expense of the municipal government for the fiscal year ending June 30, 1901, was officially estimated at $5,692,985, including $1,160,000 for schools, $799,000 for police, $758,718 for the fire department, and $892,190 for repairing and lighting streets and other public work. The funded debt is only $250,000; the assessed value of city property for 1900 $410,425,840; the total taxation $1.62½ on each $100 of assessed valuation.

Manufactures.—The city has numerous large manufacturing establishments, including a rolling-mill, machine-shops, foundries, shipyards, wire-works, ropewalk, planing-mills, sugar-refineries, and factories for carriages, furniture, boxes, shoes, clothing, tinware, etc. The gross value of the products manufactured in 1900 is estimated at something more than $100,000,000, including very large quantities of refined sugar, clothing, and shoes, furniture and other wood-

Golden Gate Entrance to San Francisco Bay
1⅛ miles wide
2¾ miles long
SAN FRANCISCO
SCALE OF MILES
0 ⅛ ¼ ½ 1 1½ 2
A
B
C
D
1
2
3
4
5
6
Fort Winfield Scott
ANITA ROCK
Presidio Reservation
Presidio Barracks
U. S. Marine Hospital
Mountain Lake
Public Square
Lobos Creek
New St.
Lake
California
Clement
Point Lobos
FERRIES & CLIFF HOUSE RY.
City Cemetery
Government Reservation for Fort
Pt. Lobos
Sutro Baths & Aquarium
SEAL ROCKS
SUTRO HEIGHTS
Laurel Hill Cem.
Calvary Cem.
Odd Fellows Cem.
Masonic Cem.
Golden Gate Race Course
U.S. Life Saving Station
GOLDEN GATE PARK
Main Drive to Cliff House
Speed Track
PARK & OCEAN R. R.
Ocean Boulevard
PACIFIC OCEAN
Buena Vista Park
Alta Plaza
Lobos Square
Hamilton Square
Alamo Square
Waste Pond
ELECTRIC ROAD
Laguna Honda
ALMSHOUSE TRACT
Almshouse Road
Boulevard
Market
Dewey
Miguel Road
Public Square
ELECTRIC RAILWAY
Ocean House Road
Life Saving Station
Laguna de la Merced
Ingleside Race Track
Ingleside Coursing Park
House of Refuge
Industrial School House
Jewish Orphan Asylum
Newmarket
Duncan
Army
Valley
Diamond
Castro
Elizabeth
Liberty
Hill
Frederick
Melrose
Mangels
Joost
Sunnyside
Monterey
Flood
Spreckels
Berkshire
Holloway
Garfield
Shields
Sargent
Randolph
Stanley St.
Palmetto Ave.
De Long St.
Grafton
Lake View
Thrift
Minerva
Farallones
Broad
Sadowa
Mission
Brunswick
Bellevue St.
City Line


SAN FRANCISCO
and Vicinity
SCALE OF MILES
Railroad Depot.
A. Southern Pacific R. R., 3 F
Churches, etc.
1. Calvary, Presb., 2 E
2. Emanu-El Synagogue, 2 F
3. First Baptist, 2 E
4. First Congregational, 2 E
5. First Meth., 1 E
6. Grace, Epis., 2 F
7. Mission Dolores (The Old Mission of San Francisco), 3 E
8. St. Ignatius Church and College, R. C., 3 E
9. St. Mary's Cathedral, R. C. 2 E
10. St. Patrick's, R. C., 2 F
Hotels.
11. Baldwin, 2 F
12. Beresford, 2 F
13. California, 2 F
14. Cliff House, 2 A
15. Grand, 2 F
16. Lick House, 2 F
17. Occidental, 2 F
18. Palace, 2 F
Theatres, etc.
19. Baldwin, 2 F
20. California, 2 F
21. Grand Opera House, 2 F
Public Buildings, etc.
22. Academy of Sciences, 2 F
23. California Market, 2 F
24. City Hall, 2 E
25. Custom House and P. O., 1 F
26. Mercantile Library, 2 E
27. Merchants' Exchange, 1 F
28. Odd Fellows Hall, 2 E
29. Stock Exchange, 2 F
30. U. S. Branch Mint, 2 F
31. U. S. Marine Hospital, 2 C
Colleges, etc.
32. Cooper Medical College, 2 D
33. Mechanics' Institute, 2 F
34. Medical Dept. Univ. of Cal., 1 E
St. Ignatius College, R. C
See No. 8. St. Ignatius Church and College, 3 E
SAN FRANCISCO BAY
GOAT I.
MISSION ROCK
CHINA TOWN
Berkeley Ferry
Oakland Ferry
Alameda Ferry
Sausalito Ferry
Tiburon Ferry
PACIFIC OCEAN

work, foundry and machine work of every description, ship building and repairing. The value of the ships constructed and under construction amount to about $7,600,000.

Commerce.—The winds are strong and constant, but rarely violent. Between mean tides the difference is only about 6 feet, so that ships can always load and discharge at the wharves. A large stone dry dock and floating dock give facilities for repairs. By possession of a central position on the west shore of the continent; the only secure deep harbor between San Diego and the Columbia river, which are 1,000 miles apart; a situation at the outlet of the only navigable rivers and large valleys of California; the natural end on the Pacific Ocean of all the transcontinental railway routes of the United States; and by the large extent of tributary territory and its great agricultural and mineral resources, San Francisco has a high metropolitan character. The merchandise imports in 1900 were valued at $394,424,435; exports for the same year at $41,419,679; coinage at the San Francisco mint for 1900, $57,446,634; customs receipts, $7,893,342; resources of savings-banks, $134,498,940; of commercial banks, $76,543,241; and bank clearances, $1,029,582,595. The shipping that entered the harbor in 1900 was 1,487,816 tons, of which 836,480 was in foreign bottoms.

History.—The first settlement of white men was made in Oct., 1776, by Spaniards, who then established a military post and a mission of Franciscan friars, who devoted themselves to the conversion of the Indians. After the country passed to the dominion of Mexico, a small village called Dolores, inhabited by Mexicans, grew up about the mission. Another village, called Yerba Buena, was laid off near the best anchorage, 3 miles N. E. of the mission, in 1835. The occupation of California by the naval forces of the U. S., with an official announcement of permanence, stimulated the growth of Yerba Buena. In Jan., 1847, the name was changed to San Francisco, and a census showed a population of 450. In 1848 the discovery of gold in the Sierra Nevada brought a flood of people from remote countries of the world. Among the notable events of San Francisco were five great fires in 1849, 1850, and 1851; the formation of vigilance committees which, in 1851 and 1856, executed criminals by extra-judicial processes; the Fraser river fever in 1858, when the market value of real estate fell more than 50 per cent. because of the large migration to British Columbia; and the sand-lot agitation in 1878 and 1879.

Population.—(1880) 233,959; (1890) 298,997; (1900) 342,782, of whom some 130,000 are foreign born, making together a cosmopolitan aggregate. Many different languages are heard spoken every day on the streets.

Bibliography.—See the *Municipal Reports*, published annually by the city since 1861; John S. Hittell, *History of San Francisco* and *Resources of California*; Theodore H. Hittell, *History of California*; Hubert H. Bancroft, *History of California*. Theodore H. Hittell.

San Francisco de la Selva de Copiapó: See Copiapó.

San Francisco Mountain: the loftiest mountain in Arizona; lat. 35° 27′ N., lon. 111° 40′ W.; altitude, 12,800 feet. It stands alone, rising abruptly from the Colorado plateau to a height of 5,000 feet, and is a conspicuous landmark from all directions. Near it are the lesser cones of Bill Williams, Kendrick, and Sitgreaves. Its base is 10 miles across, and its crest takes the form of a crescent, with the concavity turned to the east. Geologically, it is partly a mountain of eruption and partly a mountain of circumdenudation. Its upper part is composed of lava, which was extruded before the plain had been degraded to its present level. The tough lava opposed a more stubborn resistance to the agents of erosion than did the sedimentary rocks of the plain, and not merely held its own while the latter were worn away, but protected and preserved that portion of the strata which it covered. As erosion proceeded, fragments of the volcanic rock fell down upon the sedimentary escarpment, and so nearly covered it that it can be detected at a few points only. The strata preserved under the lava are of Triassic age; the bed which constitutes the surface of the plain is the upper member of the Carboniferous formation. So the mountain is an insular table of Triassic sandstone, standing on a Carboniferous floor, and capped by a volcanic cone. Since the removal of the Triassic strata new fissures have opened in the plain, and basaltic lava has flowed out, spreading over the surface in broad black sheets and throwing up hundreds of low cones. From the summit of San Francisco one can look down into the throats of more than a hundred volcanoes. G. K. Gilbert.

Sangal'lo, Giuliano, da: architect; b. in Florence, Italy, in 1443. He studied engraving, and then became an engineer. His first work as architect was the cloister of the Carmelites of Santa Maddalena dei Pazzi in Florence. He built the palace of Poggio Imperiale for Lorenzo the Magnificent, and the Church of the Madonna delle Carceri, of which Lorenzo laid the first stone in 1492. He restored the fortifications of the city of Ostia by order of Cardinal Giuliano della Rovere. On his return to his masters in Florence, he built a monastery for the hermit monks outside the Porta Sangallo, and received the surname of *da Sangallo* from this work. At Milan he began the splendid palace for the Duke Moro which war interrupted, and at Loreto the cupola of the Church of the Madonna. He restored the roof of Santa Maria Maggiore at Rome, under Alexander VI.; this he is said to have gilded with the first gold from America. He constructed the cloister of the Santi Apostoli in Rome, and designed the beautiful façade of the Church of the Florentines. The Gonfalonier of Florence, Pietro Sodevini, made use of Sangallo at the siege of Pisa, where he constructed an ingenious bridge and the fortress and the gate of St. Mark. He was called again to Rome by Leo X., who asked him to undertake the direction of the building of St. Peter's, but, being ill, he returned to his own city. D. in 1517. W. J. Stillman.

San German: See the Appendix.

Sangha, or **Samgha** [Sanskr. *saṅgha*, assembly or congregation]: the monastic brotherhood, community, or order founded by the Buddha. It consists of men who have renounced all family ties and all worldly desires, and are pledged to devote themselves to meditation, the recital of the law, self-restraint, and the accumulation of merit in order that they may find deliverance from the round of birth and death. The order is open to men of all ranks, provided they are over twenty, have the consent of their parents, are free from disease or bodily defect, are not soldiers or in the service of the state, and are not debtors, slaves, or criminals. They are pledged to celibacy and mendicancy, and depend for support on unsolicited alms. The term sangha is sometimes rendered "church" and sometimes "priesthood," but erroneously in both cases, as, except in Tibet, Buddhism has no ecclesiastical organization and no religious rites or ceremonial observances. The sangha is also the third member of the *Triratna*, or Buddhist trinity. See Triratna.

San Gil: See San Jil.

Sangir, or **Sangi, Islands**: a chain of islands connecting Celebes and the Philippine islands, lying between the Sea of Celebes and the Pacific Ocean, belonging to the Netherlands. Area, 323 sq. miles. The largest island is Great Sangir, on which is the celebrated Gunong (or volcano) Abu, a superb pyramid, subject to frequent explosions. That of 1856 caused the death of 2,800 people; another eruption was contemporaneous with that of Krakatoa. The islands produce woods, cocoa, sago, rice, trepang, and turtles. The inhabitants are Alfurus, pacific, industrious, in part Christian and Mohammedans, in part pagans. Pop. (1888) 76,387. The Taluat Islands to the N. E. are sometimes included in the Sangir group. They have a somewhat greater area, and a population estimated at 5,000. Mark W. Harrington.

Sangkoi: chief river of Tonquin. See Songkoi.

San'greal, **Sangraal**, or **Holy Grail** [*Sangreal* is from O. Fr. *saint*, holy + *greal*, grail: O. Span. *grial*: Portug. *gral* < Lat. **crata'lis*, deriv. of *cratus*, *crater*, bowl]: according to mediæval legends, the cup of emerald which held the wine at the first celebration of the Lord's Supper. St. Joseph of Arimathea, it is related, received some of the blood of the Lord in this cup at the crucifixion. In the earliest form of the legend, *Le petit Saint Graal*, composed about 1160 and ascribed to Robert de Boron, the brother-in-law of Joseph of Arimathea carries this communion chalice to the West. In *Le grand Saint Graal* and *La queste del Saint Graal*, ascribed to Walter Map, a gentleman of the court of the English Henry II., it is Joseph himself who brings the Graal to England. These romances connect the legend with the stories of King Arthur, several of whose knights undertake its quest, an adventure finally achieved by the maiden knight Galahad. Galahad takes it back to the East, and on his death it ascends to heaven. In the *Conte del Graal* of Crestien de Troyes (about 1190), and the *Parzival* of his German continuator Wolfram von Eschenbach, Percival is substituted for Galahad as the hero of the Graal legend.

The fragment of a Graal romance, *Joseph of Arimathea*, exists in English alliterative verse of the fourteenth century, and has been edited for the Early English Text Society by Rev. W. W. Skeat (1871). H. A. Beers.

Sangster, Charles: poet; b. near Kingston, Ontario, Canada, July 16, 1822, and educated there; was editor of the Amherstburg *Courier* and Kingston newspapers for fifteen years, and in 1868 became attached to the Post-office Department, Ottawa, from which he was retired in 1886. He published *The St. Lawrence, The Saguenay, and other Poems* (1856), *Hesperus and other Poems and Lyrics* (1860).

Sangster, Mrs. Margaret E.: See the Appendix.

Sanguina'ria: a genus of plants containing one species, *S. canadensis*. See Blood-root.

San'hedrin, incorrectly **Sanhedrim** [from Heb. *sanhedhrīn*, from Gr. συνέδριον, assembly; σύν, with, together + ἕδρα, seat]: either of two councils of the ancient Hebrews.

A. *The Great Sanhedrin.*—The Jewish tradition traces its origin to the seventy councilors appointed by Moses (Num. xi. 16–25; comp. Ex. xviii. 13–26), and asserts, without proof, its existence at all periods of the nation's history until after the destruction of Jerusalem by the Romans. The earliest reliable trace of its existence is under the Maccabees (2 Macc. i. 10; iv. 44; xi. 27; 1 Macc. xii. 6). It was in full activity at the time of Herod (Joseph., *Ant.*, xiv., 9–4), and we find constant mention of it in the New Testament (Matt. xxvi. 59; Mark xiv. 5, xv. 1; Luke xxii. 66; John xi. 47; Acts iv. 15, v. 21, 27, 34, vi. 12, 15, xxii. 30, xxiii. 1, 6, 15, 20, 28). It was the supreme "privy council" of the Jews; not only their court of final appeal and last resort, but also an executive and legislative assembly, shaping the general polity of the nation. Its power in matters civil and religious was practically unlimited. It decided all cases brought upon appeal from the lower courts: it had authority over kings and high priests; in it was vested the trial of heresy, idolatry, false prophecy (hence the active part it took against our Lord); and it alone had power to pronounce sentence of death. Its active jurisdiction was confined to Judæa, but the Jews in all parts of the world seem in some degree to have recognized its authority. Owing to the inability to check the constant disorders during the last years of the Jewish commonwealth, its power was greatly curtailed by the Romans, and three years before the death of Christ the right of executing sentence of death was denied, save when confirmed by the Roman authorities (John xviii. 34). In the unsettled condition of affairs attending the fall of Jerusalem it found itself unable to execute civil authority, and from that time until its extinction in the third century its power was merely nominal.

It had seventy-one members chosen from those who were distinguished in birth, learning, or position. In the New Testament are mentioned (1) priests (ἀρχιερεῖς), chiefs of different orders of priests; (2) elders (πρεσβύτεροι), those venerable from age or position; (3) scribes (γραμματεῖς), those learned in the law and tradition. Its officers were president (*Nasi*, chief); first vice-president (*Ab-beth-din*, father of the court); second vice-president (*Hhakam*, judge); besides a force of secretaries and court officers (Luke xxii. 52). The members sat in a semicircle in a room immediately adjoining the temple, called לִשְׁכַּת הַגָּזִית (hall of squares). Their meeting in the house of the high priest for the trial of our Lord does not seem to have been legal. After the fall of Jerusalem they removed to Tabneh, and finally to Tiberias, where the Sanhedrin became extinct A. D. 425.

B. *The Lesser Sanhedrin.*—A court of twenty-three members appointed by the Great Sanhedrin, sitting in all towns of over 120 households, with jurisdiction over local, civil, and criminal matters. See Matt. v. 22, x. 17; Mark xiii. 9.

Literature.—Selden, *De Synedriis et Præfecturis Juridicis Veterum Ebræorum* (1650), a mine of learning and the great source from which all knowledge of this subject is drawn, but containing a mass of irrelevant matter; Ugolini, *Thesaurus*, vol. xxv.; Lightfoot gives much valuable information, derived from the Talmud and Mishna (see *Works*); cf. Schürer, *The Jewish People in the Time of Christ*, Eng. trans., second division, i., pp. 163–195.

Revised by S. M. Jackson.

Sanitary Commission, The United States: an organization formed during the civil war for the purpose of distributing relief to the soldiers of the Union army. On Apr. 15, 1861, the day of President Lincoln's call for 75,000 men, the women of Bridgeport, Conn., organized a society with the somewhat vague idea of affording relief and comfort to the volunteers. In Charlestown, Mass., on the same day, and at Lowell a few days after, the women of those cities formed similar societies. On Apr. 19 the ladies of Cleveland, O., organized an association for the care of the families of volunteers. The Women's Central Relief Association (founded at a public meeting in the Cooper Union, New York, Apr. 29, 1861) sent a committee to Washington to confer with the medical bureau and the War Department in order to learn more definitely in what way, with least embarrassment to the Government and most help to the army, the women could serve the volunteers. They presented to the Government their plan, based very much on the sanitary commission of Great Britain, asking for the appointment of a scientific board, to be commissioned with ample powers for visiting all camps and hospitals, advising, recommending, and, if need be, enforcing, the best-known and most approved sanitary regulations in the army.

The Government not unnaturally dreaded the possible collision of such a body with the medical and military authorities, and required that the consent of the medical bureau should be obtained before such a commission was appointed. This consent was denied. The best that could be secured was the appointment of a doubtful semi-official commission, with the privilege of advising with the medical bureau, of visiting the army in the field, and of recommending to the War Department sanitary regulations and reforms. A few things soon became obvious, and guided their course:

1. The great object of such a commission must be to develop, strengthen, and support the regular medical and military authorities and methods—to stimulate the departments having the supply of food, transportation, camp equipage, drainage, and incite them by kind and wholesome criticism and counsel, and by the force of public opinion, to do their utmost to prevent pestilence and the spread of scurvy, and the lessening of needless exposures of every kind.

2. The Sanitary Commission became very early in its history thoroughly convinced that to prevent evils to the health of the army was greatly more important and serviceable than to attempt to cure them after they appeared. It accordingly gave its attention chiefly to prevention, by a system of camp-inspection and the promulgation of counsels touching the choice of camp-sites, the importance of drainage and police, and the character and cooking of food. By the appointment of skilled medical inspectors it established at once an advisory and tolerably friendly relation with the surgeons in the field.

Among the policies of the Sanitary Commission was the prevention of incompetency, inefficiency, and contracted ideas in the medical bureau. Another preventive measure which it inaugurated was the erection from its own models of pavilion hospitals, designed to make contagion and pestilence less easy and fatal. Its plans became the type of the great general hospitals which were erected at the base of the Union armies.

One of the earliest services of the Commission was the establishment of soldiers' homes at the chief places where new regiments were concentrating, to take care of the sick and supply the defects in the unperfected arrangements of the quartermaster's bureau for receiving them.

As soon as the capture of Fort Donelson the Commission, finding the Government transportation of the sick to hospitals very rude and inadequate, began to organize a system of hospital steamers. These boats, supplied with every comfort, with surgeons and nurses, plied between the ports nearest to the seats of war and the nearest general hospitals, and transported in comparative comfort tens of thousands of sick and wounded men. The cars in which the largest portion were transported were places of torture to wounded men. The Commission devised a sort of hospital-car, in which the common stretcher upon which the wounded man was carried from the field could be converted into a hanging bed in the car. The car was so hung on gutta-percha springs as to obviate jolting.

The wants of the hospitals and camps very early in 1861 had exhausted 60,000 articles which had been forwarded to the Commission. By September of that year it became plain that a demand for extra food and extra clothing was going to exceed anything that the unorganized and intermittent beneficence of the people would furnish. The organization of over 7,000 aid societies, which offered opportunities to millions of women to take some active share in the war, was one of the Commission's best services. On Sept. 5, 1861,

dépôts of supplies were established at New York, Boston, Philadelphia, Washington, Cincinnati, and Wheeling. Central aid associations were in existence at Boston for New England, at New York for the State and part of New Jersey, at Philadelphia for Pennsylvania, Delaware, and Western New Jersey; in Cincinnati, Columbus, Cleveland, in Chicago, in Iowa, and Wisconsin, for the great Western States, which throughout the war were animated by the greatest zeal and liberality. These and other centers had each hundreds of town and village tributaries.

Battle-field Relief.—The medical department, having no independent transportation, often suffered from the inevitable preoccupation of the quartermaster's department with the more urgent duty of forwarding military stores. The Sanitary Commission, as one of its chief means of usefulness, had wagons and horses of its own—often forty four-horse teams at a time—and this enabled it at periods when transportation of medical stores was most embarrassed to forward medical and sanitary supplies to the seats of immediate battle far in advance of the medical department. After Antietam (Sept. 17, 1862) nearly 10,000 wounded Union soldiers, besides many Confederate soldiers, were left, an immense proportion of the whole, shelterless in the woods and fields, without any adequate supply of surgeons, and with not a tenth part of needed medical stores, which were locked up in the block of the railway between Baltimore, the base of supply, and the battle-field. A wagon-train loaded with medical stores had, however, been sent forward from the Sanitary Commission daily for some time to meet this anticipated difficulty. For four days the medical director received no Government supplies, and the wounded were mainly dependent meanwhile on the stores of the Commission.

Special Relief Service.—Early in the war new regiments, often under incompetent officers, arrived at Washington and other centers with sick men and exhausted soldiers, compelled to walk many miles to their camps, with no Government provision of food for them at the dépôts. The Sanitary Commission at once established near the principal dépôts soldiers' homes, where weak and sick men could be temporarily received, restored to health, and forwarded to camp. Forty soldiers' homes and lodges, in short, were sustained by the Sanitary Commission in its broad field, reaching from Washington to Brownsville, Tex., and from Louisville, Ky., to Port Royal, S. C.

The Hospital Directory.—This was an organized effort to tabulate and keep the run of the names of all private soldiers who passed through the general hospitals, so that a soldier's friends could follow him, know where he lay, if he lived or died, and what became of him when out of hospital. The central office at Washington was opened to the public Nov. 27, 1862; branches were soon established at Philadelphia, Louisville, and New York.

Pension Bureau and War-claim Agency.—This agency, free of all cost to soldiers, was designed to obviate the ignorance or inefficiency, or want of strength to win their own way or to secure correct papers, among soldiers passing through the homes and lodges of the Commission.

Special inspection of hospitals was one of the duties undertaken by the Sanitary Commission. It organized a corps of sixty physicians and surgeons of assured position, under Dr. Henry G. Clark, of Boston, as inspector-in-chief, who visited all the general hospitals in the country, and reported in a thorough and exhaustive manner (in 2,500 folio pages) to the medical committee of the Sanitary Commission. The object was to attain such information in regard to the practical management of the hospitals as might furnish suggestions to the surgeon-general for improvements in the system.

Bureau of Vital Statistics.—The most scientific and permanently valuable part of the work of the Sanitary Commission was its effort to collect, tabulate, and turn to account such returns as a system of careful inspection could supply touching the effects of applied or neglected hygiene, of diet, of long marching and heavy equipment, of tent and fixed hospitals; the mortality of young recruits; the influence of climate, age, drill, nationality, of previous occupations, or state of education upon soldiers; the height, weight, strength, and force of the enlisted men.

Financial History of the Commission.—The earliest call for aid published by the Commission was June 21, 1861, in two brief papers—one addressed to the people at large, the other to life-insurance companies. In Mar., 1862, it looked as if the Sanitary Commission must disband for want of funds, but its board were determined not to abandon the experiment. The first large contribution received was $100,000, by telegraph dated San Francisco, Sept. 19, 1862. Supplies had been coming in out of all proportion to the money necessary to move and distribute them. This splendid gift from distant California awoke a general enthusiasm. From that date, after every great battle, money and supplies came pouring in from other quarters, but with each of them came a still greater drain on the stores and the treasury. In the beginning of 1864 a series of great fairs was inaugurated, either by officers of the Commission or by its friends, in aid of its treasury or of the independent treasuries of its branches. They occurred at Chicago, Cincinnati, Cleveland, Pittsburg, Albany, Baltimore, Boston, Brooklyn, New York, Philadelphia, and many other towns and cities. The net product reached $2,736,868.84. The total amount in money received from the people by the Sanitary Commission up to May 1, 1866, was $4,962,014.26; but at least $2,000,000 more was raised and expended in its interest by its branches. Free transportation by railway and express companies and communication by telegraph lines saved the Commission at least two-thirds of the cost in these departments of its work. The aggregate value of the services rendered by the public to the Commission has been estimated at $25,000,000.

Internal Organization.—The original board consisted of nine persons, with power to add as many more associates as they deemed necessary. The order of the Secretary of War creating the Commission was dated June 9, 1861. The board had a general supervision of the work, the defining of its policy and measures, which were committed to secretaries, heads of bureaus, and agents for execution. To them was presented by the general secretary a sketch of the work founded on the reports of the heads of the various bureaus. The pressure and complexity of the business compelled the board to appoint from its members a standing committee charged with all the responsibility of the Commission during the intervals between its sessions. This committee consisted of Rev. Dr. Bellows, Dr. W. H. Van Buren, Prof. Wolcott Gibbs, E. T. Strong, and Dr. C. R. Agnew, and C. J. Stillé was afterward added. It was necessary that this standing committee should be constituted of gentlemen living near each other, as their meetings were held necessarily daily, and New York thus became their headquarters. For further details see Moss's *History and Work of the Sanitary Commission.* Abridged by C. K. Adams.

Sanitary Engineering: See Drainage, Plumbing, and Sewerage.

San Jacin'to: a river of Texas, which rises in Walker co., and flows S. E. 120 miles to San Jacinto Bay, an arm of Galveston Bay; navigable 45 miles. On its banks, 2 miles S. W. of the junction of the river and Buffalo bayou, the closing battle of the war of Texan independence was fought Apr. 21, 1836. Gen. Houston, in command of the Texan forces, had been gradually falling back eastward, toward San Jacinto river and bay, before the advance of the Mexican army under Gen. Antonio Lopez de Santa Anna from the W. The armies were marching on parallel lines, Houston's object being to reach the river and hold the ferry at its mouth; Santa Anna's to cut off his retreat and capture him. They reached the bay boundary almost simultaneously, and took position within a mile of each other. On the 20th some skirmishing took place, with but little result. On the 21st, with the cry, "Remember the Alamo!" the Texans made a sudden charge, and at the expiration of an hour Santa Anna had fled, and the whole of his army not slaughtered in the action had surrendered. The force of the Mexicans was 1,536; that of the Texans about 700. The latter had 8 men killed and 25 wounded.

San Jil, Sanjil, or **San Gil,** -heel': a town of the department of Santander, Colombia; 35 miles S. S. W. of Bucaramanga, in a narrow valley, 3,600 feet above the sea. It is the center of an agricultural district (sugar-cane, cotton, and tobacco), and manufactures Panama hats. Pop. about 10,000. H. H. S.

San Joaquin (wăă-keen') **River:** a stream which rises at the foot of a small glacier near the summit of Mt. Lyell, on the eastern border of the Sierra Nevada, California, flows S. W. for nearly 100 miles, then turns N. W. and traverses the magnificent valley of the same name, and at last, joining with the Sacramento, enters Suisun Bay. The discharge to the sea is through the Golden Gate. At high water the outflow of the Tulare system of lakes is discharged by the San Joaquin, which is navigable to Stockton for large steamers for a good part of the year. The river is some 350 miles long. Revised by I. C. Russell.

San'jo Saneyosh'i: statesman; b. at Kioto, Japan, in 1836, of an old princely family. He early began to take a prominent position in state matters. His efforts were directed to the restoration of the imperial power, and his cooperation at court was invaluable to Saigo and the other leaders of the malcontents in the provinces. After the restoration in 1868 he became vice-premier, and in July, 1871, premier, a position which he held until 1886, when he became chancellor. D. Feb., 1891. J. M. D.

San José, -hō-sā': capital of Costa Rica (since 1823) and of the province of San José; in a valley at the foot of a chain of volcanic mountains; 95 miles by rail from the port of Limon on the Caribbean Sea, and 60 miles by mixed route from Puntarenas (see map of Central America, ref. 8–J). It is the commercial center of the republic, and lies in one of the richest agricultural districts; has a cathedral, national library, university, various Government buildings, and two fine parks. San José is about 4,000 feet above the sea, and consequently has a temperate climate; the water-supply is good, but there is no drainage. Owing to the frequency of earthquakes, all the buildings are low, and the churches are without towers. San José was founded about 1750. Pop. 25,000. H. H. S.

San José: city; capital of Santa Clara co., Cal.; on the Southern Pacific Railroad; 8 miles S. E. of San Francisco Bay, 47 miles S. of San Francisco (for location, see map of California, ref. 8–C). It is in the heart of the beautiful Santa Clara valley, and is connected with San Francisco by three lines of railway and a waterway through the bay, and with the Pacific Ocean at Santa Cruz and Monterey by rail. The city is laid out in the form of a parallelogram, with streets ranging from 60 to 100 feet in width. There are four public parks—Washington Square, 28 acres, containing the State Normal School (cost $200,000); the Plaza, 4 acres, containing the new city-hall (cost $150,000); St. James's Park, 2 blocks in the center of the city, opposite the court-house and Hall of Records (cost $500,000); and Alum Rock Park, 7 miles E. of the city, 400 acres, containing numerous mineral springs, and connected with the city by a beautiful boulevard and by railway. The city contains a U. S. Government building that cost $200,000.

Churches and Schools.—San José contains a Roman Catholic Cathedral and 2 other Roman Catholic churches, 7 Methodist Episcopal, 4 Presbyterian, 4 Baptist, 3 Lutheran, 2 Protestant Episcopal, 2 Christian, and one each Congregational, Friends, Jew, Seventh-day Adventist, and Unitarian. There are also a Young Men's Christian Association, Young Men's Institute, Union Chapel, Spiritual Union, Salvation Army barracks, Theosophical Society, Christ's Rescue Mission, and Florence Night Mission. The public-school system comprises a high school, 6 grammar schools, and 6 kindergartens, with an enrollment of 4,000 pupils and an annual cost of maintenance of over $90,000. The Roman Catholic Church maintains Notre Dame College, St. Joseph's College, Notre Dame Academy, and St. Aloysius's School, and the Methodist Episcopal Church the University of the Pacific, half a mile N. of the city. There are 2 commercial colleges, 4 private schools, a public library, and 4 daily, 9 weekly, and 5 monthly periodicals. The charity institutions include the O'Connor Sanitarium (Roman Catholic), the Pratt Home for Old Ladies, and the Home of Benevolence, maintained by the Ladies' Benevolent Association.

Finances and Banking.—The city has annual receipts and expenditures of about $275,000, net debt of $300,000, and a property valuation of $17,800,000. Unassessed realty belonging to the city, parks, reservations, etc., estimated, $1,000,000. In 1900 there were 6 State banks with combined capital of $1,590,000, and a national bank with capital of $300,000.

Business Interests.—The dominant industry is the preparation and handling of the fruit product. The output of agriculture and horticulture of the valley amounts to about $6,000,000 annually. There are three large canneries, one the largest in the world, numerous packing-houses and shipping firms, a large woolen-mill, and an extensive yard for granite-polishing and marble-cutting.

History.—The pueblo of San José was established in 1782 by the Spaniards. Under the first constitution of California the State capital was located here. The completion of the overland railway in 1869 greatly promoted the prosperity of the city. Pop. (1890) 18,060; (1900) 21,500.

CHARLES H. ALLEN.

San José de Cucuta: See CUCUTA.

San Juan, -hoō-aan': a western province of the Argentine Republic, between Chili, Rioja, San Luis, and Mendoza. Area, 29,700 sq. miles. A great part of the surface is covered with mountain-chains, parallel to the Andes, and 7,000 to 13,000 feet high. In the west there are arid tablelands, and in the east extensive *travesias* or dry deserts, which could be reclaimed by irrigation. Most of the inhabitatants are gathered in the three fertile valleys of Tulán, Jacal, and Fértil. Cattle and sheep are raised and exported to Chili, but agriculture is the principal occupation. There are extensive vineyards, and the wines of San Juan, resembling Malaga, are noted. Until 1864 the province was frequently devastated by civil wars. Pop. (1895) about 84,000. San Juan, the capital, on the San Juan river, was founded in 1561, and has a population of about 11,000. On Oct. 27, 1894, it was partly destroyed by an earthquake.

HERBERT H. SMITH.

San Juan Bautista, -bow-tees'tăă: capital of the state of Tabasco, Mexico; on the west or left bank of the river Grijalva, which is navigated by small steamers to this point (see map of Mexico, ref. 8–J). It is built on flat land, has few public or private buildings of any pretension, and is hot and somewhat unhealthful. It controls the trade of the upper Grijalva and portions of Chiapas. Pop. (1895) 27,036. H. H. S.

San Juan de Fuca, Strait of: the entrance to Puget Sound and the Gulf of Georgia; lies S. of Vancouver's Island and N. of the State of Washington. Its entrance is in lat. 48° 23′ 30″ N., lon. 124° 43′ 48″ W.

San Juan del Norte: See GREYTOWN.

San Juan del Rio: a town of the state of Querétaro, Mexico; 28 miles E. S. E. of Querétaro; 6,500 feet above the sea (see map of Mexico, ref. 7–G). It owes its importance principally to rich silver mines in the vicinity. The place is beautifully situated and surrounded by gardens. Pop. about 10,000. H. H. S.

San Juan del Sur: a port of Nicaragua; on a bay of the Pacific, where the coast is nearest to Lake Nicaragua (see map of Central America, ref. 7–H). The harbor is good and safe. This was the Pacific terminus of the Central American transit route, now abandoned; it is the only cable-station on the Pacific side, and the commercial port of Southwestern Nicaragua. The proposed interoceanic ship-canal will terminate just N. of this place. H. H. S.

San Juan de Nicaragua: See GREYTOWN.

San Juan de Puerto Rico: capital and most important city and port of the island of Puerto Rico, West Indies; on a bay of the northern coast (see map of West Indies, ref. 5–J). The city is built on the western extremity of a low coral island which shelters the bay; the latter forms one of the safest and most commodious harbors in the West Indies, but the entrance is somewhat difficult, requiring a pilot. San Juan was founded by Ponce de Leon in 1511; subsequently it was strongly fortified and repulsed several attacks by English fleets. The most important exports are coffee and sugar. Pop. (1899) 16,225.

San Juan River, Nicaragua: See NICARAGUA.

Sankey, IRA DAVID: evangelist; b. at Edinburgh, Lawrence co., Pa., Aug. 28, 1840; in business at New Castle, Pa., 1855–70, when he joined Dwight L. Moody in evangelistic work in Chicago, Ill. They labored together in Great Britain 1873–75, and again in 1883. Mr. Sankey is the author of several popular sacred tunes, and has published a compilation entitled *Sacred Songs and Solos.*

Sānkhya [Sanskr. *sāṁkhya*, enumerative (see below), from *saṁkhyā*, number]: the name of the oldest one among the products of Indic speculation that was elaborated into a complete system. For the names of the other five systems, see SANSKRIT LITERATURE. Native tradition makes the Sānkhya system older than Buddha (older, say, than 500 B. C.), and maintains that Buddha in the establishment of his doctrines was greatly influenced by it; and this tradition is supported by many correspondences between the two systems. The origin of the rationalistic Sānkhya is to be sought in the reaction from the idealistic monism of the Upanishads (see VEDĀNTA), and is to be localized in the same region that brought forth also Buddhism. Originally the system must have maintained an open hostility to the Brahmanical system, as appears indeed from its polemics against Brahmanical ceremonialism. But in the first pre-

Christian centuries, the Brahmans began to make friends with the Sānkhyans and to treat their doctrines as not irreconcilable with those of the Vedānta. Later, the Sānkhyans acquiesced in a nominal recognition of the infallibility of the sacred Brahmanical literature; and their system, in turn, was received into the number of the six "orthodox" systems. Indeed, Sānkhyan doctrines pervade the whole classical Sanskrit literature (so far as it concerns itself with religio-philosophical ideas) from Manu's law-book and the *Mahā-bhārata* down to the Purāṇas.

The accounts of Kapila, the founder of the system, and of his alleged pupil Āsuri, are wholly unhistoric. It is not even probable that the first Sānkhya teacher composed any works. The oldest authority of whom we can speak with any certainty is Panchaçikha, who flourished a little after the beginning of our era, but of whose writings only scanty fragments are left. The full bloom of the system belongs in the first centuries after Christ, a time when commerce between Alexandria and India was active; so that the Indic system was not without influence upon the Gnostic systems and Neoplatonism. The oldest extant complete treatise on the system, however, is probably of as late date as the fifth century; this is Içvarakrishna's *Sānkhya-kārikā*. The two chief expositions thereof are the *Sānkhya-comment* of Gauḍapāda (about 700 A. D.) and Vāchaspati-miçra's *Moonlight of Sānkhya Truth* or *Sānkhya-tattva-kāumudī* (about 1100 A. D.). Later than this, but before the sixteenth century, is the *Tattva-samāsa*, a brief compendium of the system, and the basis of many comments and supercomments. Next to the *Kārikā* in importance is the *Sānkhya-sūtra*, ascribed to Kapila, but most probably dating from about 1400 A. D. The important comments upon it are by Aniruddha (1500), Vijnāna-bhikshu (after 1550), and Vedāntin Mahādeva (about 1700). The *Sānkhya-kārikā* was translated by Colebrooke (1823), Lassen (1832), Pauthier (1833), Windischmann (1834), and with elaborate explanations by Barthélemy Saint-Hilaire (1852), and John Davies (1881); and with Gauḍapāda's comment by Wilson (1837). The *Tattva-samāsa*, with a comment, was translated by Ballantyne (1850), and the *Sānkhya-sūtra*, with extracts from the comment, also by him (3d ed. by Fitzedward Hall, 1885). Dr. Hall treats of the history of the Sānkhya literature with acuteness and great learning in his introduction to the *Sānkhya-sūtra* (Calcutta, 1862). Recently complete translations of the *Sānkhya-tattva-kāumudī* and of the commentaries to the *Sānkhya-sūtra* have been published by the present writer (Garbe), whose edition of the text of the *Sūtra* and of Vijnāna-bhikshu's commentary appears in Lanman's *Harvard Oriental Series* (Cambridge, 1895). By Garbe also, finally, *Die Saṁkhya-Philosophie*, an exhaustive treatise upon the system, its literature, history, and contents, was published at Leipzig in 1894.

The designation "enumerative philosophy" was applied to the system because of the great importance attached by the Sānkhyans to the establishment of their twenty-five principles and to their numerical classifications in general. The name has reference accordingly to externals and not to the essence of the system. Its fundamental doctrine is consistent pessimism. Conscious life is suffering. Pleasure, the lot of comparatively few, is mixed with pain, and leads only to sorrow. This is all closely connected with the widespread belief in the transmigration, with its horrible sequence of death after death. The cycle of birth, life, and death (*Saṁsāra*) has no beginning; and, for those beings who hang upon the things of this world, it has also no end. In only one way—on this point all the Indic systems are agreed—can one escape the necessity of rebirth: namely, by the recognition of the highest truth. One of the preliminaries to this recognition is a life of complete renunciation. In one other point the Sānkhya system agrees with the general Indic views: namely, in not attempting to subvert the conceptions of the popular religion, the gods, demigods, and demons, the heavens and the hells. All these supernatural beings, however, stand, as do we, within the *Saṁsāra*; unless they attain to the recognition of the highest truth and thereby to release from existence, they too are still under the power of death, and must keep changing their bodies; and are thus on a lower plane even than the man who has attained the highest aim. There is no place in the Sānkhya for an actual god (*īçvara*), who, as others suppose, created the world and maintains and governs it. The decisiveness with which the existence of such a god is denied is one of the characteristic features of the genuine early Sānkhya; which is, accordingly, properly called atheistic (*nirīçvara*).

The Sānkhya recognizes two eternal entities, matter and souls. The world of matter is, for the Sānkhya system, in contrast with the Vedānta, real; and is derived from a final cause by a genuinely philosophical method. The Sānkhya doctrine proceeds from the principle that the effect is nothing else than the cause in a certain phase of development; that from the phase which is physically perceived by us the preceding phases are each to be inferred, one after another, until we arrive at a principle which has only the character of cause, and not also that of effect. The last inferable principle is the primeval material (*prakṛti*, often inappropriately translated by "nature"), out of which, in accordance with law, the world is evolved. The originator of the Sānkhya doctrine believed that he recognized in the world of matter three substances or constituents (*guṇas*, usually and very erroneously rendered by "qualities"), unequal and mingled in varying proportions: of which the first exhibits the characteristics of lightness, of light, and of delighting; the second, those of mobility, of excitation, and of pain-causing; the third, those of heaviness, of obstruction, and of stupefaction; and to which respectively he gave the names of *sattva*, *rajas*, and *tamas*. And he set up the theory that the primeval matter consisted of these three constituent substances. The undeveloped primeval matter is accordingly the condition of equilibrium of the three *guṇas*.

It is in consequence of a disturbance of this equilibrium that the world enters upon a course of development. First arises the *buddhi*, the fine substance of that internal organ to which belong the functions of determining, discriminating, and judging. From the *buddhi* proceeds the *ahaṁkāra*, the fine substance of that internal organ whose function it is to put things into relation to the ego or soul. Since these internal organs correspond to what we mean by the nerve-system, we should say in modern phrase that the Sānkhyans look upon the nerve-substance as the first and finest development of the primeval matter. The *ahaṁkāra* produces the organs of sense and the subtile elements; from which proceed in turn the five gross elements (ether, air, fire, water, earth), that is, the visible world in all its manifoldness.

When the time of its persistence is at an end, the universe is dissolved; and in such wise that each product or set of products, beginning with the gross elements and proceeding in the reverse order, resolves itself into the material cause from which it was developed. By this process of reabsorption, finally, the three *guṇas* at last attain again their original condition of equilibrium. The primeval matter is again precisely the same and in the same state as it was in the time before its evolution; and so it persists until the dawn of a new period of a new world-evolution. This cycle of becoming, existing, and passing away never had any beginning and will never have any end.

As for the physiological side of the system, it is to be observed that the higher and lower corporeal organisms—whether of supernatural beings, of men, or of beasts—are composed of like constituents and do not differ in principle. Besides the gross-material perishable body, each organic being possesses a fine or inner body (*liṅga çarīra*), which, with the soul, passes from one gross body into another. The fine body is composed of the inner organs (*buddhi* and *ahaṁkāra*), the internal sense (*manas*), and the external senses (*indriya*), and the five fine elements; it is not only the basis of the metempsychosis, but also the bearer of the personality, since it alone is concerned with all those conditions and processes which we term psychic. The functions of the senses and of the inner organs, perception, feeling, thinking, willing, are in the first instance, according to the Sānkhya system, purely corporeal mechanical processes, and would remain unknown did not the soul (*ātman* or *purusha*), which is of purely spiritual nature, make them known by its "illuminating" power. This is the sole function of the *ātman*.

The Sānkhya system—again in sharp contrast with the Vedānta—teaches that there is an endless plurality of souls, which have existed from all eternity, are individual, and yet wholly like each other. Each one of these souls by itself is all-pervasive and infinitely great, like matter; but, for the rest, essentially different from all material principles. The souls are unchangeable; are unconcerned spectators of the processes that go on whether within or without the body; are unaffected by pleasure or pain; and, albeit incapable of any activity, willing, or wishing, they yet exert by their mere presence an excitant influence upon the dispensation of nature. Matter—that is, not only external

things, but also our inner organs—is likened to a dancer that executes a dance before the soul as spectator.

The purpose of the Sānkhya is to bring us to understand the absolute difference of the soul from matter; and, especially, even from the finest modifications of matter as exemplified in the inner organs: forasmuch as the intelligent recognition of this difference releases the soul from the bonds of matter and puts an end to the series of rebirths. And hereby is attained that absolute deliverance from sorrow which every wise man is to strive for. All other means for doing away with sorrow—because their effect is only transitory—are worthless. An offshoot of the Sānkhya system is the Yoga philosophy. See YOGA. R. GARBE.

Translated by C. R. LANMAN.

San Laz'zaro: a small island of the Venetian lagoons, first mentioned in the twelfth century, when a hospital for lepers was established there. After the disappearance of leprosy it was used for other hospital purposes, until the Venetian republic ceded it to Peter Mechitar and his Armenian followers who had fled before the Turks. The Armenian church and convent contain many objects of interest.

San Leandro, -lā-aan'drō: town; Alameda co., Cal.; on the S. Pac. Railroad; 9 miles S. E. of Oakland, the county-seat; 15 miles E. of San Francisco (for location, see map of California, ref. 7–C). It is in an agricultural and fruit-growing region, and has manufactories of agricultural implements and hardware, a State bank with capital of $25,000, and two weekly newspapers. Pop. (1900) 2,253.

San Lucar de Barrame'da (anc. *Ebora*): fortified port and town of Spain, in the province of Cadiz; on the Guadalquivir, near its mouth; 15 miles N. by W. of Cadiz (see map of Spain, ref. 19–C). It exports large quantities of wines and fruit. It is a popular summer resort for sea-bathing. Pop. (1887) 22,667.

San Lucas, Cape: See CAPE SAN LUCAS.

San Luis, -lōō-ees': an interior province of the Argentine Republic; surrounded by Mendoza, San Juan, La Rioja, Córdoba, and the territory of La Pampa. Area, about 18,000 sq. miles. In the north much of the surface is mountainous; the Salinas desert separates the province from La Rioja. The southern part is a plain included in the Pampas, but partly taken up by arid salines. Owing to the dryness of the climate little of the land is available for agriculture without irrigation, but cattle and sheep are raised in large numbers and exported both to Buenos Ayres and to Chili. The mountain region is rich in gold, silver, copper, graphite, etc. The inhabitants suffered greatly during the civil wars. Pop. (1895) about 81,500. San Luis, the capital, is a town of 10,000 inhabitants, on a plateau 2,502 feet above sea-level; from this point nearly the whole province and the distant Andes can be seen. It is an important station on the railway from Buenos Ayres to Chili. HERBERT H. SMITH.

San Luis Obis'po: city (incorporated in 1874); capital of San Luis Obispo co., Cal.; on the Southern Pacific Railroad; 9 miles N. of San Luis Obispo Bay, with which it is connected by railway to Port Harford, and 90 miles N. W. of Santa Barbara (for location, see map of California, ref. 10–D). It is in an agricultural, dairying, and stock-raising region, and contains 5 State banks with combined capital of $720,000, the Academy of the Immaculate Heart of Mary (Roman Catholic), and a daily and 2 weekly newspapers. Pop. (1880) 2,243; (1890) 2,995; (1900) 3,021. EDITOR OF "TRIBUNE."

San Luis Potosí: an interior state of Mexico; bounded by Coahuila, Nuevo Leon, Tamaulipas, Vera Cruz, Hidalgo, Querétaro, Guanajuato, and Zacatecas. Area, 24,446 sq. miles. In the central and northern parts there are extensive high plains included in the Mexican plateau; these are varied by mountains and hills. The eastern and southern portions are on the mountainous border of the table-land, and are exceedingly varied in scenery and climate. Agriculture is the most important industry, the principal crops being maize and wheat on the plateau, sugar-cane, cotton, and coffee in the warm valleys, and maguey, used for the manufacture of pulque and the spirituous liquor called mezcal. The mines (of silver, gold, lead, etc.) are among the most valuable in Mexico; salt is obtained from salines on the plateau. In the western part the grazing industry occupies much of the land. The manufactures are increasing in importance, and altogether this is one of the richest and most progressive of the Mexican states. Pop. (1895) 570,814; a large proportion are of Indian or mixed race.

HERBERT H. SMITH.

San Luis Potosí: capital of the state of the same name; in a valley on the mountainous border of the plateau, 6,200 feet above the sea; 362 miles by railway N. N. W. of Mexico (see map of Mexico, ref. 6–G). It is regularly laid out with wide streets and numerous small squares ornamented by trees; the outskirts have so many gardens and trees that, from a distance, only the higher towers can be seen. The cathedral and many churches are richly ornamented. San Luis has a university, school of engineering, mint, etc., with considerable manufactures; it is an important railway center and has a large and increasing trade. The silver mines (discovered in 1583), which first gave importance to the place, are nearly abandoned. The climate is dry and temperate. Pop. (1895) 69,676, including a number of suburban villages.

HERBERT H. SMITH.

San Marcos: town; capital of Hays co., Tex.; on the San Marcos river, and the International and Gt. Northern, and the Mo., Kan. and Tex. railways; 31 miles S. of Austin, the State capital (for location, see map of Texas, ref. 5–H). It is in an agricultural region, and contains 2 national banks with combined capital of $130,000, Coronal Institute (Methodist Episcopal, South, chartered in 1879), public-school building (erected in 1890, cost $10,000), a U. S. fish-culture station, grounds of the Texas Chautauqua Association, water-works, electric lights, several steam-ginneries and cottonseed-oil mills, an interesting group of boiling springs, and 3 weekly newspapers. Pop. (1880) 1,232; (1890) 2,335; (1900) 2,292.

ISAAC H. JULIAN, EDITOR OF "PEOPLE'S ERA."

San Mari'no: the oldest and smallest independent republic in the world, situated in eastern Central Italy (see map of Italy, ref. 4–E). It is governed by a legislative senate of sixty members elected for life, an executive council of twelve, two-thirds of whom go out every year, and two presidents elected for six months. This has been the form of government since 1847, when the constitution was considerably changed. Area, 32 sq. miles, embracing five small villages, with a population of about 8,500. The capital, of the same name, is perched on the crest of a mountain 2,635 feet above the sea. It is said to have been founded early in the fourth century by St. Marinus, a converted stone-mason, who fled from Rimini (12 miles N.) during the Diocletian persecution. Borgo, 500 feet lower down, is the residence of the principal inhabitants. The other three villages are Serravalle, Faetano, and Monte Giardino. There is a standing army of thirty-eight officers and 950 men, and an annual revenue of about 227,000 lire. The principal products are fruit, silkworms, and wine, and there is some good pasturage. Gunpowder is manufactured. See histories of the republic by Melchiorre Delfico (Milan, 1804) and Cazeneuve (Paris, 1887).

San Martin, saan'maar-teen', José, de: general: b. at Yapeyú, Misiones (now in the Argentine Republic), Feb. 25, 1778. His father was governor of Misiones, but returned in 1785 to Spain, where young San Martin early entered the army as a cadet. He distinguished himself in the wars with France, attaining the rank of lieutenant-colonel. Meanwhile he had adopted republican ideas; in 1811 he resigned and went to London, where he was associated with Miranda and other noted Spanish-American republicans. In 1812 he and other young officers sailed for Buenos Ayres with the object of offering their services to the patriot junta of that colony. On his arrival San Martin was commissioned to organize a regiment of cavalry. This force, the Mounted Grenadiers, was distinguished throughout the war for independence. About Aug., 1812, San Martin and his friends organized the secret society called the Lautaro Lodge; this speedily became the most important political influence in the country, and most of the subsequent successes were directly or indirectly due to it. At the end of 1813 San Martin succeeded Belgrano as commander of the patriot forces in Upper Peru or Bolivia. By the reverses of 1814 the patriots were practically driven out of all the South American colonies except those in the basin of the Plata. The patriots of the Plata basin had repeatedly attempted to attack the central Spanish power in Peru by way of La Paz and Lake Titicaca, but they had always been driven back, the mountain region being unfavorable for cavalry. San Martin conceived the idea of opening a new line of attack by crossing the Andes into Chili; this scheme he was able to carry out through the support of Pueyrredon, director of Buenos Ayres, and the secret influence of the Lautaro Lodge. He drilled and organized his army during two years, and on Jan. 17, 1817, began his march with 4,000 men,

crossing by the Uspallata pass, which is 12,300 feet above the sea, or 4,000 feet higher than St. Bernard where Napoleon made his celebrated passage. The Spaniards were defeated at Chacabuco, Feb. 12, and Santiago was occupied three days after. San Martin was immediately nominated supreme director of Chili, but declined, and the office was given to O'Higgins. On Feb. 12, 1818, the independence of Chili was proclaimed. The Spaniards, strongly re-enforced from Peru, won the battle of Cancha Rayada Feb. 19; but they were overwhelmingly defeated by San Martin at Maipo Apr. 5, 1818, their power in Chili being essentially ended. Meanwhile San Martin had been busily engaged in the second part of his great plan—the invasion of Peru by sea. A fleet was organized and placed under command of Lord Cochrane; and, after several brilliant naval exploits, San Martin's army of 4,500 men was transported to the Peruvian coast in Aug., 1820. By skillful manœuvering the Spaniards were forced to evacuate Lima, which was occupied by San Martin July 9, 1821; three weeks later the independence of Peru was proclaimed, and San Martin was chosen supreme protector. At this time another patriot army under Bolivar was approaching from the north, and Peru was threatened with a rivalry between the two patriot leaders. San Martin magnanimously sacrificed his own ambition to the cause. After an interview with Bolivar at Guayaquil July, 1822, he resigned his office to the Peruvian congress (Aug. 22, 1822), and in September sailed for France; there he passed the remainder of his life in comparative poverty. D. at Boulogne, Aug. 17, 1850. The final triumphs of the war were achieved by Bolivar and his generals, but the independence of South America was largely due to San Martin. See Mitre, *Vida de San Martin*; an English abridged translation by Pilling, entitled *The Emancipation of South America* (1893); and *Memoirs of Gen. Miller* (1829). See also La Serna é Hinojosa.

Herbert H. Smith.

San Miguel, -mēĕ-gel′: a town of Salvador; capital of a department of the same name; in the eastern part of the republic; on the river San Miguel (see map of Central America, ref. 6–F). It is the center of a rich agricultural region (indigo, etc.). The climate is warm and insalubrious. Pop. about 12,000. The San Miguel volcano, 10 miles to the S. W. of the town, is 6,000 feet high, and one of the most active in Salvador. H. H. S.

San Miguel de Allende: See Allende.

Sannaza′ro, Jacopo: poet; b. in Naples, Italy, July 28, 1458; educated at the academy of Pontano; traveled much, and early received great favor from King Frederick III. of Naples as a reward for his poems; followed the king into exile in 1501, when he was driven from the throne by the Spaniards, and did not return until after his death. D. in Naples, Apr. 27, 1530. A collected edition of his Italian poems appeared at Padua in 1723. The best known is *Arcadia* (Venice, 1502; Turin, 1888), which is a series of idyls, partly in prose, partly in verse, and hence one of the earliest of prose pastorals. His Latin poems comprise *De Partu Virginis* (1526; also Leipzig, 1826), *Eclogæ*, and epigrams, among which is the famous poem in praise of Venice, which gained a reward of 600 ducats from the senate.

San Nicolas′ de los Arro′yos: a town of the province of Buenos Ayres, Argentine Republic; on the river Paraná, close to the boundary of Santa Fé. It is built on a high bluff overlooking the river; is the center of a rich grazing district (cattle and sheep), and of agricultural colonies settled by Italians. There are steam flouring-mills, a meat-freezing establishment, etc. San Nicolas is a port of call for ocean steamers, and is an important railway center. Pop. (1892) 19,000, and growing rapidly. H. H. S.

San Pier d'Arena, or **Sampierdarena**, sāăm-pi-ār-dāă-rā′nāă: town; in the province of Genoa, Italy; occupying a tongue of land about 2½ miles W. of Genoa (see map of Italy, ref. 3–C). Though it is a suburb of Genoa, it has a distinct city organization. The churches contain some valuable works of art, and there are some noticeable public buildings as well as private palaces. There is much commercial and manufacturing activity. Pop. (1886) 22,960.

San Rafael: town; capital of Marin co., Cal.; on the Strait of San Pablo, and the N. Pac. Coast and the San Fran. and N. Pac. railways; 15 miles N. of San Francisco (for location, see map of California, ref. 7–B). It is in an agricultural, dairying, and stock-raising region at the base of Mt. Tamalpais, is a widely known resort for invalids, has hourly communication with San Francisco by two railways and by ferries, and contains six churches, a public high school, San Rafael Institute (opened in 1881), St. Vincent's Male Orphan Asylum, a library, a private bank, and two weekly newspapers. Pop. (1880) 2,276; (1890) 3,290; (1900) 3,879.

Editor of "Marin County Journal."

San Remo: town; in the province of Porto Maurizio, Italy; 26 miles by rail E. N. E. of Nice; railway station on the line from Genoa to Nice (see map of Italy, ref. 4–B). It is picturesquely situated on a slope descending to the sea, with rich olives behind it, and surrounded by luxuriant orchards of lemons and oranges. There is an old town with steep and narrow streets. The new town is a favorite resort of invalids, for whom ample accommodation is provided, and is preferred by many to either Nice or Mentone, as being more sheltered than the former and less confined than the latter. Pop. 16,330.

San Roque, -rō′ke: town; in the province of Cadiz, Spain; on the Bay of Gibraltar; 8 miles N. by W. of Gibraltar (see map of Spain, ref. 20–D). It was built by the Spaniards after the loss of Gibraltar. It produces great quantities of fruit and vegetables, in which it carries on a considerable trade with Gibraltar. Pop. (1887) 8,730.

San Salvador′, or **Banza Congo**: town of the province of Loanda, Portuguese colony of Angola, Western Africa; in the basin of the Congo river; lat. 6° 20′ S., lon. 14° 47′ E. (see map of Africa, ref. 6–D). It is the ancient *Ambassi*, capital of an indigenous kingdom, but destroyed about 1550. In the seventeenth century it revived under Portuguese influence, and became an important center of trade and religion, but it has again fallen into decay. It is of importance only as a center for mission-work. Pop. 700, with a dozen or score of whites. M. W. H.

San Salvador: capital and largest city of the republic of Salvador, Central America; on a branch of the river Lempa, and at the southeastern base of the extinct volcano of San Salvador; 2,270 feet above sea-level (see map of Central America, ref. 4–E). It was founded in 1528 and removed to its present site in 1539. This locality seems peculiarly subject to earthquakes; over sixty have been recorded in a single year, and occasionally they are very destructive. The city was more or less completely overturned in 1575, 1593, 1625, 1656, 1798, and 1839. On Apr. 16, 1854, it was reduced to a heap of ruins by a succession of severe shocks. An attempt was then made to found a new capital at Nueva San Salvador, 8 miles distant; but the old city, having been rebuilt, regained its supremacy, and was again destroyed, with the neighboring villages, Mar. 19, 1873. As rebuilt, all the houses and public edifices are low and surrounded by wide grounds; the cathedral and many other buildings are of wood. San Salvador has a university, national palace, normal college, national theater, etc. It is the center of a rich agricultural district, and has a thriving trade. Pop. with the suburbs, about 35,000; of the city proper, about 25,000. Its port is La Libertad, connected with it by a road which is passable for carts only during a part of the year; a railway is projected. Herbert H. Smith.

San Salvador Island: See Bahama Islands.

Sans-Culottes, sāăn′kü′lot′ [=Fr., liter., without breeches; *sans*, without + *culotte*, breeches]: a name bestowed early in the first French Revolution upon the lower classes of the populace from the fact that they wore pantaloons instead of knee-breeches, the latter garment distinguishing the dress of the bourgeoisie and nobility.

San Sebastian: capital of the province of Guipuzcoa, Spain; on a peninsula in the Bay of Biscay; surrounded with strong walls and defended by a citadel (see map of Spain, ref. 12–G). Its harbor, though not safe, is frequented by large vessels. A large import trade in French and English goods is carried on, and during the summer the town is much resorted to as a watering-place. Pop. (1887) 29,047.

San Seve′ro: town; in the province of Foggia, Italy; 18 miles by rail N. W. of Foggia and 141 N. E. of Naples (see map of Italy, ref. 6–F). The district is fertile in grain and fruit, and not lacking in pasturage. The town, of mediæval origin, has suffered severely from earthquakes on several occasions. Pop. 20,380.

Sanskrit Language: the literary language of the Aryan inhabitants of India. Two principal reasons have led to its study: the intrinsic interest attaching to the very extensive Sanskrit literature, which reveals the thought and life of a large and highly endowed part of the human race; and,

second, the fact that, of all the Indo-European languages, the Sanskrit has, on the whole, best conserved the pristine features of their common parent-speech—a consideration appealing with especial force to most of the cultivated European races, inasmuch as their languages are descended from this parent-speech. The application of the comparative method to the study of genetically related tongues is due in largest measure to the study of Sanskrit, which has thus proved to be the most important factor in the revolutionizing of some parts of classical philology and in the creation of Germanic philology. Moreover, with the broadening of the conception of philology, the conception of comparative philology has also grown broader; instead of being confined to phonology and to the morphology of word and of sentence (comparative grammar), it includes the whole intellectual life of a people, as that life is manifested not only in its language, but also in its literature, its antiquities, its customs and laws, its religion, its philosophy. These subjects when treated comparatively form chapters of comparative philology; and these are the very subjects which receive and are yet to receive especial illumination from ancient India.

The languages of India may be divided primarily into Aryan and non-Aryan (see *Ethnology* under INDIA, and especially DRAVIDIAN LANGUAGES, and Constable's *Hand Atlas of India*, plate 10); the Aryan constitute, with the IRANIAN LANGUAGES (*q. v.*), the Indo-Iranian group of the Indo-European family of languages. For the relation of this group to the others, see INDO-EUROPEAN LANGUAGES. The Aryan languages of India show three principal stages of development: (1) Old Indic or Sanskrit; (2) Middle Indic or Prākrit (see PRĀKRIT LANGUAGES); and (3) New Indic or Bhāshā. The old Indic belongs locally to the Punjaub and the Indo-Gangetic plain. The name Sanskrit is applied to the ancient and sacred language of India, the tongue in which the Vedas, Brahmanas, Upanishads, epics, etc., are written. It is difficult to say just how long it was a true vernacular; but, under the influence of learned writers and grammarians, it has maintained for 2,000 years a more or less artificial existence as a means of communication, spoken and written, for the learned of India. The word Sanskrit is a Sanskrit word meaning "elaborate," and it doubtless connotes a certain antithesis to Prākrit, which means the "ordinary" or "vulgar" (idioms). It is in its broader sense that the term Sanskrit is applied to the language of the widely different periods of Sanskrit literature; in a narrower sense, it is often used as the equivalent of "classical Sanskrit," the language of the later classical works as distinguished from the archaic dialects of the Veda and Brahmanas.

There is, properly speaking, no Sanskrit alphabet. The Hindus of the different parts of India write the language usually each in his own vernacular alphabet. The alphabet which prevails in Hindustan proper is the one called *Nāgarī*, or *Deva-nāgarī*; and this, of all the Indic alphabets, is the one adopted by Occidental editors of Sanskrit works. It is written from left to right. Alberuni (in his *India*, written about 1030 A. D., chap. xvi.) mentions among the principal alphabets the *Nāgara* of Malwa. *Nāgara* means "of the city," and refers perhaps to the very famous city of Ujjain, once the capital of Malwa. The alphabet is probably derived from a Semitic source. By far the most important discussion of this subject is that of G. Bühler, *Indian Studies*, No. 3 (Vienna, 1895).

The system of sounds, in the native order of arrangement, is as follows: Vocalic: *a*, *ā*, *i*, *ī*, *u*, *ū*, *ṛ*, *ṝ*, *ḷ*, *e*, *āi*, *o*, *āu*; the breathing *ḥ* and nasalization *ṁ*; consonantal:

Mutes.	Surd.	Surd asp.	Sonant.	Son. asp.	Nasal.	Semivowels.	Sibilants.
Guttural	*k*	*kh*	*g*	*gh*	*ṅ*	..	..
Palatal	*c*	*ch*	*j*	*jh*	*ñ*	*y*	*ç*
Lingual	*ṭ*	*ṭh*	*ḍ*	*ḍh*	*ṇ*	*r*	*ṣ*
Dental	*t*	*th*	*d*	*dh*	*n*	*l*	*s*
Labial	*p*	*ph*	*b*	*bh*	*m*	*v*	..

and the sonant guttural aspirate *h*. The vowels are written with different characters according as they are long or short. The *a*, *i*, and *u* vowels are pronounced as in Italian, save that the short *a* has the value of the neutral vowel in *but*. The *ḷ* is like the common English *l*-vowel in *ankle*, and the *ṛ*-vowels are simply untrilled *r*-sounds with vocalic value in syllable-making. Of the mutes, the unaspirated surds and sonants and the nasals of the guttural, dental, and labial series are familiar: the surd aspirates *kh*, *th*, *ph* are like the simple surd with following breathing, as in *blockhead*, *pot-hook*, *uphill*; and the sonant aspirates are rendered in practice as in *abhor*, etc., though their strict value is matter of question. The whole palatal series is secondary, and derived by modification of original gutturals (see PALATALIZATION: pronounce *c* and *j* as in *dolce*, *jar*). The linguals are pronounced with the tip of the tongue reverted upward to the dome of the palate. A most striking peculiarity is the prevalence of the *a*-sounds, which make up over one-quarter (28 per cent.) of all the sounds of any ordinary piece of text. And since original *e*, *o*, and *a* (cf. δέδορκα = *dadárça*), often also vocalic *n* and *m*, have all been leveled in Sanskrit to one uniform *a*, it is not strange that short *a* aggregates about one-fifth of all Sanskrit sounds. The word-accent is a pitch-accent, not a stress-accent. For the phonetic relations of Sanskrit to the parent-language, see Brugmann's *Comparative Grammar of the Indo-Germanic Languages*.

For the phonetic changes of the language, reference must be made to the grammars. Several general statements may be made, however: hiatus is avoided; when a surd is concurrent with a sonant, either the surd is changed to a sonant or else the sonant to a surd (assimilation, regressive or progressive); consonant groups are abbreviated. The laws of phonetic combination (*saṁdhi*) wear indeed an artificial aspect in the classical period; yet even there the *rationale* of many or most of them is discernible; and in the Vedas the case is quite otherwise, and the *saṁdhi* quite simple.

As for morphology, the Sanskrit surpasses, on the whole, all the cognate tongues in transparency of structure, thus contrasting sharply with the Latin, which has been likened, morphologically, to "a venerable ruin." Its words invite analysis and are, for the most part, easily analyzable into roots, suffixes of derivation, and inflectional endings. This feature of the language is exhibited incidentally with wonderful clearness and completeness by Whitney in his *Roots, Verb-forms, and Primary Derivatives of the Sanskrit Language* (Boston, 1885). The Sanskrit roots come nearer in form and meaning to their Indo-European prototypes than do the roots of any other of the related languages. It was this conservation of old material, coupled with its surpassing transparency of structure, that made the study of Sanskrit so fruitful in results and so suggestive of new and rigorous methods to be pursued in etymologizing and in the science of language generally.

In the noun three numbers, singular, dual, and plural, are distinguished; and the dual is actually used probably to a larger extent than in any other Indo-European language. There are the usual three genders, the feminine themes ending prevailingly in a long vowel. The cases are eight: nominative, accusative, instrumental, dative, ablative, genitive, locative, and vocative; and their proper uses are so precisely like those of the Indo-European case-system that it suffices, in lieu of a general description of them, to refer to INDO-EUROPEAN LANGUAGES. The declension of adjectives is essentially the same as that of substantives. The pronouns are of course of three persons, and except in the first and second persons show three genders. Their inflection is peculiar, but offers striking parallels to the facts of the cognate tongues (with *sa-s*, *sā*, *ta-d*, cf. *δ*, *ἥ*, *τό*, Ang.-Sax. *se*, *seō*, *ðæ-t*; with *i-d*, cf. Lat. *i-d*, Eng. *i-t*). The numerals agree well with those of the parent-speech (thus *trī* = three; *nava* = nine). See INDO-EUROPEAN LANGUAGES.

The verb shows, as in Greek, etc., the distinctions of voice, tense, mode, number, and person. The voices are active and middle. In the present system there is a special passive inflection; elsewhere the middle serves also as passive. There are four tense-systems, present, perfect, aorist, and future. The modes are indicative, subjunctive (mostly Vedic), optative, and imperative. There are three numbers and three persons. There are also secondary conjugations, passive, intensive, desiderative, and causative. Most important is the distinction between verbs without the thematic *a*-vowel and verbs with it (*-μι* verbs and *-ω* verbs). The retention of ancient accentual conditions is very remarkable, and in general the whole system of conjugation casts floods of light upon innumerable inflectional forms of the related languages.

The syntax is very bald and simple: partly because of the ample number of case-forms for the expression of all the most important logical relations; and partly because, in the case of the verb, although there is an abundant wealth of mode and tense forms, the Hindus never came to turn them to account, as did the Greeks, for the nice expression of modal and temporal relations.

The most comprehensive historical grammar is W. D. Whitney's *Sanskrit Grammar, including both the Classical Language, and the Older Dialects, of Veda and Brahmana* (2d ed. Boston, 1889). The Vedic noun-inflections have been fully treated by Lanman, *Journal of the American Oriental Society*, x., 325–601. The verbs are treated with great completeness in Whitney's *Roots, Verb-forms*, etc. For the syntax, see J. S. Speyer's *Sanskrit Syntax* (Leyden, 1886). The best dictionary is the great Sanskrit-German *Wörterbuch* of Böhtlingk and Roth (7 vols., St. Petersburg, 1852–75). Of very moderate size and cost, and yet comprehensive, are the Sanskrit-English dictionaries of A. A. Macdonell (New York, 1893) and Carl Cappeller (Boston, 1891). There is a *Sanskrit Grammar for Beginners*, by Max Müller, abridged by Macdonell (New York, 1886). Lanman's *Sanskrit Reader with Vocabulary and Notes* (Boston, 1888) is a companion volume to Whitney's grammar, and is made with especial regard for the needs of such as study the language without a teacher. For comparative study may be recommended Victor Henry's *Short Comparative Grammar of Greek and Latin* (New York, 1890). An English manual in which Sanskrit is made the primary subject, to be illuminated by the related tongues, is a desideratum; such a work has appeared in Dutch, C. C. Uhlenbeck's *Handboek der Indische klankleer, in vergelijking met die der Indogermaansche stamtaal* (Leyden, 1894).

CHARLES R. LANMAN.

Sanskrit Literature: one of the several bodies of literary products of ancient India. (Compare PĀLI and PRĀKRIT.) In its broader sense, the term Sanskrit literature includes the Vedas (which are the oldest literary monuments of our part of the human race, the Indo-European family) and the post-Vedic literature. In its narrower sense, it means post-Vedic literature only. The hither terminus of the post-Vedic period is not clearly definable; indeed, literary works were written in Sanskrit all through the Middle Ages, and are still so written even to-day. Aufrecht's *Catalogus Catalogorum*, an orderly assembling of the contents of the various catalogues of Sanskrit manuscripts, enumerates some 20,000 titles of Sanskrit works. This great quantity is of measurable variety in style and contents. In quality it is, upon the whole, distinctly inferior to the Greek. Nevertheless, the Vedas have a very high degree of importance from the light they shed on the history of religions; the Gṛhya-sūtras are of great interest to the student of private antiquities; the Dharma-sūtras, to the student of the history of law; the Upanishads and their sequels, to the student of the history of philosophic speculation; the beast-fables, to the student of popular tales; the critical history of the epics illuminates many aspects of the problems concerning the genesis of popular epics; the Hindu dramas are interesting both in themselves and often on account of their relations to the legendary material on which they are based; and the grammar, rhetoric, music, medicine, mathematics, and astronomy of the Hindus, like their philosophic speculations, may no longer be ignored by writers upon the history of the several sciences.

The history of Sanskrit literature is divided into two periods, the Vedic period and the classical period. These overlap, as is elsewhere often the case. But in all this history there is very little like a fixed chronology. The Hindus are the antipodes of the record-loving Egyptians, as indeed we might expect from the Indic views of life that go with the popular belief in transmigration and with pessimism. On the other hand, it is possible to determine the relative age of very many works, and this relative chronology offers many interesting and not insoluble problems.

A. THE VEDIC PERIOD. 1. *Mantras.*—The Sanskrit word *veda* means "knowledge," and especially the "sacred knowledge," handed down in the triple form of *ṛc*, *sāman*, and *yajus*, and including the well-known collections called Rigveda, Sāmaveda, and Yajurveda, which bodies of text are often alluded to as the *trayī vidyā*, or "triple knowledge." An *ṛc* is a hymn of praise, and especially a stanza of praise that is spoken as distinguished from one that is sung (*sāman*), or from a sacrificial formula (*yajus*). The Hindus hold that the Vedas have existed from all eternity and survive the periodic dissolutions of the universe, and that they have no human authors, but are "seen" by the Rishis or "seers," to whom they are from age to age "revealed." The Atharvaveda is of later date and canonicity than the others. These four collections, called *Saṁhitās*, consist of sacred texts, mostly metrical, called *mantras*. They embody only a part of the great mass of Mantra material which originated and was handed down by memorial tradition orally from generation to generation long before the existence of the collections. Of the Mantras not now extant in any collection we find remnants scattered about in various books. To each of these collections is attached a body of subordinate works called *Brāhmaṇas*, and yet another of works called *Sūtras*. A cross-division is thus involved, so that the oldest Indic books are classed, first, according to the Veda to which they belong, and, second, according to their character as Mantra, Brāhmana, or Sūtra.

2. *Brāhmaṇas, Upanishads.*—The Brāhmanas are the oldest Indo-European connected prose extant. In the texts of the old Yajus Sanhitās the sacred formulas are commingled with prose passages, explanatory, prescriptive, and legendary. A single such passage is a *Brâhmaṇa*, "the dictum of a *brahmán* or priest," "a priestly discourse." The separate collections of Mantras naturally suggested a similar treatment of these priestly discourses. Such a collection of discourses is itself also called a Brāhmana, and is practically a compendium of the wisdom of a priestly school. The older Brāhmanas contain descriptions of the sacrificial ceremonies, accounts of their origin, and legends to illustrate their efficacy. Conscious philosophic speculation plays a subordinate part. In the later Brāhmanas the descriptions of the ritual are relegated to systematic treatises; the theosophic and philosophic passages become, with the growth of asceticism and hermit-life, more lengthy and important, and receive—as containing matter appropriate for the meditations of the forest-hermits—the special name of *Araṇyakas*, or Forest-treatises, and *Upanishads*. From the hand of O. Böhtlingk are the best editions of the two most important Upanishads: the *Bṛhad-āraṇyaka-upanishad* (St. Petersburg, 1889); and the *Chāndogya-upanishad* (Leipzig, 1889), both in text and in German translation. Vols. i. and xv. of Max Müller's *Sacred Books of the East* contain versions of the principal Upanishads. W. D. Whitney translated the *Kaṭha-upanishad* (*Transactions of the American Philological Association*, 1890, vol. xxi.).

3. *Sūtras.*—The Brāhmanas presuppose a thorough acquaintance with the details of the sacrifice. When the ceremonies had grown to tremendous length and complexity, it became necessary to have systematic treatises for the use of the celebrants. Such works are the "Rules for the Sacrifices" or *Çrāuta-sūtras*, so called because they stand in intimate relation to the Veda or "sacred texts" (*çruti*) and continually cite those texts, and serve as rubrics to them, prescribing the manner and the occasions of their employment with the various ceremonies.

Usage and observance, crystallized into sacred ceremony, invest the whole life of an Aryan Hindu—nay, even his prenatal and *post-mortem* existence. The books that describe these observances are called *Gṛhya-sūtras*, or "Rules of Domestic Usages." Vols. xxix. and xxx. of the *Sacred Books* contain translations of the most important ones. The proper subjects of these rules are the "sacraments" (*saṁskāras*—such as name-giving, investiture with the sacred cord, marriage) and the "simple sacrifices" (*pāka-yajñas*) of the householder.

There is a third class of Sūtras, called *Dharma-sūtras*, which prescribe rules for the everyday life of those who would conform to the example of the virtuous, and of which the legitimate subjects are much more varied than those of the Gṛhya-sūtras. They embrace all sorts of injunctions and restrictions relating to etiquette, to eating and sleeping, to purification and penance, and to the details of the daily life of the student and householder and hermit, and even extend to the duties of the king and to the beginnings of civil and criminal law. The most important Dharma-sūtras are Englished in vols. ii. and xiv. of the *Sacred Books*. Out of these were developed the *Dharma-çāstras* or metrical law-books like those of MANU (*q. v.*).

These Sūtras embody the *Kalpa* or "ceremonial," and constitute one of the six classes of works which have to do either with the conservation and interpretation of the Vedic texts or else with their practical application; and they are accordingly styled *Vedāṅgas*, "limbs or members of the Veda." Their names are enumerated in the memorial verse,

çikṣā kalpo vyākaraṇaṁ niruktaṁ chando jyotiṣam,

that is, "phonetics, ceremonial, grammar, etymology, metrics, astronomy." The above are the principal general divisions of the Vedic literature.

4. *The Rigveda* is, of the several collections, the most im-

portant. It consists of 1,017 hymns, each containing on an average about ten double lines, so that the text is somewhat less than that of the two Homeric poems together. Its more significant division is into books, hymns, and stanzas (*maṇḍala*, *sūkta*, *ṛc*). There are ten books. Of these, books ii.–viii. are called "Family-books," as containing each the hymns ascribed to a single family or clan in which they doubtless originated and by which they were handed down as a sacred inheritance. Thus book iii. contains the hymns of Viçvāmitra and his tribe; book vii., those of Vasishtha; and so on, the names being those of the most famous sages or eponym heroes of Indic antiquity. The hymns of book ix. are addressed to the deified drink Soma. The tenth comprises hymns ascribed to very different authors, while the first consists of fifteen groups, each attributed to some ancient poet-sage. The soma is the juice of a plant believed to be of the milkweed family, and now classed as *Sarcostemma brevistigma*; and the Soma sacrifice appears to have been an exceedingly important feature of the Vedic religion. Certain principles of arrangement within the books are discernible: thus in books ii.–vii. the hymns to the fire-god Agni (*ignis*) come first; then those to Indra, the Jupiter Pluvius; and so on. The oldest hymns may have originated as early as 1200 or 1500 B. C., but it is not feasible to assign a precise date. Geographically, the early Vedic Aryans may be referred to the land of the Punjaub and Indus. Their religion is a worship of the anthropomorphized forces of nature, and is in many ways most instructively primitive. The best works on this subject are E. W. Hopkins's *The Religions of India* (Boston, 1895) and H. Oldenberg's *Die Religion des Veda* (Berlin, 1894).

The Brāhmanas of the Rigveda are the *Aitareya* and the *Çāṅkhāyana* or *Kāuṣītaki*; and each of these is supplemented by an Aranyaka of similar designation; and part of each Aranyaka forms an Upanishad (translated, *Sacred Books*, vol. i.). To this Veda further belong Açvalāyana's Çrāuta-sūtra and Çāṅkhāyana's Çrāuta-sūtra, both edited in the *Bibliotheca Indica* (Calcutta): and also Açvalāyana's Gṛhya-sūtra and Çāṅkhāyana's Gṛhya-sūtra, edited and translated, the first by A. F. Stenzler, and the second by H. Oldenberg.

5. *The Sāmaveda* is a Veda of *sāmans*. A Sāman is properly a tune, not a text; but the word *sāman* came to be used of the text to which a given tune was sung, a stanza of the Rigveda modified for chanting. Of the 1,549 stanzas of the Sāmaveda (edited and translated by T. Benfey, Leipzig, 1848), 1,474 occur also in the Rigveda.

6. *The Black Yajurveda* belongs to the period of the highly developed ritual. At least five schools of the older Yajurveda possessed special Sanhitās, of which four are extant. Of these, the *Tāittirīya* has been published by A. Weber (Berlin, 1872) and the *Māitrāyaṇīya*, by L. von Schröder (Leipzig, 1881–86). In all these older texts sacred formulas are confusedly mingled with prose passages. To remedy this confusion a new school, called Vājasaneyins, arranged a Sanhitā of "clear formulas," that is of formulas clear of Brāhmana passages. The word for "clear" (*çukla*) means also "bright" or "white"; and it is perhaps with reference to this double meaning that the older Yajus texts were called "Dark" or "Black." The Brāhmana of the White Yajurveda or *Vājasaneyi-Saṁhitā* is the *Çatapatha*, much of which has been Englished by J. Eggeling, *Sacred Books*, vols. xii., xxvi., and xli. *Saṁhitā*, *Brāhmaṇa*, and *Çrāuta-sūtra* (Kātyāyana's) have all been published by A. Weber (Berlin, 1852–59).

7. *The Atharvaveda* Sanhitā, as compared with that of the *Rigveda*, represents a lower plane of life and thought. It contains magic incantations for the warding off of the most diverse malign influences, and prayers and charms for success in the various affairs of life, as love, gaming, quarrels, journeys, etc. The text was published by Roth and Whitney (Berlin, 1856), and Whitney has left the manuscript of a translation, in course of publication (1895) in Lanman's *Harvard Oriental Series*.

8. *Vedic Bibliography.*—The first complete edition of the Rigveda was issued by T. Aufrecht in Roman letters (Berlin, 1861–63; 2d ed. Bonn, 1877). Max Müller's great six-volumed quarto edition, in Nāgarī letters, with native commentary, etc., was begun in 1849 and completed in 1874 (London). A new edition of this in four volumes quarto was issued in 1892 (London). Octavo editions, also in Nāgarī, were issued by Müller in 1873 and 1877. The greatest achievements in Vedic exegesis are those made by Roth, and contained chiefly in the St. Petersburg lexicon. H. Grassmann has published a *Wörterbuch zum Rigveda* (Leipzig, 1875), and a complete translation (Leipzig, 1877). For a succinct sketch of the Vedic literature, with numerous references to other sources of information, see A. Kaegi's *Rigveda* (Englished by R. Arrowsmith, Boston, 1886), notes 1–26, or Lanman's *Sanskrit Reader*, pp. 352–59.

B. The Classical Period. 1. *Epos.*—The most important works of this period are the great epics. These are treated separately. See Mahā-bhārata and Rāmāyana.

2. *The Purāṇas.*—These are pseudo-historical works, often in prophetic tone, and in metrical form. Their name means "old," but the extant Purāṇas are held to be not over a thousand years old. The *Bhāgavata-Purāṇa*—or most of it—was published and translated by E. Burnouf (Paris, 1847). Of the *Viṣṇu-Purāṇa*, H. H. Wilson gave an analysis and translation (2d ed., enriched with notes, by Fitzedward Hall, 6 vols., London, 1864–77). Of this and other Purāṇas, as the *Agni-Purāṇa*, the *Mārkaṇḍeya-Purāṇa*, there are cheap Hindu editions. The *Viṣṇu* treats of the evolution and dissolution of the universe, of the *yugas* or ages, of mythical geography, the heavenly bodies, and the origin of the castes; gives many ancient legends, accounts of the Vedic literature, the dynasties of kings, the history of the god Krishna, etc. The Purāṇas are in fact a kind of encyclopædic digest of Indic knowledge, but in many ways quite untrustworthy.

3. *The Artificial Epics.*—These are called *Kāvyas*, and the oldest are referred to the fifth or sixth century of our era. They take their material from the great popular epics, but can never themselves have been popular, since only the learned could understand them. In them the epic element gives place more or less to the lyric and descriptive, and they are often not without real poetic merit and genuine feeling. There are six of them that the Hindus call "great Kāvyas"; and among the six the most noted are the *Raghuvaṅça*, or "The Ancestry and Deeds of Rāma," and the *Kumāra-sambhava*, or "Birth of the War-god," both ascribed to the famous Kālidāsa, and both edited and translated by A. F. Stenzler, the latter translated also by R. T. H. Griffith into English verse. See especially the masterly fifth canto.

4. *The Drama.*—The real beginnings of the drama may be seen in the Rigveda, where there are not a few hymns in the form of genuine dramatic dialogue. In the Mahābhārata, too, are passages of similar character. And the public recitations of the epics were in fact really dramatic performances. The earliest direct allusion to this subject is made by Pāṇini, probably in the fourth century B. C., who speaks of "rules for actors" (*naṭa-sūtras*). The word *naṭa*, with many derivatives, including *nāṭya*, Anglo-Indian *nautch*, and *nāṭaka*, "drama," comes from the root *nart* or *nṛt*, "to dance," and perhaps warrants the inference that the Hindu drama originated in pantomime. From the statement of Patanjali (about 143 B. C.), who mentions the slaying of Kansa by Krishna as a subject of dramatic representation, it would seem that the oldest performances were of a kind like to the mediæval mysteries. There has been much debate (A. Weber, E. Windisch) as to whether the Greek drama influenced that of the Hindus. The question is unsettled. The Hindu play is divided into acts, with benediction in place of a prologue, with prelude and with interacts; and it is peculiar in that the women and inferior characters speak not Sanskrit but Prākrit. The dialogue is in prose, with lyrics interspersed. Lévi enumerates the titles of some 375 dramatic works; of the extant dramas hardly more than fifty are of considerable literary value.

The *Mṛcchakaṭikā*, or "Earthen Toy-cart," is held to be the oldest. It is ascribed to King Çūdraka, and the scene is laid at Ujjain. It is a love-story with political underplot. The Sanskrit work most famous as literature is the *Çakuntalā* of Kālidāsa (about 550 A. D. ?). For this and his dramas *Vikramorvaçī* and *Mālavikā*, see Kālidāsa. To Çri Harshadeva—apparently the King of Kanauj at the time of Hiuen-tsang (*q. v.*), about 630 A. D.—are ascribed the *Ratnāvalī* and the *Nāgānanda*. Bhavabhūti is said to have flourished at this same court of Kanauj about 700 A. D. He was author of the *Mahāvīra-carita*, or "Life of the Great Hero," and *Uttara-rāma-carita*, or "Later Life of Rāma," which together form a dramatized version of the Rāmāyana, and of the *Mālatī-mādhava*, a domestic drama. These are held in high esteem by the Hindus, but Bhavabhūti, as compared with Kālidāsa, is more artificial, more under bondage to the rules of the writers on dramatic composition. Bhaṭṭa Nārāyaṇa's *Veṇī-saṁhāra*, or "The Seizing of the

Hair-braid," is a dramatization of part of the story of the MAHĀ-BHĀRATA (*q. v.*), including the scene where Draupadī, having been lost at dice by her husband Yudhishṭhira, is rudely seized by one of the Kuru princes and dragged by the hair. The *Mudrā-rākṣasa* of Viçākhadatta is a political intrigue piece connected with the most famous period in ancient Indic political history, the time of Chandragupta or Σανδράκοττος, 315–291 B. C. The *Prabodhacandrodaya*, or "Rise of the Moon of Intelligence," is an allegorical philosophical drama, "the reconciliation of science with faith." Its characters are the Primal Spirit, Reason, Activity (Reason's wife), Faith, Peace (her daughter), Hypocrisy (as a Brahman), etc., as in the old Moralities or in Bunyan.

For translations and abstracts of the principal plays, see H. H. Wilson's *Theatre of the Hindus* (2 vols., London, 1871). Sylvain Lévi's *Le théâtre indien* (Paris, 1890) is a very full account of the native dramatics and of the history of the Sanskrit drama, and gives an abundant bibliography. See also Monier-Williams, *Indian Wisdom*, lecture xv.

5. *Lyric, Descriptive, and Didactic Poetry.*—Lyrics are found interspersed in the dramas. Religious lyrics occur in the Purāṇas, e. g. the verses chanted by Earth in the *Viṣṇu-Purāṇa* (bk. iv., chap. xxiv.). The *Megha-dūta*, or "Cloud-messenger," of KĀLIDĀSA (*q. v.*), and his *Ṛtu-saṁhāra*, or "Seasons," are the most famous descriptive poems. In the former, a demi-god in exile sends to his wife in the Himālaya a love-message by a cloud, whose journey across India is described. The Sanskrit is rich in didactic poetry, mostly in epigrammatic form—proverbs and moral maxims. The oldest collection is ascribed to Chandragupta's minister Chāṇakya. A most admirable collection of over 7,600 has been made by O. Böhtlingk, *Indische Sprüche* (St. Petersburg, 1870–73), with critical text, German translation, and bibliography. Excellent collections are published in India: notable is K. P. Parab's *Subhāṣita-ratna-bhāṇḍa-āgāra*, or "Treasure-house of the Jewels of Bons-mots" (over 10,000 —Bombay, 1886).

6. *Fables and Narratives.*—Based on the common Indic stock of folk-lore are the Buddhist Jātakas (see PĀLI LITERATURE), and the famous beast-fables contained, for example, in the PANCHATANTRA (*q. v.*) and Hitopadeça. For an account of the latter works, see Lanman's *Sanskrit Reader*, pages 310–316. The best collection of stories, fairy tales, and the like, is the *Kathā-sarit-sāgara*, a recast by the Kashmirian poet Somadeva, about 1070 A. D., of Guṇādhya's *Bṛhatkathā* of the sixth century. (See *Sanskrit Reader*, pages 331–334.) Text of Somadeva, by K. P. Parab (Bombay, 1889); complete translation by C. H. Tawney in the *Bibliotheca Indica* (Calcutta, 1884). We may mention also Daṇḍin's *Daçakumāra-carita*, or "Adventures of the Ten Princes"; text by Bühler and Peterson (Bombay, 1887 and 1891); Englished by P. W. Jacob in *Hindoo Tales* (London, 1873).

7. *Law.*—The genetic relations of the law books to the Vedic literature were explained above. The Dharma-sūtras were prose rules, apparently intended to be learned outright and to be explained by the teacher. Scattered among them are occasional brief metrical passages, a kind of easily remembered *regulæ juris*. These couplets, it would seem, proved so convenient to the schools that their use was extended until they covered all the subjects of the older prose treatises and eventually displaced them. These metrical recasts of the Dharma-sūtras are called *Dharma-çāstras* or *Smṛtis*. The principal one is the *Mānava-dharma-çāstra*, either the "Law Book of the Mānavans" or the "Laws of Manu." A full account of the best recent opinion on their history, with bibliography, is given in *Sanskrit Reader*, pages 340–345. The best text edition is J. Jolly's (London, 1887); English translations by Burnell and Hopkins (London, 1884); and by G. Bühler, *Sacred Books*, vol. xxv. Next to Manu in importance is Yājñavalkya; text and translation by A. F. Stenzler (Berlin, 1849). The comment thereon, called *Mitākṣarā* (translated by H. T. Colebrooke), is a comprehensive, important, and highly esteemed work. The *Viṣṇu-smṛti* and the *Nārada-smṛti* were edited by Jolly, and translated by him, *Sacred Books*, vols. vii. and xxxiii.

8. *Philosophy.*—The orthodox systems are six: SĀNKHYA and YOGA; (*Pūrva-*) MĪMĀṄSĀ and *Uttara-mīmāṅsā* or VEDĀNTA; NYĀYA and VAIÇESHIKA. (See the articles under the above headings.) An admirable conspectus of the systems (except Vedānta) is given by the *Sarva-darçana-saṁgraha*, or "Summary of all the Systems," edited in the *Bibliotheca Indica* (1858), and translated by E. B. Cowell and A. E. Gough (London, 1882). This also deals with the "heretical" systems of the Chārvākas, or materialists, and of the Buddhists and Jains. For further details, recourse may be had to H. T. Colebrooke's *Essays*, vol. i. (London, 1873), and to Paul Deussen's *Allgemeine Geschichte der Philosophie* (Leipzig, 1894).

9. *Grammar, Lexicography, etc.*—The conservation of the meaning and precise form of the sacred Vedas turned the attention of the Hindus at an early date to grammatical studies. We still have ancient collections of synonyms and hard words (γλῶσσαι), called *Nighaṇṭavas*, the oldest Vedic glossary; and to the ancient sage Yāska is ascribed a comment thereon called *Nirukta* (ed. by R. Roth, 1852), the oldest extant work of formal Vedic exegesis. Even this acknowledges a number of predecessors. PĀṄINI (*q. v.*) and Patanjali (the author of the *Mahā-bhāṣya*, or "Great Comment" on Pāṇini) represent the culmination of Indic grammatical science. Lexicography was sedulously cultivated by the ancient Hindus, although, strange to say, the simple idea of alphabetic arrangement was never made use of by them. The most famous dictionary is the *Amara-koça* (ed. by A. Loiseleur-Deslongchamps, 1845). For an account of native lexicography, see H. H. Wilson's *Essays*, vol. iii. For metrics, see A. Weber, *Indische Studien*, vol. viii.

10. *Rhetoric, Music, Mathematics, etc.*—One of the most important works on poetics, the *Kāvyādarça*, was edited and translated by Böhtlingk (Leipzig, 1890). The *Sāhityadarpana*, or "Mirror of Composition," was edited and translated in the *Bibl. Indica*. Respecting music, see Sourindro Mohun Tagore's *Hindu Music* (Calcutta, 1875). For their arithmetic and algebra, the reader may consult H. T. Colebrooke's *Algebra, with Arithmetic and Mensuration from the Sanskrit* (London, 1817), and his *Essays*, vol. ii. For their astronomy, see W. D. Whitney, *Journal of the Am. Oriental Society*, vol. vi., and his *Oriental and Linguistic Studies*, 2d series (New York, 1874). Of the oldest medical treatise, *Caraka-saṁhitā*, a translation is now appearing in Calcutta.

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CHARLES R. LANMAN.

Sanson, saăn'sōn', NICOLAS: cartographer; b. at Abbeville, France, Dec. 20, 1600; was teacher of geography to Louis XIII., afterward royal geographer, and prepared a great number of maps of the Roman empire, etc. D. in Paris, July 7, 1667. His two sons, Adrien (d. 1708) and Guillaume (d. 1703), succeeded him as royal geographers, and after them followed his grand-nephew, Robert de Vaugondy.

Santa Ana: a city of Salvador; 36 miles W. N. W. of San Salvador (see map of Central America, ref. 4–E). It is nearly or quite equal to the capital in importance, is the center of the finest agricultural region in the republic, and controls most of the sugar-trade. Santa Ana is on the high road from San Salvador to Guatemala, and is connected with the port of Acajutla by railway. Pop. about 22,000. The volcano of Santa Ana, or Lematepec, 11 miles S. W., is one of the highest in Salvador (6,614 feet), and has recently been in eruption.

H. H. S.

Santa Ana: city; capital of Orange co., Cal.; on the S. Pac. and the S. Cal. railways; 6 miles S. of Anaheim, 33 miles S. E. of Los Angeles (for location, see map of California, ref. 12–G). It is in a rich fruit-growing and wine-making region, and contains 13 churches, 5 public and 2 private schools, business college, a national bank with capital of $150,000, 2 State banks with combined capital of $120,000, and a daily and 4 weekly newspapers. The city was founded in 1869. There are extensive peat-beds in the vicinity. Pop. (1880) 711; (1890) 3,628; (1900) 4,933.

EDITOR OF "BLADE."

Santa Anna, originally **Santa Ana**, ANTONIO LOPEZ, de: general and politician; b. at Jalapa, Mexico, Feb. 21, 1795. He entered the Spanish army as a cadet in 1810, served against the early revolutionists, and attained the rank of captain. In 1821 he supported Iturbide, swearing allegiance

to him as emperor; but later he went over to the republicans, and by heading a revolt at Vera Cruz Dec. 2, 1822, was the chief instrument of Iturbide's downfall. During the presidency of Guadalupe Victoria, 1824–28, Santa Anna lived in retirement; but the political struggles of 1828 brought him again into prominence. By a pronunciamento in favor of Guerrero he materially aided him to attain the presidency, and was rewarded by high commands in the army. In 1829 he was sent against the Spanish army, which had invaded Mexico under Gen. Barradas; the latter was forced to capitulate at Tampico Sept. 11, and this success added immensely to Santa Anna's popularity. In 1832 he headed the revolt by which Bustamante was overthrown and Gomez Pedraza, the constitutional president, was restored for the remainder of his term. Santa Anna himself became a presidential candidate, and was elected for the term beginning Apr. 1, 1833. He assumed the executive only at intervals and for short periods. At first the chair was occupied by Vice-President Gomez Farias, an enlightened statesman who instituted many reforms. These excited violent opposition in the Church and army, secretly fomented by Santa Anna, who, whenever he acted as president, posed as the champion of religion and order. By such intrigues he obtained the support of the reactionists, had Farias banished in 1835, abolished the federal constitution, and became practically dictator, though commonly acting through vice-presidents who were his subservient tools. Texas seceded in 1836. Santa Anna marched against the rebels, stormed the Alamo, and massacred its garrison Mar. 6, 1836, but was defeated and captured by Houston at the battle of San Jacinto Apr. 21–22. To obtain his release he recognized the independence of Texas in a treaty which was repudiated at Mexico; all his popularity was lost, and when he returned to Jalapa he signified his intention of retiring to private life. The French invasion of Vera Cruz in 1838 brought him out again; he was given command of the army, defeated the French Dec. 5, and, having lost a leg in the engagement, became at once a popular hero and martyr. In 1839 he supported Bustamante against the federalist revolts, and was for a short time acting president. In 1841, partly by intrigue and partly by open rebellion, he deposed Bustamante and caused himself to be chosen president with dictatorial powers, increased by the new constitution of June 12, 1843. This led to fresh revolts. In Dec., 1844, his opponents seized the capital during his absence; he was defeated, captured, and banished, taking up his residence in Havana. Fresh changes brought his party again into power; he was recalled in 1846, and in December of that year was again elected president, but, as usual, only assumed the executive at intervals. During the war with the U. S. he commanded the Mexican army, and was repeatedly defeated by Taylor and Scott (see TAYLOR, ZACHARY, and SCOTT, WINFIELD); after the capture of Mexico he resigned and left the country. In 1853 he was recalled by a conservative revolution, was made acting president, and on Dec. 16, 1853, declared himself perpetual dictator, with the title of supreme highness. But the liberals, under Alvarez and Comonfort, speedily excited a civil war. After a vain attempt at conciliation Santa Anna fled from the capital Aug. 9, 1855, and soon left the country. In his absence he was tried and condemned for treason and his estates were confiscated. He was never again prominent in Mexican affairs, though he kept up a series of intrigues in the U. S. and elsewhere, and vainly offered his services to the French invaders and to Maximilian. In 1867 he made an attempt to enter the country, but was captured and exiled. After the amnesty of 1874 he returned, but lived in obscurity. D. at Mexico, June 20, 1876. HERBERT H. SMITH.

Santa Bar'bara: city; capital of Santa Barbara co., Cal.; on Santa Barbara channel, and the S. Pac. Railroad; 14 miles E. of Elwood (for location, see map of California, ref. 11–D). There is regular steamer communication with San Francisco, San Diego, and San Pedro. Santa Barbara is in a sheltered nook of the shore, is protected on the N. by the Santa Ynez Mountains, and from its dry, equable climate has become one of the most noted midwinter health resorts on the Pacific coast. The temperature ranges from 50° to 55° in winter, and from 65° to 70° in summer. The city has beautiful surroundings, with luxuriant roses and tropical plants, many attractive residences, a Spanish and a Chinese quarter, and an excellent bathing-beach. There are a public high school, primary and grammar schools, St. Vincent's School, manual-training school, free kindergarten, collegiate school, commercial college, College Hospital, 2 national banks with combined capital of $200,000, 2 State banks with capital of $60,000, 3 libraries (Public, Franciscan Mission, and Natural History), and 2 daily and 3 weekly newspapers. The Spanish Mission, founded by Junipero Serra in 1786, is within a mile of the city; it includes a church with two towers, a refectory, a dormitory, and a garden, and is still in charge of Franciscan monks. Other points of interest are the springs containing sulphur, sulphuretted hydrogen, iron, alumina, and potash; the Parra Grande, or great grapevine, which annually yields about 8,000 lb. of fruit, at Montecito, 4 miles distant; and numerous avenues of magnolias, bananas, and date-palms, fields of pampas grass, groves of walnut, orange, prune, olive and loquat trees, and interesting Chinese vegetable gardens. The city is in an agricultural and stock-raising region, and has large wool, olive oil, asphaltum, petroleum oil, and fruit-growing interests. It has received the popular name of the American Mentone. The harbor was first visited by Sebastian Vizcaino in 1603. The presidio established by Gov. Felipe Neve in 1782 was maintained till the arrival of Gen. Frémont. Pop. (1880) 3,460; (1890) 5,864; (1900) 6,587.
G. E. THURMOND.

Santa Cathari'na: an island of the state of Santa Catharina. It is 34 miles long by 3 to 5 miles wide, and is separated from the mainland by a channel which forms an excellent harbor. The surface is partly hilly. On the western side is the capital of the state, sometimes called Santa Catharina, but properly DESTERRO (*q. v.*). H. H. S.

Santa Catharina: a maritime state of Brazil, bounded by Paraná, the Atlantic, Rio Grande do Sul, and the Argentine Republic. Area, 28,627 sq. miles. A low coast belt lies between the ocean and the Coast Range, which here rises to 5,000 or in parts to 6,500 feet. This range is succeeded by an irregular plateau which falls gradually westward. The coast belt and mountains are covered with forest, araucaria predominating above 3,000 feet. The plateau is occupied in part by open grass-lands, in part, especially toward the W., by tracts of forest. The principal rivers are the Pelotas or upper Uruguay, on the southern boundary; the Iguassú, a branch of the Paraná, on the northern boundary; and the Itajahy, flowing to the Atlantic. The climate is essentially tropical on the coast, temperate on the plateau. Santa Catharina, though it has a fertile soil and other natural advantages, has developed very slowly. Agriculture and grazing are almost the only occupations. There are considerable agricultural colonies of German and Italian immigrants. A little coal is mined. Pop. (1888) estimated, 236,346. H. H. S.

Santa Clara: town (founded in 1852, received new charter in 1867); Santa Clara co., Cal.; on the S. Pac. Railroad; 3 miles W. by N. of San José, and 48 miles S. S. E. of San Francisco (for location, see map of California, ref. 8–C). It is in the center of the beautiful and rich agricultural valley from which the town takes its name, and contains a State bank with capital of $125,000, a public high school, Santa Clara College (Roman Catholic, opened in 1851), Academy of Our Lady of Angels (Roman Catholic), convent school, a library, and two newspapers. The University of the Pacific (Methodist Episcopal, opened in 1852) is about midway between Santa Clara and San José. Pop. (1900) 3,650.

Santa Clara, Cuba: See the Appendix.

Santa Cruz, or **St. Croix**: an island of the Danish West Indies; in the Virgin islands group; 37 miles S. of St. Thomas. Area, 83 sq. miles. The surface is hilly, with considerable plains near the coast; the soil is fertile and well watered. Sugar and rum (known as Santa Cruz rum) are the principal products and exports. The common language is English. Santa Cruz was discovered by Columbus in 1493, was occupied in turn by Spanish, English, and French adventurers, and was sold by the French to a Danish company in 1733. Chief town, CHRISTIANSTED (*q. v.*). H. H. S.

Santa Cruz: a territory of the Argentine Republic; occupying the southern part of Patagonia S. of lat. 46° S., and bounded S. and W. by Chili. Area, 111,000 sq. miles. The greater part is a terraced plateau, which, especially near the Andes, contains good pasture-land. Some of this has been taken up by sheep-farmers, but the civilized population does not exceed 2,000. There are a few roving Indians, who sell guanaco-skins to the traders. Capital, Gallegos. The Santa Cruz river, from which the territory takes its name, has its sources in several beautiful lakes on the western slope of the Andes; it is navigable for small craft, and its estuary forms the port of Santa Cruz. H. H. S.

Santa Cruz: an eastern department of Bolivia, bordering on Brazil. Area, 126,317 sq. miles. Spurs of the Andes, and plateaus or terraces bordering them, occupy a comparatively small area in the western part; all the rest is a plain, varied only by a few hills and including in the eastern part portions of the flood-plains of the river Paraguay, which flows just beyond the frontier. Most of the drainage, however, is northward to the Mamore and Guaporé. The plains have few inhabitants except Indians, and are very imperfectly known; they include considerable tracts of forest and great areas of open land known as the llanos de Chiquitos, from the Chiquitos Indians. A little-used road crosses to the Brazilian frontier. The civilized population is gathered in the mountain region, which has a rich soil and valuable gold mines. Pop. 97,185. Capital, Santa Cruz de la Sierra.
HERBERT H. SMITH.

Santa Cruz: city; capital of Santa Cruz co., Cal.; on Monterey Bay, at the mouth of the San Lorenzo river, and the Southern Pacific Railroad; 75 miles S. of San Francisco (for location, see map of California, ref. 8–C). The surface rises gradually from the sea in circling plateaus, covered with handsome villas, to the mountains, which shelter the city from the N. winds. With an average winter temperature of 55° and summer temperature of 62°, a magnificent bathing-beach, attractive drives of 10 miles along the sea-cliffs, and good roads through mountain scenery to the famous Big Tree grove, 5 miles distant, Santa Cruz is a favorite health resort all the year. The San Lorenzo river and its branches are spanned by eight bridges within the city limits, and furnish fresh-water bathing and boating-places. The city has bitumen-covered streets, a public park of 200 acres overlooking the city and bay, several public plazas, water-works, electric-light plant, street railways (operated in part by electricity), and several large hotels. There are 14 churches, 7 public-school buildings with 1,500 pupils, public-school property valued at $136,400, School of the Holy Cross (Roman Catholic), a business college, and a Free Public Library containing 15,000 volumes. The banking interests comprise 6 State banks for savings and loans, with a combined capital of $302,000; the industrial establishments include tanneries, foundries, soap and glue works, and planing-mills; and the trade reports show large shipments by rail and water of powder, lime, and bituminous rock. There are 3 daily, 3 weekly, and 2 monthly periodicals. In 1895 the city had an assessed property valuation of $12,200,000. The city is built on the site of the Santa Cruz Mission, founded by the Spaniards in 1791. Pop. (1880) 3,898; (1890) 5,596; (1900) 5,659. LUCY UNDERWOOD MCCANN.

Santa Cruz (Span. pron. saan'tăă-krooth'), ANDRES: general and politician; b. at La Paz (now in Bolivia) about 1794. He was of mixed white and Indian blood. He entered the Spanish army and attained the rank of colonel; but being captured by the patriots in Dec., 1820, went over to them, rose to be general, and led an invasion of Upper Peru in 1823. Under Bolivar he was acting president of Peru from Sept., 1826, to June, 1827. Gen. Sucre, president of Bolivia, having been deposed, Santa Cruz was elected president of that republic for the term of ten years beginning Jan. 1, 1829; at the same time he received the military title of grand marshal. His internal policy was progressive and the country was very prosperous; but almost from the first he conceived the idea of uniting the Pacific coast republics. Peru at this time was agitated by civil wars, and there were several claimants to the presidency. Orbegoso, who had been deposed, appealed for aid to Santa Cruz, who marched into the country (1835), successively defeated Gamarra and Salaverry, and in Oct., 1836, proclaimed the Peruvian-Bolivian confederation. This consisted of the states of North Peru, South Peru, and Bolivia, each with a president, Santa Cruz himself being the chief executive, with the title of protector. His execution of Salaverry excited general horror. A Chilian army invaded Peru, and after many months of fighting Santa Cruz was finally defeated at the battle of Yungay, Jan., 1839. He resigned and left the country, and the confederation was at once dissolved. Santa Cruz subsequently held diplomatic posts for Bolivia in Europe, a politic means of keeping him out of the country. D. at St.-Nazaire, France, 1865. HERBERT H. SMITH.

Santa Cruz de la Sierra: capital of the department of Santa Cruz, Bolivia; on a tributary of the Guapay, or upper Mamore. As its name indicates, it was originally founded in the highlands, but was removed to its present site in the lowlands in 1590 (or 1575?). As the frontier town in this direction it has a considerable trade with Brazil and with the half-civilized Indians of the plains. Most of the men are engaged in trading, etc., at distant points; hence the permanent population (about 10,000) is largely composed of women. H. H. S.

Santa Cruz de Santia'go, or **de Teneriffe**: capital of the Canary islands; on the northeast coast of Teneriffe. It has an excellent harbor, making the city the chief commercial port of the islands. Wine, brandy, cochineal, tobacco, and agricultural produce are exported. The town and harbor are strongly fortified. Pop. of commune, 16,610.

Santa Cruz Islands: an archipelago of Melanesia, between the Solomon islands and the New Hebrides, between parallels 8° 31′ S. and 11° 40′ S., and meridians 165° E. and 168° E.; under British protectorate, but claimed by the French, and very little known. They consist of a dozen volcanic islands and many islets, with a total area of about 360 sq. miles, and an estimated population of 5,000. The largest island is the Santa Cruz or Nitendi, with an area of 215 sq. miles. The inhabitants present a mixture of the Melanesian and Polynesian types, the former prevailing, and differ much from island to island. They have uniformly proved hostile to visitors, and even missionaries have as yet got no foothold on the islands. MARK W. HARRINGTON.

Santa Fé, Span. pron. saăn'taă-fā': a province of the Argentine Republic; on the west side of the river Paraná; between Chaco on the N., Corrientes and Entre Rios on the E., Buenos Ayres on the S., and Córdoba and Santiago del Estero on the W. Area, 18,000 sq. miles. The surface is level, and the greater part is included in the open pampas, but in the north there are extensive forests. The climate is mild and healthful, and Santa Fé is one of the most favored provinces in being generally free from floods and droughts. Its progress, especially since 1864, has been wonderfully rapid, mainly owing to the influx of immigrants and the establishment of agricultural colonies. The level surface has facilitated the construction of a network of railways, and the Paraná is a safe channel for seagoing vessels. In the construction of public works a heavy provincial debt has been contracted, and the finances are in bad condition. Grazing and wheat-raising are the principal industries; maize, flax, lucerne, and, in the north, sugar-cane are largely cultivated. There are extensive flouring-mills and other manufactures. Pop. about 400,000, over one-third of foreign birth. ROSARIO (*q. v.*) is the principal city and river-port. Santa Fé, the capital, is on the Santa Fé river, an arm of the Paraná. It was founded in 1573, and has a thriving trade. The port does not admit large vessels, except when the river is flooded. Pop. about 25,000. H. H. S.

Santa Fé: city; capital of New Mexico and of Santa Fé County: on the Atch., Top. and S. Fé, and the Den. and Rio Grande railways, being the New Mexico terminus of the latter; 20 miles E. of the Rio Grande, 64 miles N. E. of Albuquerque (see map of New Mexico, ref. 10–S). Next to St. Augustine it is the oldest settlement in the United States. Among the old archives is found a census taken in 1605, which gives a population of 1,708 inhabitants. In the older portions of the city the streets are narrow and crooked, but in the modern portions they are wide and regularly laid out. Many of the buildings are of adobe, or sun-dried brick, but many new modern structures have been erected during the past 15 years. The principal open space is the plaza, containing a soldiers' memorial monument, and having on one side a long, one-story structure known as the Governor's Palace. The city is the seat of a Roman Catholic archbishop. It is in an agricultural, stock-raising, and mineral region, which contains gold, silver, copper, lead, zinc, coal, marble, a variety of building-stone, clay, and gypsum. The city has a national bank with a capital of $150,000, 3 libraries, and 1 daily and 4 weekly newspapers.

Public Buildings.—The Governor's Palace, built during the early Spanish *régime*, has been used continuously as the official residence of the chief executive, under whatever title and superior authority he has served. One end of it contains the quarters and priceless treasures of the New Mexico Historical Society, and the other the post-office. The capitol is an attractive building of cream-colored sandstone and pressed brick, and cost $200,000. Other buildings of note are the penitentiary (cost $150,000), New Mexico School for the Deaf and Dumb (opened 1885), U. S. Government building, county court-house, St. Vincent's Hospital, and a Roman Catholic orphan asylum.

Churches and Schools.—The oldest church in the city.

also said to be the oldest in the U. S., is San Miguel, built about 1605, destroyed by the Indians, and rebuilt in 1710. The cathedral of San Francisco, of light brownstone, is built around a former cathedral whose history dates back to 1622. The educational institutions comprise one high school and 4 ward schools, St. Michael's College (Roman Catholic), the Presbyterian Academy (opened 1881), Academy of Our Lady of Light (Roman Catholic), and a Catholic school for Indian boys and girls; also, a Government Industrial Indian School.

History.—In prehistoric times the place existed as an Indian pueblo or town. About 1605 it was occupied by the Spaniards, who gradually reduced the Indians to slavery and opened and worked the rich mines of gold, silver, turquoise, copper, and iron in south Santa Fé County. In 1680 the Indians revolted, expelled the Spaniards, closed up and obliterated all traces of the mines, and burned all the Spanish archives and church ornaments. The Spaniards under Vargas recaptured the pueblo in 1692, and the territory was held by Spain till 1821, when Mexico declared its independence. In 1846 U. S. troops under Gen. S. W. Kearny took possession of the city; in 1848 the territory was ceded to the U. S.; in 1851 Congress created the Territory of New Mexico, with Santa Fé as its capital. Pop. (1890) 6,185; (1900) 5,603. MAX. FROST, EDITOR "NEW MEXICAN."

Santa Fé de Bogotá: See BOGOTÁ.

Santala'ceæ: See SANDALWORTS.

Sant-Aldegonde: See MARNIX, PHILIPP, VAN.

Santal-wood, Sanders, or **Saunders**: the heart-wood of a tree, *Pterocarpus santalinus*, found in the East Indies, Ceylon, and Madagascar, and on the coasts of Coromandel and Malabar. It occurs in large billets, compact, hard, and of a dull murky red. Its coloring-matter is supposed to be similar to, if not identical with, that of barwood. It is only developed by age, and, while it is abundant in the trunks, is not found in the young branches. Weidel isolated two peculiar bodies from santal-wood: (1) *Santal* ($2C_8H_6O_3H_2O$), colorless crystals, tasteless, odorless, insoluble in water, bisulphide of carbon, benzene, and chloroform, and slightly soluble in alcohol and ether. Its alkaline solution is yellow, but becomes rapidly red in the air, and gives red precipitates with lime and baryta. Its alcoholic solution assumes a dark red with ferric chloride. He obtained 3 parts from 1,000 of wood. (2) *Santaline* ($C_{15}H_{14}O_5$), which is a magnificent scarlet, with a green metallic irideseence, is insoluble in water, slightly soluble in alcohol and ether, and imparts a reddish purple to alkaline solutions. Santal-wood is used chiefly on the Continent to give a bottom to woolen cloth to be subsequently dyed with indigo, yielding by this combination a fine blue (*bleu de Nemours*), which is purple blue by reflected light. It also imparts a dark red to woolen and cotton goods, which assumes a rich brown on passing through a bath of bichromate of potash; with sumac it gives a dark brown, with fustic a light brown. Revised by IRA REMSEN.

Santa Maria: a name for PUERTO DE SANTA MARIA (*q. v.*).

Santa Maria: town (settled in 1874); Santa Barbara co., Cal.; on the Santa Maria river, and the Pacific Coast Railway; 13 miles from the ocean, 31 miles S. of San Luis Obispo (for location, see map of California, ref. 10–D). It is in an agricultural, fruit-growing, and stock-raising region, and contains 4 churches, 3 public-school buildings (high school cost $15,000), 4 hotels, State bank with capital of $25,000, and 2 weekly newspapers. Pop. (1880) 300; (1890) 900; not returned separately in 1900.

Santa Maria, DOMINGO: statesman; b. at Santiago, Chili, Aug. 4, 1825. He graduated at the University of Santiago; was admitted to the bar in 1847; held minor Government offices, and early became known as a pronounced liberal. Being involved in the insurrection of 1851–52, he was banished for a year to Peru; was elected to congress on his return, and became widely known for his brilliant oratory; and during the political struggles of 1858–59 was again banished, traveling in Europe. President Perez recalled him, and made him Minister of Finance 1863–64. During the war with Spain he negotiated a treaty of alliance with Peru. In 1868 he was appointed judge of the Supreme Court. He supported the administration of President Pinto, was his Minister of Foreign Affairs and of the Interior, and finally Minister of War during the second year of the contest with Bolivia and Peru. His vigorous measures won him great popularity, and he was elected to succeed Pinto Sept. 18, 1881–Sept. 18, 1886. The war was brought to a successful end in 1883, and in the same year the Araucanian Indians were finally subdued. Subsequently he was president of the senate. D. at Santiago, 1890. H. H. S.

Santa Maria di Capua: See CAPUA.

Santa Marta: capital and port of the department of Magdalena, Colombia; on a bay of the northern coast; 40 miles E. N. E. of the mouths of the Magdalena (see map of South America, ref. 1–B). It was founded by Rodrigo de Bastidas in 1525, as the capital of the province of the same name, which corresponded in part to the modern department. During the colonial period it was very important as a port and center of conquest; Quesada, marching from this place, conquered the plateau of Bogotá. The town was repeatedly attacked by Indians, and taken and sacked by English and French corsairs; the ruins of the Spanish forts erected for its defense may still be seen. The harbor is one of the best on the coast; a short railway runs to Cienega, and (1895) is projected to Cerro de San Antonio on the Magdalena. Santa Marta is an episcopal see, and has a cathedral, seminary, hospital, etc. Pop. about 6,000. HERBERT H. SMITH.

Santa Marta, Sierra Nevada de: an isolated group of mountains in Northern Colombia (department of Magdalena), near the coast, and immediately S. E. of the town of Santa Marta. Brettes and Nuñez, who first scaled the highest peak in 1891, found it to be 17,018 feet above sea-level; other estimates make it higher. From the sea the snow-crowned summits present a magnificent sight. The group is completely separated from the Andean system, and has a different geological structure. H. H. S.

Santa Maura, saan'tăa-mow'răă, or **Leuca'dia**: one of the Ionian islands: formerly a peninsula, but since the seventh century B. C. separated from Western Greece by a strait about a mile wide. Area, 180 sq. miles. Pop. 25,000. Its history has been mainly that of the other IONIAN ISLANDS (*q. v.*). Hills traverse it from north to south, terminating in white cliffs, whence its ancient name *Leucas* (Gr. λευκός, white). One of these cliffs served as a place of execution of criminals. This is still called Rock of Sappho's Leap, from the tradition that the poetess and other unhappy lovers cast themselves hence into the sea. E. A. G.

Santa Mon'ica: city; Los Angeles co., Cal.; on the Pacific Ocean, and the S. Cal. and S. Pac. railways; 17 miles W. of Los Angeles, the county-seat (for location, see map of California, ref. 12–F). It is a popular summer resort, is engaged in ostrich-farming, lumbering, and milling, and contains one of the longest ocean wharves in the world (extending 4,700 feet into Santa Monica Bay), 7 churches, graded grammar and high school, public library, water-works, electric lights, 2 State banks with combined capital of $115,000, and a weekly newspaper. The Pacific branch of the National Home for Disabled Volunteer Soldiers is here. Pop. (1880) 417; (1890) 1,580; (1900) 3,057. EDITOR OF "OUTLOOK."

Santa'na, PEDRO: general and politician; b. at Hincha, Santo Domingo, June 29, 1801. He was a lawyer and wealthy landowner until 1844, when he headed the revolution by which the eastern part of the island became independent of Haiti; was president of the Dominican Republic, then formed, 1844–48; repulsed the invasion of Soulouque 1849; deposed Jimenes, and was president for a short time; was president by regular election 1853–57, and again defeated Soulouque in 1855 and 1856. After the deposition of Baez, Nov., 1858, Santana again assumed the presidency, but, despairing of bringing about order, he ceded the republic to Spain in Mar., 1861. He was appointed lieutenant-general in the Spanish army, and quelled an insurrection in Azua. D. at Santo Domingo, June 14, 1864. H. H. S.

Santander': capital of the province of Santander, Spain; on a promontory in an inlet of the Bay of Biscay, where a spacious and perfectly safe harbor is formed by two moles and provided with convenient quays and docks (see map of Spain, ref. 12–F). The surrounding hills are beautiful, covered with vineyards and forests, and rich in mineral springs and iron and copper ores. The rivers and the sea teem with fine fish. There are several good manufactories. Wheat and ores are the principal exports. Pop. (1887) 41,829.

Santander: an interior department of Colombia, on the east side of the river Magdalena; surrounded by Magdalena, Venezuela, Boyacá, Antioquia, and Bolivar. Area, 16,291 sq. miles. It is traversed by the Eastern Cordillera of the Andes, and two-thirds of the surface is essentially mountainous. Near the Magdalena and in the eastern part there are extensive plains. The river Sogamoso divides the

mountain region by a deep gorge, flowing to the Magdalena. The drainage of the northern part is to Lake Maracaibo. The soil, climate, and natural productions embrace nearly everything found in Colombia; but the roads are mere mule-tracks, and the difficulty of communication has prevented the development of the department. The principal occupation is agriculture, the most important crops being coffee, cacao, and tobacco. Gold, silver, emeralds, etc., are mined on a small scale. There is a considerable trade with Venezuela. Pop. (1885) estimated, 600,000. Capital, Bucaramanga. HERBERT H. SMITH.

Santander, FRANCISCO DE PAULA: general and statesman; b. at Rosario de Cúcuta, New Granada, Apr. 2, 1792. He was a student at Bogotá when the war for independence broke out in 1810; joined the patriots, and served through the subsequent campaigns; was with Bolivar in the llanos 1817–18; commanded an advance division in the invasion of New Granada, and, by his opportune union with the main army, enabled Bolivar to gain the victory of Boyacá Aug. 7, 1819. Santander was promoted general of division on the field, was appointed vice-president, or governor, of Cundinamarca, and on Sept. 7, 1821, was elected vice-president of Colombia under Bolivar. During the latter's campaigns in the south and Peru, 1822–27, he governed the republic with wisdom and energy, completely cleared it of hostile Spaniards, obtained the recognition of foreign powers, and sent more than 6,000 men to re-enforce the liberator. He was re-elected vice-president in 1827. After Bolivar's return in that year he led the federalist opposition to him, though he did not openly revolt; and when Bolivar assumed dictatorial powers in 1828 Santander was deposed. Soon after he was arrested and condemned to death on a charge (never proved) of conniving at an attempt to assassinate Bolivar. The sentence was commuted to banishment and loss of rank, and he went to Europe. In 1831, after the dissolution of the republic of Colombia, Santander's honors were restored, and he was invited to return. Before his arrival he was elected president of New Granada Mar. 9, 1832, and he held the post until the beginning of 1837. Subsequently he was an active member of congress. D. at Bogotá, May 5, 1840. Santander was one of the ablest statesmen of his country and time, and he is properly regarded as the founder of New Granada, the modern Colombia. H. H. S.

Santa Paula, -pow'lăă: town; Ventura co., Cal.; on the S. Pac. Railroad; 16 miles N. E. of San Buena Ventura, the county-seat, and 65 miles N. W. of Los Angeles (for location, see map of California, ref. 11–E). It is the center of a rich agricultural region, the place of residence of many of the wealthiest farmers in the Santa Clara valley, and a noted health resort. The valley is surrounded by mountains abounding in excellent water, petroleum, asphaltum, and valuable building-stone and timber. It has the largest bean-fields in the country (yielding an average of a ton per acre), prolific orange and lemon groves, and a great honey industry. The town contains 11 churches, 3 public-school buildings, a national bank with capital of $75,000, and 2 weekly newspapers. The principal industries are the refining of petroleum, and the manufacture from it of over fifty articles of commerce, the manufacture of printing-inks, the shipment of building-stone and asphaltum, and the drying of fruit and beans. Pop. (1880) 188; (1890) 1,047; township (1900) 3,583. EDITOR OF "CHRONICLE."

Santarem, săăn-tăă-reń': a town of the state of Pará, Brazil; on the river Tapajós, 3 miles above its junction with the Amazon (see map of South America, ref. 3–F). It is the most important river-port between Manáos and Pará; is the center of an agricultural and grazing district; and controls the rubber-trade of the Tapajós. Near it is an agricultural colony, partly composed of immigrants from the Southern U. S. Pop. about 9,000. H. H. S.

Santarem, MANUEL FRANCISCO DE BARROS E SOUSA, Viscount of: politician and historian; b. at Lisbon, Portugal, Nov. 18, 1791. His father was a courtier. He accompanied the royal family to Brazil in 1807, held diplomatic positions in Europe from 1814, and was minister of Portugal to Denmark 1819–20. From 1823 to 1827 he was director of the archives of Portugal. Under the regency and Dom Miguel he was Minister of State 1827–33. After the fall of Miguel he retired to Paris, where the remainder of his life was spent. His numerous works in French and Portuguese are rather collections of historical material than well-arranged histories, but they are very valuable. Among them are *Recherches sur Améric Vespuce* (1842); *Essai sur l'histoire de la cosmographie et de la cartographie pendant le moyen âge* (3 vols., 1849–52; continued by Mendes Leal); and *Quadro elementar das relações politicas e diplomaticas do Portugal* (10 vols. by Santarem; continued by Rebello da Silva). D. in Paris, Jan. 18, 1856. H. H. S.

Santa Ritta Durão, -rit'tăă-dŏŏ-rowń', JOSÉ, da: poet; b. near Marianna, Minas Geraes, Brazil, 1737. He studied in Rio de Janeiro and at Coimbra, and became Doctor of Theology at the University of Coimbra, Dec. 24, 1756. After a sojourn in Rome, where he made the acquaintance of his compatriot, Basilio da Gama, and felt powerfully the influence of the Italian poets, he became professor at Coimbra (before 1778). Here he pronounced an elegant and truly interesting Latin oration (*Josephi Durani, Theologi, Conimbricencis O. E. S. A. pro annua studiorum instauratione oratio* (Coimbra, 1778). Here also he wrote his epic, *Caramurú* (Lisbon, 1781), an account of the discovery and settlement of Bahia, by Diogo Alvares (called *Caramurú* by the aborigines.) The poem has been several times printed, but the best edition is in Varnhagen, *Epicos brasileiros* (Lisbon, 1845). D. in Lisbon, Jan. 24, 1784. A. R. MARSH.

Santa Rosa: city (located in 1854); capital of Sonoma co., Cal.; on the San. Fran. and N. Pac. and the S. Pac. railways; 51 miles N. of San Francisco (for location, see map of California, ref. 6–B). It is widely known for its roses, which bloom all the year in the open air, and is the center of a region peculiarly adapted to fruit-culture, hop and grain growing, hay-making, and dairying. The city is laid out on a site nearly level, with wide streets and broad sidewalks bordered with trees. There are nine churches; one, the Baptist, was built entirely from a single tree, a giant redwood from the Guerneville forest. The educational institutions comprise the public schools with 1,500 pupils, the Santa Rosa Seminary and the Ursuline Academy (Roman Catholic), the Santa Rosa Ladies' College (non-sectarian), and the Pacific Methodist College (Methodist Episcopal South, opened in 1861). The court-house is an imposing structure, and, with adjacent county buildings, cost $200,000. The city has an excellent gravity water-supply, gas-works, two electric-light plants, several flour-mills, and extensive fruit-drying and canning works. There are a national bank with capital of $150,000, 3 State banks with combined capital of $620,000, and 2 daily and 3 weekly newspapers. In 1894 the city had receipts of $40,318, and an assessed property valuation of $3,822,632. Pop. (1880) 3,616; (1890) 5,220; (1900) 6,673. JAMES W. OATES.

Santa Rosa de los Osos: a town of the department of Antioquia, Colombia; 26 miles N. N. E. of Medellin; on a plateau of the Andes; 8,560 feet above sea-level. It owes its importance to rich gold-deposits in the vicinity; there are over forty regular works, but the methods of washing are antiquated. The climate is cold for Colombia (mean, 57·7° F.), and very salubrious. Pop. (1892) 10,059. H. H. S.

Santa Rosali'a: city of Southern Chihuahua, Mexico; on the Mexican Central Railway; 325 miles S. of El Paso (see map of Mexico, ref. 3–E). It is celebrated for its hot sulphur springs, long known to be curative by the natives and much resorted to by invalids. They are especially useful in inflammatory rheumatism. Pop. estimated at 8,000. M. W. H.

Santa Tecla, or **Nueva** (noŏ-ā'văă) **San Salvador:** a town of Salvador; 8 miles S. W. of San Salvador; beautifully situated in a valley on the south side of the San Salvador volcano. After the destruction of San Salvador by the earthquake of 1854 an attempt was made to remove the population to this place, which was officially declared to be the capital in 1855. The latter arrangement was never carried out, but the newly founded city has prospered. Pop. (1890) 13,715. H. H. S.

Santee' Indians: See SIOUAN INDIANS.

Santee River: a stream formed in South Carolina by the union of Wateree and Congaree rivers. It is 150 miles long and is navigable throughout for steamboats. Its lower course is through pine-forests and low rice-lands. It reaches the Atlantic through the North and the South Santee.

Santerre, săăń'tăr', ANTOINE JOSEPH: revolutionist; b. in Paris, Mar. 16, 1752; was a brewer by trade, and acquired influence by his wealth and generosity. His brewery in the Faubourg Saint-Antoine became a frequent meeting-place for the Jacobins. As commander of a battalion of the national guard, he took part in the storming of the Bastile July 14, 1789, and played a conspicuous part in the riots of the Champ de Mars, the attack on the Tuileries (June 20,

1792), and the insurrection of Aug. 10. He was appointed commander-in-chief of the national guard of Paris, with the rank of general of division, and governor of the Temple during the imprisonment of the king, whom he escorted to the scaffold. In the summer of 1793 he was made a general of division and sent to the Vendée at the head of an army of 20,000 men, but was beaten at Coron Sept. 18, 1793; recalled and arrested as an Orleanist, he did not regain his liberty till after the fall of Robespierre. After this he withdrew into private life. D. Feb. 6, 1809. See Carro, *Santerre, sa vie politique et privée* (Paris, 1847).

Santi, saan'tĕe, Giovanni: painter; father of Raphael Sanzio; b. at Castello di Colbordolo, in the duchy of Urbino, Italy, about the middle of the fifteenth century. His master in painting is unknown, but he seems to have formed his style from that of Melozzo da Forlì and other great painters of his time. Giovanni Santi's best-known work is the fresco in the Dominican church at Cagli (1482). There is a *Visitation* at Fano, and a *Madonna with Saints* in Sta. Croce there. A *St. Jerome* in San Bartolo at Pesaro; an *Enthroned Madonna with Four Attendant Saints*, at the Pieve of Gradara; a *St. Sebastian*, in the oratory of that saint at Urbino, besides a votive picture of the Buffi family in the Franciscan church there, and a fresco of a *Madonna and Child* in Raphael's house in Urbino are recognized as Santi's work. The Brera at Milan and the National Gallery in London possess examples of his art. He was also a poet; a MS. in the Vatican Library (*Codex Ollobonianus*, 1305), consisting of 344 folio leaves in *terza rima* exists, celebrating the virtues of Duke Federigo di Monte Fettro, and is interesting, as it contains allusions to the artists of the time and Giovanni Santi's sentiments and opinions on art. D. in 1494. W. J. Stillman.

Santiago, or **Santiago de Chile**, săan-tĕe-aa'gō-dā-cheelā: capital and largest city of Chile; on a plain by the little river Mapocho; 68 miles E. S. E. of Valparaiso, its port (116 miles by rail); 1,755 feet above sea-level (see map of South America, ref. 8–C). It is the most populous city on the Pacific slope of America except San Francisco; is the center of Chilian wealth, fashion, and culture, and exhibits more luxury and taste in building than any other capital of South America. The situation, on the plateau called the valley of Chile, is very fine. The plain, naturally dry, has been improved by an elaborate system of irrigation which keeps the city gardens and parks always green. The snow-capped Andes, including the giant of the range, Aconcagua, are in plain view on the E., contrasting with the barren rocks of the Coast Range on the W. A single rocky hill, Santa Lucia, rises within the city limits, and has been transformed by private munificence into a beautiful park and pleasure-ground. The Alameda, a very wide street, crosses the city and is its main artery; it is ornamented by four rows of trees, with a central promenade and two driveways, and is set at intervals with statues, some of them spoils of the Peruvian war. Many of the finest public and private buildings and retail stores are on this street. The cathedral, municipal buildings, etc., face the old Plaza de Armas, now the Plaza de la Independencia. Among other public edifices may be mentioned the Hall of Congress, fronting a fine square, the mint, the opera-house, said to be the finest in America, and the Exposition Hall. Nearly all the better class of buildings are of stone, and many show great architectural taste. The residences are generally of two or at most three stories, and set in extensive grounds ornamented with orange-trees, etc.; for this reason the city occupies a very large area in proportion to its population. Dwellings are furnished with taste, often with great luxury. There are several public parks, and a well-stocked botanical garden. As a center of learning Santiago has a renowned university and various other institutions of higher education; a national library with 70,000 volumes and 40,000 manuscripts; a museum, academy of fine arts, observatory, etc. It is connected by railway with the northern and southern provinces, and with the coast. Commercially it yields in importance to Valparaiso. Santiago was founded by Valdivia, the conqueror of Chile, in Feb., 1541. Earthquakes are frequent, but have never been very destructive. The climate is changeable, ranging from 23·9° to 91·1° F. Pop. (1885) 189,332; (1895) 256,403. The province of Santiago, of which the city is also the capital, has an area of 5,223 sq. miles, and a population of about 425,000. Herbert H. Smith.

Santiago de Compostela, -dā-kom-pōs-tā'laă: city; in the province of Corunna, Spain; at the confluence of the Sar and the Sarela; 33 miles S. by W. of Corunna (see map of Spain, ref. 12–B). It is the see of an archbishop, and has a magnificent cathedral, a university, and several educational and religious establishments, from which it chiefly derives its importance. The cathedral is said to contain the bones of the patron of Spain, the apostle James. It was built in the eleventh century in the form of a cross, 270 feet long and 204 feet broad, and contains six naves formed by beautiful Gothic pillars. Before the Reformation this church was annually visited by great crowds of pilgrims, but the number of visitors has since decreased and the city decayed. There are manufactures of linen, silk, leather, and paper, and the vicinity is rich in cereals, vegetables, fruit, and wine. Pop. (1887) 24,302.

Santiago de Compostela: the name given to James (*q. v.*), the son of Zebedee, as the patron saint of Spain.

Santiago de Cuba, -dā-koo'băă, or simply **Cuba** (in old books often called *St. Jago de Cuba*): city; on a bay near the eastern end of Cuba (see map of West Indies, ref. 5–E); capital of the province of Santiago de Cuba. The harbor is one of the finest in the West Indies, but it is separated from the interior by rugged mountains which retard communication; hence the port is only the third in Cuba in importance. The city, surrounded on three sides by mountains, is very picturesque, but hot and subject to epidemics of yellow fever. It has several fine squares and public gardens. Short railways run to the interior. Santiago is the center of the Cuban copper region. Sugar, rum, coffee, cacao, fruits, and copper ore are exported. On July 3, 1898, a Spanish squadron was destroyed by U. S. war-ships off Santiago harbor; and on July 17 the Spanish surrendered Santiago to a U. S. army. Pop. (1899) 43,090. Herbert H. Smith.

Santiago del Estero, -dāl-ās-tā'rō: an interior province in the northern part of the Argentine Republic; surrounded by Santa Fé, Córdoba, Catamarca, Tucumán, Salta, and the territory of El Chaco. Area, 31,500 sq. miles. It is a plain, the greater part included in the region of mingled forests and open lands called the Gran Chaco; in the southern part there are true open pampas. The principal rivers are the Salado and Dulce, neither of which is navigable. Nearly all the civilized population is gathered in the region S. of the Salado, about 18,000 sq. miles in extent. Grazing, grain-planting, and timber-cutting are the only important industries. Pop. (1890) about 250,000 (including wild Indians). Santiago del Estero, the capital, on the Dulce, was founded in 1552, and (disregarding the first settlement of Buenos Ayres) is the oldest town in the republic. It is much decayed, and has frequently suffered from overflows of the river. Pop. 8,000. Herbert H. Smith.

Santiago de los Caballeros, -dā-lōs-kăă-băăl-yā'rōs, or **de la Vega**: town of the Dominican Republic, West Indies; in the central plain called the Vega Real; 85 miles N. N. W. of Santo Domingo, on the road to Puerto Plata (see map of West Indies, ref. 5–H). This is the most beautiful and fertile part of the island, and is free from the heat and fevers of the coast. The town is the most populous in the interior of the republic, and has a thriving trade, especially in tobacco. Pop. about 10,000. H. H. S.

Santillana, săan-tĕel-yaa'năă, Inigo Lopez de Mendoza, Marquis of: soldier and poet; b. at Carrion de los Condes, Spain, Aug. 19, 1398; son of the grand admiral of Castile; was created Marquis de Santillana by Juan II. of Castile for his services in wars against Aragon and the Moors, and after the battle of Olmedo against the King of Navarre in 1445 received the title of Conde del Real de Manzanares. Upon the death of Juan in 1454 Mendoza retired from public life and devoted himself to literature. His best-known work is *Los Proverbios*, or *Centiloquio* (1496), a collection of 100 proverbs in rhyme. He wrote also *Diálogo de Bias contra Fortuna* (1448); *Doctrinal de Privados* (1453); the *Comedieta de Ponza* (a dramatic poem); and *serranillas*. D. at Guadalajara, Mar. 25, 1458. His works have been edited by Amador de los Rios (Madrid, 1852).

Santley, Charles: baritone singer; b. in Liverpool, England, Feb. 28, 1834; studied at Milan under Gaetana Nava and under Garcia on returning to England. He sang the part of Adam in Haydn's oratorio *The Creation*, at St. Martin's Hall in London, Nov. 16, 1857. In 1859 he appeared in the opera of *Dinorah* with the Pyne and Harrison Company at Covent Garden theater; and in 1862 made his *début* in Italian opera. He made a tour in the U. S. in 1871. In London he sang in *Zampa* and *The Waterman*, with the

Carl Rosa Company in *The Flying Dutchman*, and for many years at musical festivals and concerts. In 1889 he made a tour in Australia, and passed through New York in 1890 in returning to England. B. B. VALLENTINE.

Santo Domin'go, or **Haiti** (incorrectly *San Domingo*, and formerly *Española*, or *Hispaniola*): an island of the Greater Antilles, West Indies; between the Caribbean Sea and the Atlantic; separated from Cuba on the W. N. W. by the Windward Passage, and from Puerto Rico on the E. by the Mona Passage. Length from E. to W., 403 miles. Area, 29,823 sq. miles, divided between the republic of Haiti (about one-third) in the west and the Dominican Republic in the east. From the sea it appears to be a mass of mountains; in reality there are several east and west ranges, separating extensive plains, such as the beautiful Vega Real in the Dominican Republic and the plain of Artibonite in Haiti. The scenery everywhere is very fine, some of the mountain-peaks rising to 6,000 or 7,000 feet. The island is abundantly watered and one or two of the rivers are navigable for short distances. The most important streams are the Artibonite in Haiti, and the Yaqui, Yuna, and Ozama in the Dominican Republic. In the southwest there are two considerable lakes, Enriquillo in the Dominican Republic and Fondo in Haiti. The coasts, broken by deep indentations, form several good harbors; the largest of these is Samaná Bay, but the principal commercial ports are Port-au-Prince, Cape Haytien, Santo Domingo, and Puerto Plata. The soil of the valleys and plains is very fertile and the mountain forests contain many cabinet-woods and dye-woods. The island does not appear to be rich in minerals. A little gold is obtained, and silver, platinum, coal, etc., are reported. The climate is hot and occasionally unhealthful in some of the coast towns, mild and salubrious in the interior, the temperature varying with the elevation. The wet season, from April to October, is characterized only by a higher temperature and more abundant rains. Hurricanes are occasionally destructive from July to October. Several severe earthquakes are recorded. The island has no volcanoes.

History.—Santo Domingo, called Haiti by the natives, was discovered by Columbus and Pinzon at the end of 1492, and was the first part of the New World settled by the Spaniards. (See COLUMBUS.) The natives, a mild race of Arawak stock, were at first very friendly; later they rose against their oppressors, but were beaten in several wars by Columbus and his successors, and were reduced to the semi-slavery of the *encomiendas*; they soon disappeared and their blood can only be traced in the mixed races. Gold-mining, even with enforced Indian labor, was never very profitable, and agriculture became the chief occupation. Negro slaves were introduced as early as 1502, and later great numbers were brought, especially to the western part of the island. Santo Domingo (founded in 1496) became the chief city, and until about 1520 was the capital of Spanish America. The island was the point from which subsequent discoveries and conquests were made. From it were settled Cuba (and hence Mexico and California), Darien (and hence Peru, Chili, and Ecuador), Santa Marta, and New Granada, Puerto Rico and Florida, Venezuela, and Jamaica. But after the rich discoveries on the mainland, the island was neglected and partly depopulated, and it became the prey of the buccaneers. About 1630 some French buccaneers from Tortuga formed permanent establishments which soon increased in strength; and by the treaty of Ryswick (1697) the western part of the island was definitely ceded to France. This French colony became very prosperous; but the Negro slaves were ten times as numerous as the whites, and the free mulattoes, who were debarred from legal rights, were very discontented. The French Revolution of 1789 was quickly followed by a revolt of the mulattoes; both they and the whites appealed to the slaves, and in 1791–92 a terrible Negro insurrection broke out in the French part of the island. The blacks, under different chiefs, massacred the planters or drove them out; royalist and republican, white, black, and mulatto factions strove for supremacy; and in 1793 the distracted colony was invaded by the British and Spanish. The French Assembly conciliated the blacks by an edict of emancipation (1795); under their favorite leader, Toussaint Louverture, they resisted the British, who were driven out in 1798. Meanwhile, in 1795, Spain had ceded the eastern part of the island to France; it was occupied by Toussaint, who was appointed general-in-chief of the island forces in 1797, but in reality was dictator. He governed, nominally in the name of France, until 1801, when he practically declared independence. In 1802 Bonaparte sent a large force under Leclerc to subdue him. After some resistance he was conquered and sent a prisoner to France. Dessalines, Christophe, and others headed fresh rebellions, and the French were finally driven out in Dec., 1803. On Jan. 1, 1804, Dessalines declared the independence of Haiti, then including the whole island; soon after he proclaimed himself emperor; but he was assassinated in 1806. His successor, the Negro Christophe, proclaimed himself king, but could hold only the northwestern part of the island. The southwestern part formed a republic under Pétion, and the eastern part was seized by Spain. On Christophe's death (1820), Boyer, the successor of Pétion, annexed his domains; in 1821 the eastern part rebelled against Spain and formed a republic under the protection of Colombia, but was shortly after conquered by Boyer; thus the whole island was united in the republic of Haiti, and this was the most prosperous period of its history. Boyer was overthrown in 1843, and in 1844 a revolution in the east resulted in the formation of the Dominican Republic. For subsequent history, descriptions of the two countries, and bibliography, see HAITI and DOMINICAN REPUBLIC.

HERBERT H. SMITH.

Santo Domingo: capital and most important city and port of the Dominican Republic, island of Santo Domingo, West Indies; on a bay of the south coast; at the mouth of the river Ozama (see map of West Indies, ref. 5–H). It was founded by Bartholomew Columbus in 1496, and is the oldest existing town of European origin in the New World. Many of the buildings and the fortifications date from a very early period, and some of them are associated with the history of Columbus. A fine statue of the discoverer adorns the principal square. The cathedral is a large but bare and rather unsightly building; in it is shown a crypt supposed to contain the remains of Columbus. They were certainly brought from Spain and buried in this cathedral, and it is claimed that the bones transferred to Havana in 1796 were those of another member of the family. Santo Domingo is the principal emporium of the southern part of the republic, and exports coffee, sugar, cabinet-woods, etc. The harbor is exposed to south winds, and is in fact little more than an open roadstead. Pop. about 25,000. H. H. S.

Santon: See DERVISHES.

San'tonin: a crystallizable principle obtained from the drug *Santonica*, or Levant wormseed. Santonin occurs in flat, quadrilateral, colorless prisms, is inodorous and nearly tasteless, and practically insoluble in water. In overdose it is poisonous to the animal system, producing convulsive tremblings, dilatation of the pupils, and enfeebling of the functions of the heart and lungs. It also causes the urine to acquire an unnatural yellow, and, what is very singular, it produces yellow vision by staining the humors of the eye, the field of view appearing as if seen through a yellow-tinted medium. Santonin is exceedingly poisonous to the round-worm, *Ascaris lumbricoides*, a parasite infesting the intestines in man, and is consequently used in medicine as an anthelmintic or vermifuge. From its poisonous properties it must be given with care. Revised by H. A. HARE.

Santorin, săn-tō-reen', or **Thera**, thā'răă: Greek island in the Ægean Sea; the most southern of the Cyclades. It is crescent-shaped, being the eastern portion of the circumference of a vast crater. Geologically, it is intensely interesting on account of the volcanic phenomena which have taken place in it. Sometimes land in the immediate vicinity has risen from the sea and formed islets, some of which still exist. A prodigious eruption began in Jan., 1866, and continued two years. On its cessation the inhabitants, who had fled in terror, returned to the island. Apparently Santorin was inhabited from earliest antiquity. On some of the rocks may be seen the most ancient specimens of Greek writing known. Pop. (1889) 22,000. Capital, Thera. See Virlet in *Bulletin de la Société géologique de France*, vol. iii.; also Fouqué in *Mission scientifique à l'île Santorin*, *Arch. des Missions*, second series, vol. iv., 1867.

E. A. GROSVENOR.

Santos, saan'tōs: city and principal port of the state of São Paulo, Brazil; on a low peninsula (formerly an island) fronting the Bay of Santos; 40 miles by railway S. of São Paulo (see map of South America, ref. 7–F). The harbor is one of the best in Brazil, and vessels load directly at wharves. The city has many large warehouses and some good public buildings; but the climate is hot, and, owing to the yearly

epidemics of yellow fever, Santos is the most unhealthful port in Brazil. It is the outlet of the greater part of São Paulo, and exports more coffee than any other port in Brazil except Rio de Janeiro. Great numbers of immigrants pass through it. Santos was founded in 1539. Pop. about 20,000. Six miles S. of it is the small town of São Vicente, the oldest permanent settlement in Brazil (founded 1532), and until 1681 capital of the captaincy of the same name. H. H. S.

Sanzio, Raphael: See Raphael.

São (sowñ) **Carlos**: See Campinas.

São Francisco River: a river of Brazil, rising in Minas Geraes near lat. 20° 30′ S., flowing N., then N. N. E., and finally curving to E. S. E., and entering the Atlantic in lat. 10° 29′ S. Length about 1,800 miles. It traverses the states of Minas Geraes and Bahia, and below its great bend separates Bahia and Sergipe on the S. from Pernambuco and Alagoas on the N. Among the great rivers of South America, the São Francisco ranks in length with the Orinoco; but, unlike the Orinoco, Amazon, and Paraguay, it is essentially a highland river, the greater part of its course being over the surface of the Brazilian plateau; and it is nowhere bordered by extensive forests. Its most remarkable feature is its division into an upper and a lower course by a series of rapids and a great cataract. These mark its descent from the plateau, after it has attained its full volume, only 200 miles from the sea. The cataract of Paulo Affonso is sometimes called the Niagara of Brazil, and it approaches Niagara in grandeur though differing greatly in appearance. The great river is here forced through a narrow gorge—in one place only 51 feet wide—and after rushing down a slope, forms three successive falls, with a total depth of 265 feet. The torrent is churned into a mass of foam, producing an effect of indescribable grandeur. Above this fall there are several rapids, and below it an unnavigable space where the river forms a deep cañon; the total obstructed portion is about 190 miles long. Below it the river is freely navigable from Piranhas to the sea, 148 miles; at Penedo, 30 miles above the mouth, it is nearly a mile wide. The bar, at high water, admits vessels of 15 feet draught. Above the falls there is a navigable space from Pirapora to Sobradinho, 984 miles. Of the numerous affluents the most important are the Paraupeba and Rio das Velhas on the right and the Paracatú, Urucuya, Carinhanha, Corrente, Rio Grande, and Rio Preto on the left. All of these are navigable for greater or less distances. The São Francisco was opened to free navigation in 1867, but no foreign commerce has been attracted to it. Brazilian steamers ply regularly on the upper course, which is connected with Bahia by railway; the Rio das Velhas is also navigated. The principal industry of the basin is cattle-raising, but it contains much agricultural and mining land. See Burton, *Exploration of the Highlands of Brazil* (1869); Halfeld, *Relatorio concernente á exploração do Rio de S. Francisco* (1858) and *Atlas e Relatorio* (1860); Roberts, *Relatorio sobre o exame do Rio S. Francisco* (1880); Wells, *Three Thousand Miles through Brazil* (1886).

Herbert H. Smith.

São Gonçalo, Rio: See Lagoa dos Patos.

São João (-zhō-owñ′) **da Barra**, or **da Parahyba**, -daa-paă-raă-ee′baă (formerly *Parahyba do Sul*): city and port of the state of Rio de Janeiro, Brazil; on the right bank of the Parahyba river, near its mouth. Formerly it was the commercial center of the lower Parahyba valley, but its importance has decreased since Campos has been united to the Bay of Rio de Janeiro by a railway. It is a port of call for coasting steamers, and exports sugar. The bar is passable only during spring tides; at other times vessels anchor in the roadstead. São João has an important sugar-factory. Pop. about 7,000. H. H. S.

São João d'El Rei, -del-rā′ĕĕ: a town of the state of Minas Geraes, Brazil; 66 miles S. W. of Ouro Preto (see map of South America, ref. 6–G); is connected with Sabará and Rio de Janeiro by railway, and is the commercial center of a large district. It was founded about 1670, and was long famous for its gold and diamond mines. Cattle and hogs are raised in the vicinity, and hides, lard, and the favorite Minas cheeses are exported. Pop. about 10,000. H. H. S.

São Leopol'do: a town of the state of Rio Grande do Sul, Brazil; on the Rio dos Sinos, a branch of the Guahyba or lower Jacuhy; 20 miles N. of Porto Alegre (see map of South America, ref. 7–F). The first German colony in Brazil was established here in 1824, and the town is the center of a thriving agricultural region almost entirely peopled by Germans or their descendants; it has railway and steamboat communication with Porto Alegre. German is the common language. Pop. about 7,000. H. H. S.

São Luiz: See Maranhão (the city).

São Miguel: See St. Michaels.

Saône, sōn: a river of France which rises in the department of Vosges, at an elevation of 1,299 feet above the level of the sea; flows S. and joins the Rhône at Lyons. Its entire length is 282 miles; it is navigable for a distance of 170 miles below the city of Gray, department of Haute-Saône. It is joined by the Doubs on the left side.

Saône-et-Loire, -ā-lwăăr: department of France; between the rivers Saône and Loire, and mostly occupied by the mountains of Côte-d'Or. The mountains are low, and rich in coal and iron, and on their slopes is produced the celebrated Mâcon wine. On the pastures along the rivers large herds of cattle and horses are reared. Iron plates and rails, machinery, etc., are manufactured in Creusot and other towns. Area, 3,302 sq. miles. Pop. (1896) 621,237.

Saône, Haute: See Haute-Saône.

São Paulo, sowñ-pow′lō: a southeastern maritime state of Brazil; bounded by Minas Geraes on the N. and E., Rio de Janeiro on the E., the Atlantic on the S. E., Paraná on the S., and Matto Grosso on the W. and N. W. Estimated area, 112,330 sq. miles, but the boundary with Minas Geraes is unsettled. The Brazilian Coast Range, here divided by the Parahyba valley into two parallel chains, traverses the southeastern part, and is separated from the ocean by a narrow strip of lowland. Back of the mountains the surface is an irregular plateau, varied by hills and by the deep valleys of rivers which flow westward to the Paraná. The coast-strip mountains and a wide tract back of them were originally covered with forest, and this is the most fertile and thickly settled portion of the state. Bordering the Paraná and its branches there are other extensive forests inhabited only by a few roving Indians. The river Paraná forms the western boundary, and its branch, the Paranapanéma, separates São Paulo from Paraná. The Pardo, Tieté, and Aguapehy are important branches of the Paraná, obstructed by falls near their mouths, but partly navigable in their upper courses. On the Atlantic side the only important river is the Parahyba. The principal harbors are the Bay of Santos and the channel formed by the island of São Sebastião. The climate of the plateau is mild and salubrious; some coast towns, as Santos, are hot and unhealthful. A little gold is washed in the river-beds, and there are deposits of excellent iron, marble, etc. The forests are rich in cabinet woods. São Paulo is the most populous and thriving of the Brazilian states and the most important coffee-producing region of the world; the coffee zone includes the Parahyba valley and the forest strip back of the mountains; sugar-cane is extensively planted, especially in the coast belt; and on the plateau the grazing industry is important. The people, called Paulistas, have always been noted for their enterprising spirit. During the colonial period they discovered the mines of Minas, Goyaz, and Matto Grosso, settling all those regions and the southern province; and their slave-hunters were long a terror to the Indians of Paraguay. Of late they have covered a large part of the state with railways, encouraged exploration and settlement toward the Paraná, and developed manufactures; and they have given some of the best statesmen, authors, and engineers to Brazil. The captaincy of São Paulo, originally called São Vicente, was formed in 1534, with its capital at São Vicente, on the Bay of Santos; this was changed to São Paulo in 1681. The captaincy originally included all of Southern Brazil; Rio de Janeiro, Minas Geraes, Santa Catharina (with Rio Grande do Sul), Goyaz, Matto Grosso, and Paraná were successively cut off from it. Pop. (1888) estimated, 1,386,242; the calculated annual increase is 3·5 per cent. There are many German and Italian immigrants. H. H. Smith.

São Paulo: capital and principal city of the state of São Paulo; on a small branch of the river Tieté; 236 miles W. S. W. of Rio de Janeiro (370 miles by railway), 38 miles from its port of Santos (see map of South America, ref. 6–G). Owing to its situation on the plateau and near the Tropic of Capricorn, it has a mild and very agreeable and healthful climate. It is well built, and has the aspect rather of a European than of a Brazilian town; there are a number of public gardens and parks. The old Jesuit college is used as the state-assembly building; other notable edifices

are the São José theater, city-hall, episcopal palace, and many churches, including some of Protestant denominations. The law school is the most famous in Brazil, and many of the most noted Brazilian statesmen are among its graduates. There is a large and well-equipped hospital. Besides its railway connections with Santos and Rio de Janeiro, São Paulo is the center of the extensive state-railway system, and it has a large and constantly increasing trade. The city was founded as a mission station (Piratininga) in 1554 by the Jesuit Anchieta. It became the capital in 1681. Pop. (1894) about 75,000. H. H. S.

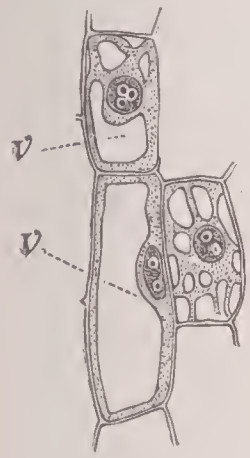
São Pedro do Rio Grande do Sul: See Rio Grande do Sul.

São Salvador, or **San Salvador**: city of Brazil. See Bahia.

São Sebastião: an old name of Rio de Janeiro (*q. v.*).

São Vicente: See Santos.

Sap [O. Eng. *sæp* : O. H. Germ. *saf* > Mod. Germ. *saft*, sap, juice; cf. Sanskr. *sabar*, nectar, Lat. *sapio*, but the Teutonic words may be borrowed from Lat. *sapa*]: the water contained in living plants, together with the substances dissolved in it. All active plant-cells have more or less water in their protoplasm, and when there is a surplus it is in the form of drops or masses in cavities (vacuoles) in the protoplasm (see illustration). Intercellular spaces and the cavities of inactive internal cells also may contain water, holding various substances in solution.



Cells of a fritillaria with sap-cavities (*v*) in the protoplasm (× 500).

In terrestrial plants this water is absorbed by the roots from the water of the soil, and carries with it the substances dissolved in it. In the plant it is absorbed from cell to cell, suffering in each a loss of such substances as are appropriated by the protoplasm, and gaining such as are soluble.

It thus contains many substances, some of which are organic, e. g. sugar, inulin, etc., and others inorganic, e. g. salts of lime, potash, etc. By puncturing (as in the maple), crushing (as in the cane), or slicing and diffusion (as in the sugar-beet), the sap is obtained in large quantities, and on evaporation yields much sugar, with many other substances.

For the details as to the movement of water in the plant, see the article Physiology, Vegetable. There is no such thing as crude sap or elaborated sap, as commonly understood, nor is there a circulation of sap, one current going up and another coming down. The popular notion that the sap goes down into the roots of trees in the fall and rises again in the spring is erroneous. Charles E. Bessey.

Sapajou: a name corrupted from a South American term, and applied to New World monkeys of the family *Cebidæ*, having a prehensile tail whose under surface is naked and callous toward the tip; the throat is not dilated. It is applied to the small monkeys of the genus *Cebus* and to the spider-monkeys, *Ateles*. Revised by F. A. Lucas.

Sapan-wood: a red dyewood obtained from the *Cæsalpina sappan*, exported from Siam, Japan, the East Indies, etc.

Sap-green: a coloring-matter obtained by boiling down the juice of the berries of the buckthorn (*Rhamnus catharticus*), after adding lime to prevent change by acid fermentation, which would turn the color red. The buckthorn is a native of Europe, but has made its way to the U. S., and grows wild in some parts. It is a shrub 6 or 8 feet high, with branches that terminate with thorns. The berries contain four seeds, are about the size of a pea, black and shining, with green pulp, of disagreeable odor and nauseous bitter taste. They constitute an active purgative medicine, seldom used, as it causes griping pains. Sap-green is used chiefly as a water-color pigment. It is not permanent.

Sapodil'la, or **Naseberry**: the fruit of *Achras sapota*, a West Indian tree of the family *Sapotaceæ*. It is highly valued as a dessert fruit.

Saponification: See Soap.

Sap'onin [from Lat. *sa'po, sapo'nis*, soap], or **Stru'thiin** [from Mod. Lat. *Stru'thium*]: an uncrystallizable substance obtained from the soapwort or bouncing-bet (*Saponaria officinalis*). It is also contained in *Gypsophila struthium* and many other plants. Bley discovered it; Bussy first obtained it pure; and Bucholz found 34 per cent. in the dry soapwort root, which makes with water a lather like soap. By first extracting the root with water and evaporating, then treating the extract with alcohol, a solution of saponin is obtained nearly pure. On evaporation the saponin appears brown, though white when pure; hard, brittle, and sweetish in taste, followed by persistent acrimony. When inhaled in powder it produces violent sneezing. It is said to be poisonous, and to produce an extraordinary local paralysis of the muscles, without acting through the general nervous system, when injected into the cellular tissue of animals. For its composition the following is assigned, but deemed questionable: $C_{19}H_{30}O_{10}$. Revised by Ira Remsen.

Sapota'ceæ: See Star-apple Family.

Sappers, Miners, and Pontoniers: engineer troops. (See Engineers, Corps of.) Among the great improvements in the attack and defense of fortifications introduced by Vauban, not the least was the establishment of regularly organized companies of sappers and of miners. The duties of these troops had previously been performed in a desultory manner by soldiers detailed from the artillery and infantry. The first company of sappers was organized about 1690 as a free company, under the command of Vauban himself. It was armed and drilled as infantry, and was instructed in all the works appertaining to sieges. The men were taught to make gabions, fascines, hurdles, etc., to trace lines and trenches, to drive the various kinds of saps (see Siege), to descend into and pass the ditch, to destroy the enemy's obstacles, to drain the trenches, to take care of the tools, to put up the various kinds of revetments, to post and superintend working parties, and were expected also to serve in the mines when required. In the defense they were taught to adjust and sod the slopes, to place the various obstacles, such as palisades, fraises, etc., and to repair the defenses when injured by the enemy's artillery. All of these duties are still performed by sappers. Three engineers, Goulon, Esprit, and Mesgrigny, organized in 1679, 1695, and 1705, respectively, each a company of miners, whose duties were the construction and service of mines and countermines. By the year 1705 these companies, as well as the sappers, had been attached to the artillery. They naturally belonged to the engineer service, but convenience of transportation and personal influence kept them with the artillery until 1759, when they were placed under the engineers. In 1760 they were returned to the artillery, where they remained until 1793, when they were finally attached to the engineers. The duties of pontoniers, or constructing temporary military bridges, had up to this time (1793) been performed by "artillery-workmen." The necessity of a better organization was evident, and companies of pontoniers were organized, continuing, however, to form part of the artillery. The numbers of these troops were increased from time to time as the necessities of the service demanded; the present force in France, including the artillery pontoniers, is about 16,100.

In Great Britain the Corps of Royal Sappers and Miners was established in 1812. It performed the duties of pontoniers, as well as those indicated by its title. It was composed entirely of enlisted men, the officers being detailed from the Royal Engineers. In 1856 the two corps were consolidated under the name of the Corps of Royal Engineers. The force comprises about 7,550 men.

In Prussia a company of pontoniers was created in 1715, and placed under the orders of the artillery. In 1742 Frederick the Great organized two companies of miners, which were at first attached to a regiment of pioneers, and afterward formed an independent corps. Previously to 1810 there were no regular sappers in the Prussian army, but in that year the pontoniers and miners were placed under the engineers and took the name of pioneers, a part of their duties being those of sappers. The force is about 13,300 men.

In the U. S. a company of "bombardiers, sappers, and miners" was attached to the Corps of Engineers by the act of Congress of Apr. 29, 1812, but was discontinued in the reorganization of 1821. In 1846 a company of "sappers, miners, and pontoniers" was organized as part of the Corps of Engineers, and was sent to Mexico with the army of invasion. It took part in the siege of Vera Cruz, in the attack at Cerro Gordo, and formed part of the storming parties at Contreras, Churubusco, and Molino del Rey. At Chapultepec it was engaged in the construction of batteries, occa-

sionally fighting with muskets, and at the Garita San Cosme it did excellent service as infantry. After the war it was stationed at West Point to assist in the instruction of cadets at the U. S. Military Academy. In 1853 a detachment accompanied Stevens's survey of the Northern Pacific Railroad. In 1858 the company formed part of the Utah expedition, returning to West Point in the fall of the same year. In the fall of 1858 a detachment was sent to the Pacific coast, where it was engaged until 1861 in opening and repairing roads, constructing bridges, and in fortifying San Juan island at the time of the boundary dispute. In 1861 this detachment proceeded to Washington, where it was engaged upon the defenses and in the instruction of volunteer troops in the preparation of siege-material. The main portion of the company was engaged during the summer of 1861 in the defense of Fort Pickens. In the fall of 1861 it joined the Army of the Potomac. An act of Congress of Aug. 6, 1861, added three companies, of 150 men each, to the engineer troops, and authorized one company of topographical engineers. In 1863 the Corps of Engineers and of Topographical Engineers were merged into one, and the strength of the battalion of engineers thus became five companies. One of these was not organized, however, until 1865. From the fall of 1861 until the end of the civil war the battalion formed part of the Army of the Potomac, and its services were invaluable. Under Capt. Duane (afterward brigadier-general and chief of the Corps of Engineers) the original company had been thoroughly instructed in pontoniering, sapping, and mining. This instruction quickly pervaded the battalion, and it was thus enabled to give lessons to the volunteers which could be obtained from no other source. A number of volunteer regiments were organized as engineer troops, and in addition to these many infantry and artillery troops served as engineer soldiers when occasion required, the high character and intelligence of the volunteers rendering it an easy matter to find men capable of being quickly instructed in these duties. For mining at Vicksburg and Port Hudson practical miners were selected from the different regiments, and temporarily organized as military miners. The sapping at these sieges was done by details from the infantry, as it had been in the seventeenth century, before the time of Vauban. In all cases these troops served under the engineers when on engineer duty.

The most remarkable feats in this branch of the service during the war were, in mining, the Petersburg mine (July, 1864); in sapping, the siege of Fort Wagner before Charleston, July to Sept., 1863; and in pontoniering, the bridge across the James river at Charles City Court-house. The latter was over 2,000 feet long in pontons, besides 200 feet of trestle-work. It was built by the regular battalion of engineers, two companies of the Fifteenth New York and part of a company of the Fiftieth New York, in all about 450 men, in about five hours on the evening of June 15, 1864, the approaches having previously been prepared by the First New York Engineers. The stream was rapid and deep, in some places 85 feet. This was the longest floating bridge ever constructed by an army in the field. Another long bridge was built by the same troops over the Chickahominy in 1862. That stream was a less difficult one, and a large portion of the bridge was built on trestles and cribwork.

Upon the reduction of the army in 1870 the number of enlisted men in the battalion of engineers was limited to 354, one company being reduced to a skeleton of ten sergeants and ten privates; and in 1875 the number was further reduced to 200. In 1884 the number was increased to 450 and in 1889 to 500. One company of 100 men is stationed at the Military Academy at West Point, engaged in the instruction of cadets in practical military engineering. The others are stationed at the engineer school of practice at Willets Point, N. Y. They are kept thoroughly drilled as infantry, and are well instructed in field fortification, sapping, mining, pontoniering, field-sketching, and the service of submarine mines. The officers of the battalion are temporarily detailed from the Corps of Engineers, usually serving with it four or five years.

Napoleon I. considered the proper proportion of engineer troops to infantry to be 1:40. Since his day the advances in the art of war have largely increased this proportion. It should be especially large in a country like the U. S., where the army is rather a magazine of military knowledge than a force capable of resisting a powerful enemy. In France the proportion is about 1:21; in Great Britain, 1:20; in Germany, 1:25; in Russia, 1:18; in Austria-Hungary, 1:19; and in the U. S., 1:25. O. H. Ernst.

Sappey, săăp′pā′, Marie Philibert Constant, M. D.: anatomist; b. at Bourg, department of Ain, France, Aug. 10, 1810; graduated M. D. from the Paris School of Medicine in 1843; in 1844 passed the *concours* for associate professor of surgery; in 1868 was appointed Professor of Anatomy. He is a member of many French and foreign medical and scientific societies, and an officer of the Legion of Honor. His great work is his *Traité d'anatomie descriptive* (1847–63, numerous editions). S. T. A.

Sapphire [from O. Fr. *saphir* < Lat. *sapphi'rus* = Gr. *σάπφειρος*, from Heb. *sappīr*, sapphire]: a gem, among the purest forms of corundum. However, it is not usually called sapphire by dealers in gems unless blue, the red stones being called rubies, the yellow ones Oriental topaz, the green Oriental emeralds, and the purple Oriental amethyst, industrially used for wire draw-plates, watch-jewels, phonograph points, etc. *Asteria* is a variety of sapphire which when cut round shows a star of bright rays, due to its crystalline structure. See Corundum, Ruby, Topaz, and Precious Stones.
Revised by Geo. F. Kunz.

Sappho, săf′ō (Gr. Σαπφώ): the world's greatest poetess; b. at Eresos or at Mytilene in Lesbos, toward the latter part of the seventh century B. C., contemporary of Alcæus and Solon. In consequence of political troubles she had to take refuge in Sicily, but returned to Lesbos in course of time and there she died. The literary mythmongers of antiquity made up stories out of supposed allusions in her verses. Of this order is the romance of her hopeless love for the fair youth Phaon, and of her leap from the Leucadian rock. But the poetess of love fared worse with the comic poets of Athens, who could not understand the Lesbian songstress and who wrought their wicked will on her memory. To them Sappho was a courtesan; to them the school of maidens whom she trained in the service of the Muses and to whom she addressed her burning verses was a school of vice. Nowadays few are found to controvert the thesis that Sappho was a lofty as well as an ardent soul, to whom all lovers of true womanhood as well as of true art must do homage. Her poems, written in the Æolic dialect, "few but all roses," were arranged in nine books after the number of the nine Muses and according to the measures employed. Of these only two poems remain entire or nearly so, and there are besides a number of fragments, enough at all events to show her ardor, her tenderness, her playfulness, her love of art, her love of nature. In the handling of the language and of the metrical form she was a supreme artist, and if nothing else remained, the Sapphic strophe would be a monument of her genius. Editions of her poems have been published by Neue (Berlin, 1827); by Bergk, *Poetæ Lyrici Græci*; by Wharton, with English translations (2d ed. 1887). See the elaborate work by Cippolini, *Saffo* (1890).
B. L. Gildersleeve.

Sapporo, or **Satsŭporo**, săăp′pō-rō: a town in Yezo, Japan, and once the capital of the island; in a plain about 20 miles from the mouth of the Ishikari river (see map of Japan, ref. 3–E). When the colonization department (*Kaitakushi*) began its work in 1871, Sapporo became a center of activity. Planing-mills, silk-factories, an agricultural college with model farm attached, a brewery, etc., were organized. A mission from the U. S., with Gen. Horace Capron at its head, was located here, and professors from the U. S. were intrusted with the organization of the college. Since the breaking up, in 1881, of the very expensive colonization department, Sapporo has been merely chief town of one of the three prefectures of the island. Its port is Otaru, 22 miles distant, with which it is connected by a railway which extends inland 40 miles to the coal mines of Poronai.
J. M. Dixon.

Sap′rophytes [Gr. *σαπρός*, rotten + *φυτόν*, a plant]: plants which live upon the organic matter of dead plants or animals, or at least on their dead parts, as distinguished from Parasites (*q. v.*), which live upon and obtain their food from living plants or animals. They are all colorless plants, or at least they are not green, and have suffered a greater or less structural degeneration of their vegetative organs, as in the case of parasites. In fact the effect of saprophytism upon the plant appears to be essentially the same as that of parasitism, a result to be anticipated, since in some cases a parasite may become saprophytic, while in others a saprophyte may become parasitic.

Saprophytes occur in four of the six great branches of the vegetable kingdom. Thus of the protophytes, some of the bacteria are saprophytes. Of the phycophytes, the black

moulds (*Mucoraceæ*) and the water-moulds (*Saprolegniaceæ*) contain many saprophytes. In the carpophytes there are thousands of species of saprophytes, in many of the families of the fungi of the great classes *Ascomycetes* and *Basidiomycetes*, the latter well represented by the toadstools, puff-balls, etc. The *Bryophyta* and *Pteridophyta* contain no saprophytes, and in anthophytes there are few if any species which are strictly saprophytic. The Indian-pipes (*Monotropa*) and their relatives are doubtfully saprophytic, and the same may be said of a few of the orchids. On the other hand, many farm and garden plants under cultivation are partially saprophytic, obtaining much of their food from the decaying organic matter used for enriching the soil. The saprophytes in the vegetable kingdom are estimated at from 20,000 to 30,000 species, the greater portion of which are carpophytes. CHARLES E. BESSEY.

Sap-rot: See DRY ROT.

Sapsago Cheese: a corrupt name used in the U. S. for Schabzieger cheese. See CHEESE.

Sapsucker: the yellow-bellied woodpecker (*Sphyrapicus varius*) of North America, so named on account of boring into maple or other sweet-sapped trees to obtain the sap. It is readily recognized by its black throat and decidedly yellow under parts. F. A. L.

Sapwood: See ALBURNUM.

Saqqa'rah, or **Sakḳarah** [cf. Egypt. *Sokar, or Seker*]: a village of Egypt, W. of the site of Memphis, which has given its name to a group of pyramids and to the ancient necropolis of Memphis. The necropolis was in use from the remotest dynasties down to Roman times. The earliest monuments are the pyramids and mastabas and the latest the tombs of the Apis bulls. The whole region is honeycombed with subterranean funereal chambers. The mastabas are rich in representations of scenes of ordinary life in the fifth and sixth dynasties, and some of the pyramids are inscribed with religious texts. The most notable objects at Saqqarah are the Step Pyramid (see PYRAMIDS), the tombs of the Apis bulls (see SERAPEUM), and the tombs of early nobles, such as Ti and Ptahhotep, of the fifth dynasty. (See MASTABA.) From Saqqarah came the oldest mummy in the world, that of a son of Pepi I. of the fifth dynasty, probably above 6,000 years old. C. R. G.

Saracen'ic Art: the art of the countries ruled by the SARACENS (*q. v.*). The Arabs who followed Mohammed and his earlier successors had little industry of the finer sort and no fine art. With the singular ability they possessed of inspiring others with their enthusiasm, making them reverence Mohammed, talk Arabic, and fight for Islam, they absorbed into one empire the far more artistic races on the Mediterranean. The Byzantine style became their type in architecture. The workmen of Syria and Egypt developed new fashions under the new dominion, as has been shown under MOHAMMEDAN ART (*q. v.*). Saracenic art therefore includes the earlier work of Syria, Egypt, Asia Minor, the islands, such as Cyprus and Rhodes, and, in its largest extension, of the North African coast and of Southern Spain, all from about 700 to 1400 A. D. Turkish art would thus be excluded by its date and Persian by its eastern situation. R. S.

Sar'acens [from Lat. *Sarace'nus*, Saracen, a Saracen, from Arab. *sharqī*, Oriental, eastern, deriv. of *sharq*, east, deriv. of *sharaqa*, rise]: a name originally applied to a tribe or tribes inhabiting the eastern slopes of the Serāt, the great mountain chain of Arabia which reaches from Syria to Yemen (Glaser, *Skizze der Gesch. und Geogr. Arabiens*, Berlin, 1890, p. 230). Later Greek and Latin authors used this local name to designate the troublesome Bedouin tribes on the southern frontier of the empire, or even the Arabians as a whole (Ammianus xiv., 4; xxiii., 6, 13). After the rise of Islām, the use of the word was further extended, and included the followers of the new faith, wherever they might be. It has also been used as a synonym for *infidel* (gypsies, pagan Prussians, etc.). See also A. Sprenger, *Die Alte Geogr. Arabiens* (Bern, 1875, § 328); C. Snouck Hurgronje, *Het Mekkaansche Feest* (Leyden, 1880, p. 196). See MOORS. RICHARD GOTTHEIL.

Saragos'sa (Span. *Zaragoza*, anc. *Cæsarea Augusta*): capital of the province of Saragossa, Spain; on the Ebro; 212 miles by rail N. E. of Madrid (see map of Spain, ref. 14–H). It was founded by the Phœnicians. Under the Romans and Moors it was a flourishing city, and reached the culmination of its prosperity when (in 1118) it became the capital of the kingdom of Aragon. After the union of Aragon and Castile, when Madrid became the royal residence, Saragossa lost some of its splendor, and in 1809 it was nearly destroyed by the French, by whom it was twice besieged during the Peninsular war. The first siege lasted from June to Aug., 1808; the second began on Dec. 20, and the bombardment continued till Jan. 27, 1809, when the city was entered by general assault. The inhabitants offered a determined resistance, and it was not until Feb. 20 that the place capitulated; 60,000 lives were lost during the siege, mainly by disease. Of the two cathedrals, one is an old building in Gothic style and the other is a highly ornamented edifice of the seventeenth century, which contains a pillar upon which, it is said, the Virgin descended from heaven, A. D. 40. The university (1474) is attended by about 800 students. Saragossa has also an academy of sciences, a library with 18,000 volumes, a law school, and a medical school. Cloth, chocolate, silk, soap, and hats are the principal industrial products. Pop. (1887) 92,407.

Saragossa, Maid of: See AGUSTINA.

Saraiva, săă-rī'văă, JOSÉ ANTONIO: statesman; b. in Bahia, Brazil, 1823. He graduated in law 1846; was president successively of Piauhy, Alagoas, São Paulo, and Pernambuco; entered the lower house of parliament 1855, and became senator 1869; was sent on a special mission to the Rio de la Plata 1864, and was prominently connected with the events which led to the wars with Uruguay and Paraguay. As early as 1857 he formed part of a liberal ministry; later he became the leader of the moderate liberals, and from 1880 to 1887 was several times premier. H. H. S.

Sarajevo, să-răă-yee'vō, **Serajevo**, or **Bosna Seraï**, bos'năă-se-rī': town; on the river Miliatzka, near its junction with the Bosna; 122 miles S. W. of Belgrade (see map of Austria-Hungary, ref. 10–G). It was formerly capital of Bosnia, and is now of the Austro-Hungarian district of Serajevo. Because of its picturesque appearance and fine situation it is called by the Mussulmans the Damascus of the North. It has iron-works and manufactures side-arms, and is the commercial entrepôt of the province. Pop. (1885) 26,268. To the east, on a cliff 350 feet above the Miliatzka, is the imposing castle, built in the thirteenth century by the Hungarian general Castroman, which has given the name to the town.
EDWIN A. GROSVENOR.

Sarakhs, or **Serakhs**, sā-raaks': fort and town of military importance at the northeast angle of Persia; on the plain to the left of the Tajand or lower Heri-rud, where this stream enters the Turcoman plains. The fort is large but ill-provided, the town small and poor. Water is supplied by a canal 10 miles long to a point on the Tajand, where the water flows throughout the year. Opposite the town the stream has water only in the spring or after heavy rains. Sarakhs is of high strategic importance, and the numerous ruins of forts in the vicinity attest that this has long been recognized. Two or three miles to the E., on the other side of the river, is the Russian frontier post of Sarakhs, which is rapidly growing. M. W. H.

Sarasa'te, PABLO MARTIN MELITON: violinist; b. at Pamplona, Spain, Mar. 10, 1844; entered the Paris Conservatory Jan. 1, 1856, and gained the first prizes for solfeggio and violin; studied harmony in Reber's class, and soon started on a successful career as a concert violinist. He has traveled through Europe and the U. S., playing with the greatest success. He has a very large repertory and has composed much for the violin. D. E. H.

Sarasva'ti (i. e. River of pools): the name of several streams of India. The principal one is a string of pools 125 miles long (losing itself in the sand several times and often dry in places), which rises in the Siwalik hills in the Southeast Punjaub and empties into the Ghuggur, which lower down loses itself in the Bikanir desert. It is the sacred river of the *Rig-Veda*, where it is referred to as a powerful stream, "the finest of the seven sisters," "the first in beauty and abundance." Many shrines and sacred places are scattered along its course. M. W. H.

Saratoff': government of Russia; W. of the Volga, and S. of Penza and Simbirsk. Area, 32,624 sq. miles. Although a large portion of the government consists of desert steppes, much rye, wheat, and oats is exported, bees and silkworms are extensively reared, and fisheries, distilleries, and many kinds of manufactures are in operation. Pop. (1897) 2,419,756, among whom are about 120,000 Protestant Germans.

Saratoff: city of Russia; capital of the government of Saratoff; on the Volga; 500 miles by rail S. E. of Moscow (see map of Russia, ref. 8–F). It has many fine public build-

ings of stone, 2 cathedrals, 30 churches, and a museum with a fine-art gallery and a library. It manufactures cloth, linen, tobacco, leather, earthenware, rope, etc., has large breweries, distilleries, vinegar-factories, and foundries, and carries on an extensive trade in grain, cattle, and fish. Pop. (1897) 133,116.

Sarato'ga, Battle of: a decisive battle of the Revolutionary war in the North American colonies. Burgoyne, in command of the British forces, had crossed the Hudson Sept. 13 and 14, 1777, and encamped his army on the heights and plains of Saratoga. Gates, who commanded the Americans, had in the meantime moved his army up to Stillwater and taken possession of Bemis's Heights, to the S. of Saratoga, near the river—a strong position—which he fortified. On Sept. 19 Burgoyne attacked the left wing of the American army under Benedict Arnold, and succeeded in holding the field, though he sustained a loss of over 500 men, that of the Americans falling below 400. Burgoyne then discovered that he had a dangerous foe in his front. He also learned of the capture of his fleet of boats laden with supplies by Lincoln's militia in his rear, and the destruction of his communications with Canada; but, receiving promise of aid from Sir Henry Clinton from below by way of the Hudson, he fortified his position and awaited the latter's coming. As Clinton did not arrive, Burgoyne, finding himself in danger of being cut off from retreat, and his supplies being nearly exhausted, determined to risk a battle, and on Oct. 7 advanced at the head of 1,500 men, with six pieces of artillery. His right was at once attacked by a New Hampshire brigade and Morgan's riflemen. Arnold, who had been relieved from command after the battle of Bemis's Heights owing to some misunderstanding with Gen. Gates, and acting without orders, placed himself at the head of the troops, and with great daring and recklessness led them into action. The British lines were repeatedly broken and Burgoyne with difficulty regained his camp, but with the loss of his able second, Gen. Frazer. Gen. Arnold was also severely wounded in the leg. Renewing the assault, the Americans gained a lodgment in the camp, when darkness put an end to the conflict. During the night Burgoyne retreated and took possession of the heights in his rear. Afraid of being surrounded, he continued his retreat next day to Saratoga. As he received no aid from Clinton, and as every line of retreat was closed to him, it was decided in council to propose a cessation of hostilities while terms of capitulation were being negotiated. Gates at first demanded an unconditional surrender, which Burgoyne refused, but on the 17th terms were agreed upon—the British to march out with the honors of war, and be permitted to embark for England, on condition of not serving against the U. S. again during the war. The number of prisoners surrendered was 5,752. Gates's army numbered upward of 10,000. The terms of the surrender were not ratified by Congress, Burgoyne's army being retained as prisoners until the close of the war. Burgoyne and several other officers, however, were permitted to depart; forty-two guns, between 4,000 and 5,000 muskets, and a large supply of ammunition were among the valuable captures.

Revised by F. M. Colby.

Saratoga Springs: village (incorporated in 1826); Saratoga co., N. Y.; on the Adirondack, the Del. and Hudson, the Boston and Maine, and the Sar., Mt. McGregor and Lake George railways; 38 miles N. of Albany, 182 miles N. of New York (for location, see map of New York, ref. 4–J). It is in the foot-hills of the Adirondack Mountains, has a small valley running through its center, is one of the most famous summer resorts, and is noted for the number and variety of its mineral springs. It is also widely known for the political conventions that have been held here. The village has the Holly system of water-works, supplied from mountain springs; efficient fire department; electric street lights; 3 public parks, Woodlawn, Yaddo, and Congress; and a large number of costly summer residences. It has wide, clean streets and extensive drives.

There are nearly forty mineral springs, of which the best known are the Congress, Vichy, Hathorn, Arondack, Victoria, High Rock, Re-Me-Ho, Red, Columbian, Royal, Magnetic, Geyser, Patterson, Favorite, Excelsior, Empire, and the Star. They are alterative, diuretic, cathartic, and tonic (see also Mineral Waters), and the waters are shipped to all parts of the world. Four miles E. is Saratoga Lake, a favorite place for regattas, with a straight-away course 3 miles long and wide enough to accommodate eight racing sculls abreast. The Saratoga Racing Association has grounds near the village, with a mile-track and a grand stand accommodating 5,000 persons.

The principal public buildings are the new Convention Hall, seating 5,000 persons (cost $100,000); the town-hall, containing the courts and theater; and the armory of Company L (Twenty-second Separate Company), N. G. S. N. Y. Of hotels, the largest are the Grand Union, the United States, and Congress Hall. These, with eight other large, and numerous small ones, have accommodations for 40,000 guests. During the summer season they expend $40,000 for orchestral music.

There are 2 Presbyterian, 2 Baptist, 2 Methodist Episcopal, and Congregational, Protestant Episcopal, 6 Roman Catholic, Grace Pentecostal, and Christian Science churches. The educational institutions comprise seven public schools, including an academic and central grammar school, with enrollment of 2,500, and annual cost of $40,000, and the Temple Grove Female Seminary, with accommodations for 200 pupils. The charitable institutions include the Children's Home, the Saratoga and St. Faith's hospitals, and Home of the Good Shepherd, and St. Christina's Home. There are three libraries (Athenæum, Temple Grove Seminary, and Union Free School) with about 10,000 volumes, and a monthly, 1 daily, and 4 weekly periodicals. The annual receipts and expenditures of the village are about $125,000 each; bonded debt, $200,000; property valuation, $8,401,088. In 1901 there were two national banks, with combined capital of $225,000 and surplus of $175,000. The principal industries are the bottling of mineral waters and the manufacture of medical supplies.

The name Saratoga is derived from the Indian, meaning "Hillside of the Great River." The territory was deeded by the Indians to the Dutch in 1684. Rip van Dam was the first white owner of the original springs, and Sir William Johnson was the first who thoroughly tested their efficacy. The first hotel was established in 1774. Some of the mineral waters have been bottled and exported to various parts of the world since 1826. The Saratoga battle-field, where Gen. Burgoyne surrendered to Gen. Gates on Oct. 17, 1777, is 12 miles S. E. of the village. Pop. (1880) 10,820; (1890) 13,171; (1900) 12,409.

Philip S. Wakeley,
City Editor, "The Daily Saratogian."

Sarawak': a British dependency on the northwest coast of Borneo. It was granted in 1842 to Sir James Brooke, with the title of rajah, by the Sultan of Brunei. He was succeeded in 1868 by his nephew, Sir Charles Brooke, and in 1888 the state was placed under the protection of Great Britain. Area, 50,000 sq. miles. Pop. about 300,000, consisting of native races—Malays, Dyaks, Tayans, and Muruts, as well as some Chinese. The capital, Kuching, has about 25,000 inhabitants, and carries on a large and steadily increasing trade in timber, edible birds' nests, gutta-percha, sago, antimony ore, and rice, in exchange for which it imports European manufactures and tobacco. The revenue for 1893 was $457,122; expenditure, $478,198.

Revised by M. W. Harrington.

Sarcocol'la [= Lat. = Gr.; *σάρξ, σαρκός*, flesh + *κόλλα*, glue]: a nauseous gum-resin produced by *Penæa sarcocolla*, *P. mucronata*, *Sarcocolla vulgaris*, etc., evergreen shrubs of the order *Penæaceæ*, ranging from the Euphrates to the Cape of Good Hope. It is seldom used in civilized regions.

Sarcoph'agus [= Lat., from Gr. *σαρκοφάγος*; scil. *λίθος*, liter., flesh-consuming stone; *σάρξ, σαρκός*, flesh + *φαγεῖν*, eat]: primarily a limestone found in Assos in the Troad, used for making coffins which were supposed to have the property of destroying the corpse within a brief period. The name came thus to be applied to all stone coffins, and loosely also to any large coffin of other material. The earliest specimens are those of Egypt, which were made of granite, basalt, limestone, alabaster, and jointed wood. In the course of time the forms underwent considerable change. The earliest are from the fourth dynasty and are rectangular, with a flat or curved cover, with little or no ornamentation, and in the shape of an Egyptian house. From the Middle Kingdom the specimens are mainly of wood, the tops being intersected by lines of inscriptions, with figures of gods in the open spaces. Outside they were painted and adorned with false doors, while the interiors were adorned with sacred texts. In the New Kingdom both stone and wood were used, and a more artistic form employed. Sacred texts were placed on papyrus rolls instead of on the coffins, so that the flat sides were no longer needed for this purpose. As a consequence a

human shape was given to the coffins, and the deceased was thus represented lying at full length. In the latter dynasties the rectangular shape was again employed, and in Roman times the wooden coffin was customary. Among other peoples the sarcophagus has been more or less employed and various beautiful forms have been discovered, but their great cost has been an effectual bar to their general use. The name in its etymological significance has nothing to do with the Egyptian conception of the sarcophagus; rather the two are diametrically opposed. CHARLES R. GILLETT.

Sarcoplasm: See HISTOLOGY (*Muscular Tissue*).

Sar'cosine [from Gr. *σάρξ, σαρκός*, flesh]: a product of the decomposition of CREATINE (*q. v.*), the crystalline constituent of juice of flesh, discovered by Chevreul. It forms colorless crystals, soluble in water with ease, but insoluble in ether and with difficulty in alcohol. It is neutral in reaction, though it forms salts with acids, which react acid. Sarcosine is obtainable from other sources than from creatine, as by the action of methylamine on chloracetate of ethyl. Revised by IRA REMSEN.

Sard: See CHALCEDONY.

Sardanapa'lus [Latin form of the Assyrian name]: according to an inaccurate classic tradition, the last King of Assyria. He was noted for effeminacy and voluptuousness, and in order to escape falling into the hand of the besiegers of Nineveh ended his worthless life by burning himself in his palace. It seems certain that the original of Sardanapalus is Asshurbanipal, King of Assyria, 668–626 B. C. His brother, King of Babylon, who made war against him, was burned alive, and this may be the source of the story that Asshurbanipal was burned. It is also possible that one of his weak successors on the Assyrian throne met this fate, especially the one reigning at the time of the capture and destruction of Nineveh. Asshurbanipal's large harem was chiefly a matter of statecraft, a form of alliance with the kings of many other countries. The story related by late classic writers of the tomb erected for himself, with an epitaph stating that there is nothing of life beyond eating and drinking, had its rise, of course, in one of those triumphal monuments which Assyrian kings were accustomed to set up in conquered lands, like the one of Sargon, Asshurbanipal's great-grandfather, found on Cyprus in 1845. Asshurbanipal's title to fame and gratitude is the library of clay books in the cuneiform character which formed part of his palace treasures at Nineveh. Many thousands of these books are now in the British Museum. Cf. Carl Bezold's *Catalogue of the Cuneiform Tablets in the Kouyunjik Collection of the British Museum* (3 vols., London, 1889–93). Many of the best Assyrian bas-reliefs have likewise come from the palace of Asshurbanipal. D. G. LYON.

Sardes: See SARDIS.

Sardine [from Lat. *sardi'na* = Gr. *σαρδήνη*, kind of tunny caught near Sardinia, deriv. of *Σαρδώ*, Sardinia]: a name applied to a number of fishes belonging to the family *Clupeidæ*, and especially to those preserved in oils and inclosed in tin boxes. The true sardine of the Mediterranean and contiguous ocean is the *Pomolobus* or *Clupea pilchardus*, and a very near relative of this species (*Pomolobus sagax*) is found on the Californian coast. The sardine of the Mediterranean is dressed, salted, and partly dried, then scalded in hot oil, and finally hermetically sealed in tin boxes with hot salted oil or oil and butter. The spare space in each box is filled up with oil, and, the lid having been soldered on, the box is exposed for a short time to the action of steam or hot water. These cured sardines are largely exported to various countries, where they are esteemed as a delicacy. The real sardine is something like a small pilchard; but many of the fish cured as sardines, especially those prepared on the Atlantic coast of France, are sprats, pilchards, or small herrings. The sardines of the U. S. and British North America are small herrings, and even the menhaden (*Brevoortia menhaden*). See FISHERIES. Revised by F. A. LUCAS.

Sardin'ia: an island belonging to Italy in the Mediterranean Sea, nearly midway between Spain and Italy and between Europe and Africa; and S. of Corsica, from which it is separated by the Strait of Bonifacio, 7½ miles wide. It is divided into the two provinces of Cagliari and Sassari. Area of the island, 9,294 sq. miles. Pop. (1893) 741,362. A range of mountains—whose highest peak, Gennargentu, situated nearly in the center of the island, rises 6,233 feet—traverses the island from N. to S., and sends out branches to both sides. These mountains are in some places completely naked and barren, but in others they are covered with forests or with fine pastures, and almost everywhere they contain marble, alabaster, lead, copper, iron, rock-crystal, etc., though mines and quarries are not much worked. Between the offshoots of the central range lie large table-lands or slightly sloping valleys, in which sandy and stony districts alternate with tracts of fertile soil. Along the coasts, which are in most places steep and rugged, are found extensive salt-marshes and lagoons, which are very unhealthful owing to malaria. Some improvement, however, is being effected by drainage-works. Agriculture takes the first place among the occupations of the inhabitants, in spite of backward farming and heavy taxation. Wheat, maize, and beans, wine, olives, figs, and oranges, tobacco, linseed, cotton, hemp, cheese, butter, and wool are raised in large quantities. Horses are extensively bred, and considerable numbers of cattle, sheep, etc., are kept. The fisheries along the coasts, especially of tunny, anchovies, and sardines, are valuable, but are mostly in the hands of foreigners. Salt is the only manufacture of any importance. In 512 B. C. the island was conquered by the Carthaginians, from whom it was wrested by the Romans in 238 B. C. For several centuries after the time of Tiberius it prospered greatly, and was one of the principal granaries of the Roman empire. While owing allegiance to the Eastern empire and the popes it was overrun by the Goths, Vandals, and Saracens. In 1406 it came into the possession of Aragon, and, after a brief period of Austrian rule, in 1720 was given to the house of Savoy, under which it was long neglected. Old forms of society kept the majority of the population in ignorance and indolence, while feudal tenure and feudal jurisdiction were not finally abolished until 1856. Revised by R. A. ROBERTS.

Sardinia, Kingdom of: a former kingdom, comprising Savoy, Piedmont, Genoa, and Sardinia, with a total area of 28,769 sq. miles, and a population of over 5,000,000. It was formed Aug. 24, 1720, by a treaty between Austria and Victor Amadeus II., Duke of Savoy. The house of Savoy began to make itself felt in the history of Europe as early as the eleventh century, partly by the fidelity and vigor with which its members supported the emperors against the popes, partly by the shrewdness with which they managed to profit by the wars between Germany and France, in which they could not help being implicated. In 1111 Amadeus III. was created Count of Savoy by the Emperor Henry V., and in 1416 Amadeus VIII. was created Duke of Savoy by the Emperor Sigismund. In the war of the Spanish Succession (1700–13) Duke Victor Amadeus II. (1675–1730) was a claimant for the Spanish throne, and by the treaty of peace at Utrecht (1713) he received the island of Sicily and the title of king. Sicily he was compelled to yield to Austria in 1720, but as a compensation he received the island of Sardinia, from which he took his title of king, and thus was formed the kingdom of Sardinia. In 1831 the elder line of the house of Savoy failed, and the younger line ascended the throne with Charles Albert (1831–49). In his foreign policy Charles Albert was rather unsuccessful, but his interior administration was prudent and vigorous. The material resources of the country were developed with great sagacity, and the state was brought to a most prosperous condition. In 1848 he granted a free constitution, and the whole of Italy looked naturally to Sardinia and Charles Albert as the leaders in a war for liberty and independence. Charles Albert declared war against Austria, but on Mar. 23, 1849, was thoroughly defeated at Novara. He resigned the crown to his son, Victor Emmanuel II., who succeeded in the task of uniting the scattered Italian nation into one free state, for a history of which see ITALY.

Sar'dis, or **Sardes** [= Lat. = Gr. *Σάρδεις*; Turk. *Sart*]: ancient city of Asia Minor; capital of Lydia; situated at the foot of Mt. Tmolus, on the river Pactolus. Under Cræsus and its subsequent masters, the Persians, it was one of the wealthiest and most magnificent cities of Asia Minor. Declining under the Romans, and utterly destroyed by earthquake during the reign of Tiberius, it was rebuilt but never regained its former importance. In 1401 it was razed to the ground by Tamerlane, and its site has been almost abandoned ever since. Among its ruins a theater, stadium, gymnasium, the temple of Cybele, and two early churches may be distinguished. One of the "seven churches of Asia" was at Sardis (Rev. iii. 1–5). E. A. GROSVENOR.

Sardonyx: See CHALCEDONY.

Sardou, sär'doo', VICTORIEN: dramatist; b. in Paris, Sept. 7, 1831; studied medicine, then history; gained his liveli-

hood as a teacher and by writing for papers, magazines, and cyclopædias; tried his fortune as a dramatist in 1854 with the *Taverne des Étudiants*, which failed; tried again in 1860 with *Candide* and *Monsieur Garat*, which succeeded: and then wrote a number of plays with a rapidity almost unparalleled: *Les Pattes de Mouche*, *Piccolino*, *Les Femmes fortes*, and *Nos Intimes* in 1861; *Les Ganaches*, *La Papillonne*, and *Les Premières Armes de Figaro*, in 1862; *Bataille d'Amour* and *Les Diables noirs* in 1863; *Don Quichotte* and *Les Pommes du Voisin* in 1864; *Les Vieux Garçons* and *La Famille Benoîton* in 1865; *Nos Bons Villageois* and *Maison neuve* in 1866, etc. Most of these plays made a great and decided success, and the author took rank by general consent as the first playwright of his age, ruling the stage wherever there is one. The most prominent of his later works are *Séraphine* (1868); *Patrie* (1869); *Fernande* (1870); *Divorçons* and *Daniel Rochat* (1880); *Odette* (1881); *Fédora* (1882); *La Tosca* (1887); *Cléopâtre* (1890); *Thermidor* (1891); *Gismonda* (1894). He received the decoration of the Legion of Honor in 1863, and was received as member of the French Academy May 23, 1878. Revised by A. G. Canfield.

Saree′: town; in the province of Mazanderan, Persia; on the Tejen, 18 miles from its mouth in the Caspian Sea (see map of Persia and Arabia, ref. 2–H); center of a rich and fertile country; is an old place, mentioned by Firdausī, but long ago lost its importance. In 1836 cholera destroyed nearly the whole population, and since that time it has been rising very slowly. Pop. estimated at 8,000.

Sargas′so Seas [*Sargasso* is from Span. *sargazo*, seaweed]: areas in the North Atlantic, North Pacific, and other oceans, having an abundance of the seaweed *Sargassum bacciferum*. The best known is that in the North Atlantic, which is the central area of a whirl of currents, and is a region of light winds. It extends from the Azores to the Antilles, and from lat. 16° N. to lat 38° N., but the sargasso is most abundant W. of lon. 45° W. The seaweed is found in the Gulf Stream and neighboring waters, and is often cast upon the shores of the West Indies and Florida. In the Sargasso Sea it is in streaks, often scores of feet long, or in islands which may cover many acres, but the outlines of which are constantly changing. It forms a thin superficial layer and offers no resistance to ships. There are twenty to twenty-five plants, on the average, to each square mile, and each plant when pressed together makes from a pint to a quart when wet, or about one-eighth of this when dry. The plant vegetates freely on the Sargasso Sea, but has not been found fructifying there. Its color is greenish olive, varying with age from yellowish to whitish, and bears many berry-like lumps or floats. The patches of seaweed have a veritable fauna of fish, crustaceans, and molluscs numbering sixty or seventy species, several of which have developed marked features of protective imitation. One remarkable fish (*Antennarius marmoratus*), 2 to 4 inches long, can be distinguished from the plant only by close inspection. The Sargasso Sea has remained substantially in the same place and with the same characteristics for the 400 years since Columbus's first voyage. Mark W. Harrington.

Sargent, Aaron Augustus: U. S. Senator; b. at Newburyport, Mass., Sept. 28, 1827; was in early life a printer and editor; emigrated to California in 1849; studied law while editing *The Nevada Journal*; was admitted to the bar 1854; was district attorney of Nevada County 1855–56; vice-president of the Republican national convention at Chicago 1860; M. C. 1861–63 and 1869–73, and U. S. Senator for the term 1873–79. Became U. S. minister to Germany 1882; resigned in 1884. He was the author of the first Pacific railway act passed by Congress. D. in San Francisco, Cal., Aug. 14, 1887.

Sargent, Charles Sprague: arboriculturist; b. in Boston, Mass., Apr. 24, 1841; graduated at Harvard College 1862; from that time served in the Union army until the close of the civil war, attaining the rank of major; then traveled in Europe; appointed director of the Arnold arboretum and botanic garden of Harvard College in 1872, holding that position six years; in 1878 appointed Arnold Professor of Arboriculture in Harvard College; in 1879 became special agent of the tenth census to collect statistics in regard to the forests of the U. S.; became head of the forest division of the northern transcontinental survey; in 1888 became editor of *Garden and Forest*; has written many papers for scientific and other journals on botany, forestry, etc. He is the author of *Report on the Forests of North America* (being vol. ix. of the *Reports of the Tenth Census of the United States, 1883*); *The Woods of the United States, with an Account of their Structure, Qualities, and Uses* (1885); *The Silva of North America* (begun in 1891); and *Notes on the Forest Flora of Japan* (1894).

Revised by Charles E. Bessey.

Sargent, Epes: journalist and author; b. at Gloucester, Mass., Sept. 27, 1813; educated at the Boston Latin School and Harvard College; was editorially connected at different times with the Boston *Advertiser* and *Atlas* (1837), the New York *Mirror* (1839) and *New Monthly Magazine* (1843), and the Boston *Evening Transcript* (1846). In 1847 he settled at Roxbury, near Boston, and devoted himself entirely to literary work. He was an industrious compiler of readers and speakers for schools; edited many reprints and collections, and wrote a number of successful plays, such as the *Bride of Genoa* (1836) and *Velasco* (1837), besides tales for the young, poems, and novels, some of which were once popular, but are mostly forgotten. Some of his songs were spirited and were set to music. The best known of them is *A Life on the Ocean Wave*. Perhaps his *Life of Henry Clay* (1842) and his *Songs of the Sea* (1847) have the best title to remembrance among his original writings. D. in Boston, Dec. 31, 1880. H. A. Beers.

Sargent, John Singer: portrait and figure painter; b. in Florence, Italy, of American parents, in 1856; pupil of Carolus Duran, Paris; honorable mention, Paris Salon, 1878; second-class medal, Paris Salon, 1881; medal of honor, Paris Exposition, 1889; Legion of Honor, 1889. He was one of the greatest modern portrait-painters. His works are distinguished by consummate technical skill, and are excellent in the representation of character. He painted many portraits in Paris, London, New York, and Boston. He lived in Paris for a number of years, from about 1872 to 1885, then went to London. He visited the U. S. in 1888, 1889, and 1891. His picture of a Spanish dancer, *La Carmencita*, first exhibited in New York in 1890, was bought by the French Government in 1892. He was a member of the Society of American Artists (elected 1880), an associate of the National Academy, a member of the Société Nationale des Beaux-Arts, Paris, and a member of the Royal Academy (1897). D. Apr. 13, 1900. W. A. C.

Sargent, Winthrop: soldier; b. at Gloucester, Mass., May 1, 1753; graduated at Harvard 1771; became captain of one of his father's ships 1775; navy-agent at Gloucester 1776; served at the siege of Boston as captain of artillery, and subsequently in the Long Island, New Jersey, and Pennsylvania campaigns, attaining the rank of major; was connected with Gen. Rufus Putnam's Ohio Company; was made by Congress surveyor-general of the Northwest Territory 1786; became its secretary 1787; was its Governor 1798–1801; was adjutant-general of St. Clair's expedition against the Miami Indians 1791, and in Wayne's expedition 1794–95, being wounded in the former; was a member of the American Academy of Arts and Sciences and of the Philosophical Society, and an original member of the Society of Cincinnati as delegate from Massachusetts; aided Dr. Benjamin S. Smith in preparing his *Papers Relative to certain American Antiquities* (1796); published *Boston*, a poem (Boston, 1803); was Governor of Mississippi Territory 1790, and again 1801. D. in New Orleans, June 3, 1820.

Sargent, Winthrop: author; grandson of Maj. Winthrop Sargent; b. in Philadelphia, Pa., Sept. 23, 1825; graduated at the University of Pennsylvania 1845, and at Cambridge Law School 1847; practiced his profession in Philadelphia, and subsequently in New York; edited from original MSS., with a valuable introductory memoir, *The History of Braddock's Expedition against Fort Duquesne* (Philadelphia, 1855); edited *The Loyalist Poetry of the Revolution* (1857) and several reprints of curious Revolutionary tracts: and was author of *The Life and Career of Major John André, Adjutant-General of the British Army in America* (Boston, seventy-five copies only, 1861), a work of extraordinary research. He wrote largely for *The North American Review* and other magazines; was an accomplished bibliographer; was for many years engaged in preparing a *catalogue raisonné* of books relating to America (unfinished). D. in Paris, France, May 18, 1870.

Sar′gon [Assyr. *Sharru-kenu*, the true king]: King of Assyria 722–705 B. C.; founder of the last and most illustrious Assyrian dynasty 722–606 B. C. He appears to have been a usurper, though probably of royal stock. Numerous records

of his reign, written on clay cylinders and prisms and on alabaster tablets, are extant, and give a full picture of the royal activity. He was a great general and waged successful wars with the Chaldæans, Egyptians, Philistines, Hebrews, and many other peoples. In his first year he took Samaria, carried the leading inhabitants of Israel into exile, repeopled the land by captives from Babylonia and elsewhere, and thus put an end to the kingdom of Israel. But for the monuments, one might suppose (from 2 Kings xvii.) that this was done by Shalmaneser, the predecessor of Sargon. In the closing years of his reign he built a new palace at *Dûr-Sharru-kenu*, near Nineveh, where he was murdered 705 B. C. (See ASSYRIA and ASSYRIAN EXPLORATIONS.) In *Die Keilschrifttexte Sargons* (vol. i., Leipzig, 1889) Hugo Winckler has given all accessible Sargon inscriptions in transliteration and German translation. The preface to this volume gives the earlier bibliography; vol. ii. (Leipzig, 1889) gives the inscriptions in the cuneiform. D. G. LYON.

Sarma'tia (in Gr. Σαρματία): the ancient name for the vast regions extending from the Baltic to the Black Sea, and from the Vistula to the Volga.

Sarmiento, sär-mi-en'tō, DOMINGO FAUSTINO: statesman and educator; b. at San Juan (now in the Argentine Republic), Feb. 15, 1811. He was poor, and from his sixteenth year engaged in teaching, for which he showed a great aptitude; the idea of promoting popular education became a passion with him even while his own studies were hampered by lack of means. In 1829 he fought against Rosas and Quiroga, and was forced to fly to Chili. Returning to San Juan in 1836, he established a newspaper; this, though not a political sheet, was seized, and after suffering imprisonment he again fled to Chili. Encouraged by Manuel Montt and others, he was able to carry out some of his educational schemes, established a normal school at Copiapó, and from 1844 to 1847 traveled in Europe and the U. S., studying school systems. The results of these studies were embodied in 1847 in a report to the Chilian Government, which was published and had a wide circulation. In 1852 he took part in the overthrow of Rosas. From that time, aided by the Government, he devoted himself to the cause of popular education in Buenos Ayres and the provinces. In 1856 he organized the department of public instruction, of which he became the chief. He was Minister of Public Instruction 1860, and of the Interior 1861; subsequently was governor of San Juan and minister to the U. S., and while occupying the latter position was elected president of the Argentine Republic. During his term, Oct. 12, 1868, to Oct. 12, 1874, the Paraguayan war was brought to a successful close, and an insurrection was put down. The president was indefatigable in promoting education; schools and colleges were founded in all parts of the country; American and European teachers were invited to Argentina, and a national observatory was established. At the same time railways and other improvements were rapidly pushed forward. Dr. Sarmiento was debarred from re-election only by the constitutional provision. Among his numerous published works are biographies of Lincoln and Quiroga, and *Civilización y barbarie*. D. at Asuncion, Paraguay, Sept. 11, 1888. HERBERT H. SMITH.

Sarmiento de Gambo'a, PEDRO (often written *Pedro de Sarmiento Gamboa*): navigator; b. in Galicia, Spain, about 1530. He was long prominent on the Peruvian coast, and was with Mendaña in the discovery of the Solomon islands, 1568. In 1579 he was sent from Callao with a fleet of eleven vessels to explore the Strait of Magellan and intercept Drake, who was expected to return that way; Drake crossed the Pacific and returned by the Cape of Good Hope; but Sarmiento explored the coasts of the strait and returned in 1580 to Spain, where he submitted a report of his voyage (since published). Philip II. resolved to fortify the strait; for this purpose he dispatched Sarmiento, toward the end of 1581, with twenty-four vessels and 2,500 men; Diego Flores Valdez was associated with him. Eight vessels were lost in a storm, and at the entrance of the strait Valdez deserted with twelve more. In Jan., 1583, Sarmiento established a colony of 300 men at San Felipe (afterward called Port Famine), and returned to Europe, but was captured by an English cruiser and kept a prisoner until 1588. Nearly all the colony died of starvation; a survivor was rescued by Cavendish in 1587, and another by Meriche in 1589. Sarmiento died soon after his release. HERBERT H. SMITH.

Sar'nia: a port of entry; capital of Lambton county, Ontario, Canada; is situated at the head of Lake St. Clair, and opposite the Michigan town of Port Huron, and is the terminus of a tunnel under the St. Clair river (see map of Ontario, ref. 5–B). Point Edward (formerly Port Sarnia) is a northern suburb of the town. Sarnia has thriving manufactures, and extensive commerce by rail and steamers. Pop. (1891) 6,693.

Sar'no: town of Southern Italy, province of Salerno, about 12 miles N. of the city of Salerno (see map of Italy; ref. 7–F). It is situated on the western slope of the spur of the Apennines which divides the valley of the Volturno from that of the Sarno. Silk, cotton, linen, and hempen fabrics are manufactured and exported. Besides the more common products of Southern Italy, cotton is grown extensively in the vicinity. Pop. 11,680.

Sarpe'don (in Gr. Σαρπήδων): in Grecian mythology, son of Zeus and Laodamia, grandson of Bellerophon, Prince of Lycia. He fought on the side of Troy in the Trojan war, and was slain by Patroclus. His body was carried back to Lycia by the brothers Sleep and Death, where it was given honorable burial by his kinsmen. The story is told in the *Iliad* of Homer. J. R. S. S.

Sarpi, saar'pĕe. PIETRO, commonly known under his monastic name, Fra PAOLO: ecclesiastic and historian; b. at Venice, Aug. 14, 1552; entered the order of the Servites in 1565; became provincial in 1579 and procurator-general in 1585. As such he resided at Rome, where he enjoyed great favor at the papal court, and kept up constant intercourse both with leading churchmen like Bellarmine and with the foremost scientists of the day. While his eagerness for knowledge was thus stimulated, his faith seems to have been weakened and he was regarded with suspicion. In 1588 he returned to Venice and devoted himself for some years to the study of mathemathics, physics, astronomy, and medicine. Several important discoveries—that, for instance of the circulation of the blood—have been ascribed to him, but the evidence in his favor is insufficient. In 1606 the republic chose him her counselor and theologian in the controversies with Pope Paul V. concerning the relations between Church and state. Sarpi opposed the papal claims with great energy, and wrote several works against the censures pronounced by Rome, and especially against the interdict under which the Venetian republic was placed. At different times attempts were made upon his life, and, in spite of his caution, he was dangerously wounded Oct. 5, 1607. After his recovery he was offered a private residence by the government, but he preferred to spend the rest of his days in his monastic cell, where he died Jan. 14, 1623. His chief work, the *Istoria del Concilio Tridentino*, was published in London in 1619, through the agency of Marco Antonio de Dominis, and under the pseudonym *Pietro Soave Polano*. It was translated into English in 1629 and 1676. It was ably written, but its partisan spirit and erroneous statements called forth several rejoinders, the principal one being Pallavicini's work on the same subject (1656). A collected edition of his works, including his letters, appeared at Venice in 6 vols. in 1677. His *Life* was written by Bianchigiovini in 1836 and by Miss A. G. Campbell in 1875. See also T. A. Trollope, *Paul the Pope and Paul the Friar* (London, 1860), and *Fra Paolo Sarpi, the Greatest of the Venetians*, by Rev. Alexander Robertson (London, 1894). These accounts are favorable. On the other side, see Giusto Fontanini, *Storia Arcana della Vita di Pietro Sarpi* (1863); C. Cantu, *Gli Eretici d'Italia* (1870); and the *Civiltà Cattolica*, sixth series, vol. xii. (1867). J. J. KEANE.

Sarrace'nia [Mod. Lat., named in honor of Dr. Sarrasins, of Quebec]: a genus of North American herbs of the family *Sarraceniaceæ*, remarkable for the expanded petal-like style, and especially for the hollow pitcher-shaped leaves (see PITCHER-PLANTS), usually half full of water, and containing many drowned insects. Of the six species *S. purpurea* is the commonest. Its roots, and those of *S. variolaris*, at one time had a great reputation as a remedy in smallpox.
Revised by CHARLES E. BESSEY.

Sarsaparilla [from Span. *zarzaparrilla*; *zarza*, bramble, and probably Parillo, the name of a physician]: the dried roots of certain species of smilax, indigenous in the northern part of South America and in Central America, especially *Smilax officinalis* and *S. medica*. The medicinal species of smilax are climbers, growing from a large woody rootstock, from which long fleshy roots grow horizontally in all directions. These vary in thickness from that of a quill to that of the little finger, and consist of a thick cortical portion covered with a thin epidermis of various colors, a

thin ligneous layer, and a central medulla, which often abounds in starch. The roots have scarcely any smell, but when chewed produce a disagreeable acrid impression in the mouth, which persists for some time. Sarsaparilla contains a crystallizable principle called parillin, upon which such medicinal virtues as the drug possesses most probably depend. There are various sorts of sarsaparilla, obtained from different localities, which are most easily grouped into the mealy and non-mealy, according to the proportion of starch they contain. Of the mealy are Honduras, Guatemala, and Brazilian or Lisbon sarsaparilla, and of the non-mealy Jamaica, Mexican, and Guayaquil. Sarsaparilla was at one time held in high esteem as a medicine, principally as a remedy for syphilis, but it is now accorded but feeble power, and where used is prescribed simply to assist the action of more potent drugs. Revised by H. A. Hare.

Sarsfield, Patrick, Earl of Lucan: Jacobite soldier; b. in Ireland about 1645; served on the Continent in the English Life Guards, under the Duke of Monmouth, and against him at Sedgmoor 1685; was at the Revolution a member of the Irish Parliament; adhered to the cause of King James; fought at the battle of the Boyne July 1, 1690; compelled William III. to raise the siege of Limerick Aug., 1690; commanded the Irish reserve at the battle of Aughrim July 12, 1691; exhibited great gallantry in the second defense of Limerick; retired to France with a corps of Irish volunteers; distinguished himself at Steenkirke Aug., 1692, and was killed at the battle of Landen July 19, 1693.

Sartain', Emily: See the Appendix.

Sartain, John: engraver, designer, and literary editor; b. in London, England, Oct. 24, 1808; became an engraver; and did some important work, including some of the plates for William Young Ottley's works on early Italian prints. He removed to the U. S. in 1830, and settled in Philadelphia. He is generally thought to have introduced mezzotint engraving into America. He also practiced oil-painting and miniature-painting on ivory and vellum. Afterward he was editor and proprietor of *The Foreign Semi-monthly Magazine*, and having bought *The Union Magazine* renamed it, making it *Sartain's Union Magazine*. He designed several public monuments, among which is that to Washington and Lafayette in Monument Cemetery, Philadelphia. His *Reminiscences of a Very Old Man* was published in 1899. D. in Philadelphia, Oct. 25, 1897. Revised by Russell Sturgis.

Sartain, Samuel: See the Appendix.

Sartain, William: See the Appendix.

Sarthe, särt: department of France, extending on both sides of the Sarthe; comprises an area of 2,396 sq. miles. The surface is mostly level, and the soil often light and sandy. Wheat and wine are produced, but the rearing of cattle, poultry, and bees is the chief occupation. The manufactures comprise iron, glass, porcelain, and faïence. Capital, Le Mans. Pop. (1896) 425,077.

Sarti, Giuseppe: composer; b. at Faenza, Italy, Dec. 28, 1729; received his musical education in Bologna; composed his first opera in 1752, *Pompeo in Armenia*, which had success; was director of the opera at Copenhagen 1756–65; visited London in 1769–70; was chapel-master at the Cathedral of Milan 1779–84; went in that year to St. Petersburg as director of the opera. D. in Berlin, July 28, 1802. He composed over thirty operas, of which none, however, made any great impression, but of his church music his terzetto, *Amplius Lava Me*, is still remembered. He was the teacher of Cherubini.

Sarto, Andrea, del; properly Andrea d'Agnolo, named *del sarto*, or [son] of the tailor, from his father's calling: painter; b. probably at Gualfonda, in Tuscany, in 1487. It is commonly stated that his family name was Vannuechi. He was apprenticed to a goldsmith, then to Giovanni Barile, a Florentine painter of no eminence, and finally to Piero di Cosimo, an artist of ability, with whom Andrea remained for some years. He was still a very young man when he painted the frescoes at the convent of the Servi, in Florence, on the square of the Annunziata, and those of the convent of the Scalzo in the old Via Larga, now Via Cavour. By the time he was twenty-five he was one of the best fresco-painters in Florence, and also a consummate painter in oil. From that time until his death he was the generally accomplished artist, capable of any kind of work, and incapable, in a sense, of error, as his nickname, *Andrea senza errore*, suggests. Without great elevation of style or much originality of conception, he was still a painter of delightful pictures, the color of which is especially to be enjoyed. In 1518 he went to the court of France and painted for King Francis I., and the story is told that the king intrusted money to him to be used in the purchase of pictures in Florence, and that Andrea misappropriated it. He was certainly in Florence again in 1521, and never left Italy, and rarely Florence, after that time. D. in Florence, Jan. 22, 1531. Of his numerous frescoes, those in the convent of the Servi represent scenes in the legendary *Life of St. Philip*, a *Birth of the Virgin*, in which a lovely female figure is asserted to be a portrait of the artist's wife, and a *Procession of the Magi*. In a cloister adjoining is the noble fresco of the Holy Family called *La Madonna del Sacco*, because St. Joseph is leaning on a large full sack. The frescoes in the Scalzo convent are in monochrome, a series of biblical subjects with ornamental borders. At Poggio a Caiano is a very important fresco of *Cæsar receiving Tribute*. Of his easel-pictures one of the finest is in the Louvre, *Charity*. There are also there two pictures of the *Holy Family* and an *Annunciation*. In the London National Gallery is a valuable portrait of himself. In the Pitti Palace there are two *Annunciations*, a *Deposition from the Cross*, the portraits of himself and wife, and a dozen other pictures of value. In the Uffizi Gallery is the *Madonna di San Francesco*. Very many other paintings are to be seen in public and private galleries throughout Europe. Russell Sturgis.

Sarto'ris, Adelaide (*Kemble*): See Kemble.

Sarts: a name applied to the sedentary natives, as distinguished from the nomads, in Turkestan and neighboring parts of Central Asia, whatever their ethnic relations, but sometimes limited to the sedentary population of Turkish language and relationship in Russian Turkestan. As thus limited they number about 700,000, are homogeneous, devoted to trade, are Mohammedans, and have a considerable sacred literature. M. W. H.

Sartwell, Henry Parker, M. D., Ph. D.: botanist and physician; b. at Pittsfield, Mass., Apr. 18, 1792; surgeon in the U. S. army during the war of 1812–15; settled at Bethel, Ontario co., N. Y., 1821, and at Penn Yan 1832; for more than forty years was an enthusiastic botanical collector, forming an herbarium of 80,000 species, owned by Hamilton College, Clinton, N. Y. About 1846 he devoted his whole time to the study of the genus *Carex*, and brought out *Carices Americanæ Septentrionalis Exsiccatæ* (2 parts, New York, 1848; part iii. unfinished). D. at Penn Yan, Nov. 15, 1867.

Saskatch'ewan: district of the Northwest Territories of Canada, between lats. 52° N. and 55° N., with Keewatin and Manitoba on the E. and Alberta on the W. Area, 107,092 sq. miles. It is a well-watered and wooded country, thickly scattered with lakes, especially in the northern half, and is crossed from W. to E. by the Saskatchewan river. It is generally level or gently rolling, but a series of lofty hills follow along the south bank of the river just named. A large part of it is considered suitable for colonization, and it is made accessible by a railway extending from Prince Albert southward to Regina on the Canadian Pacific Railway, and by the Saskatchewan, which is navigable. The population in 1891 was 11,150, of whom over half were Indians and nearly one-fourth half-breeds. The latter are mostly of French descent, and, with a few of pure French race, are for the most part settled about Batoche on the South Saskatchewan. The agricultural products are yet small, and include live stock, wheat, barley, oats, peas, and potatoes. There is also a considerable production of pelts, mostly musk-rat. The chief settlements are Battleford and Prince Albert. Mark W. Harrington.

Saskatchewan River: a river which rises on the eastern slope of the Rocky Mountains in two main branches, flows eastward for about 1,200 miles, and empties into Lake Winnipeg. A few of the minor branches of the South Saskatchewan have their sources in the U. S. It is a part of the drainage system that reaches Hudson Bay through Nelson river, which is one of the great hydrographic basins of North America. From the junction of the North and South Saskatchewan to Lake Winnipeg the river flows through the deserted bed of Lake Agassiz. The sources of the north and south branches are stated by Dr. Hector to be but a few miles apart, in a nucleus of lofty summit-glaciers about lat. 51° 40′ N., lon. 117° W., near Mt. Hooker, 15,700, and Mt. Brown, 16,000 feet in height, where the Rocky Mountains are 200 miles in breadth. Thence diverging 300 miles apart midway, they unite at 550 miles in direct distance eastward,

the course of the north branch being about 836 miles, the south branch about 903 miles. At 260 miles up the latter it receives Red Deer river, about 445 miles long, on the left. About 177 miles up the north branch it receives on the right Battle river, nearly 400 miles long. Measured in August, the volume of water flowing in the north branch was 25,264, and in the south branch 34,285 cubic feet per second, or very little more than the mean of the Rhine. A little below their junction it measured 59,667 cubic feet per second. At 333 miles farther it enters Cedar Lake, 30 miles long; at 20 miles from which it enters Lake Winnipeg, descending 60 feet, 43½ of which is in the Grand Rapid, 2¾ miles long, commencing 5 miles from the mouth. The last 2 miles are swift waters. The Saskatchewan is narrow, varying from 220 to 660 yards in width below the forks. In the south or lesser branch navigation is obstructed at low water by shoals and shifting sandbars. By warping up two rapids, steamboats can easily ascend from the head of the Grand Rapid to Fort Edmonton on the north branch, 850 miles, and probably very nearly to Rocky Mountain House, 160 miles higher. The average ascent in the 894 miles is 15 inches per mile. Revised by I. C. Russell.

Sassafras [= Fr. from Span. *sasafras*, sassafras < Lat. *saxifraga*, saxifrage. See Saxifrage]: the *Sassafras officinale*, a tree of the family *Lauraceæ*, common in the eastern parts of the U. S., from Massachusetts to Iowa, Kansas, and southward. Its leaves are aromatic and highly mucilaginous, and the bark of the root is a powerful stimulant, with a pleasant taste and smell. It has considerable use in medicine, but is employed principally for flavoring.
Revised by Charles E. Bessey.

Sassafras-nuts: See Pichurim Beans.

Sassafras, Oil of: a highly fragrant essential oil, obtained from the root of the sassafras-tree, which contains from 1 to 2 per cent. of it. It is heavier than water; boils at 430° F. Saint-Evre gives as its composition $C_{20}H_{20}O_4$.

Sassan'idæ: name of a celebrated Persian dynasty. It was founded in 226 by Ardshir, or Artaxerxes, son of Sassan, who overthrew the Arsacidæ and reigned as Shahinshah, king of kings, till 240; it ended in 651. The reign of the Sassanidæ was a period of national glory and prosperity. The boundaries of their empire were extended and its resources developed, though engaged in almost ceaseless struggle with the Romans or the Byzantines. Sapor I. (240–273) defeated the Emperor Valerian at Edessa, took him prisoner, and, having flayed him alive, hung up his skin in a temple. Sapor II. (310–381) conquered Armenia and defeated the Romans in eight battles, in one of which, at Ctesiphon, the Emperor Julian was slain (363). Chosroes I. the Great (531–579) ruled from the Indus to the Mediterranean, from the Jaxartes to Egypt and Arabia. The dominions of Chosroes II. (591–628) reached the Thracian Bosphorus, but he was overcome by Heraclius I. Yesdigerd III. (632–651) was defeated at the battle of Cadesiah, after which Ctesiphon was destroyed and the Persian royal crown sent to the Caliph Omar at Medina. E. A. Grosvenor.

Sas'sari: town of Sardinia; capital of the province to which it gives its name, in the northwest portion of the island, about 12 miles from the seashore (see map of Italy, ref. 7–B). The commerce of Sassari is almost entirely carried on by the Genoese. The principal exports are oil, grain, and cheese. It formed an independent republic from 1294 to 1323. Pop. (1893) 41,200.

Sassy-bark: one of the ordeal drugs of Western Africa. It is the bark of the *Fillæa suaveolens* or *Erythrophlœum guineense*, a large tree of the order *Leguminosæ*. Like the Calabar bean, it is a very poisonous narcotic, administered in Africa to supposed witches. Its properties are not well understood.

Sas'tean Indians: a linguistic stock formerly inhabiting Siskiyou co., Cal., in Shasta and Scott river valleys, and along the Klamath from beyond Bogus creek to the hills above Happy Camp, and extending into Oregon as far as Ashland. Their southeastern limit was Mt. Shasta. The stock comprised three divisions: the Autiré of Shasta valley, with nineteen villages and about 1,140 souls in 1851; the Édohwe, with twenty-four villages containing about 1,440 inhabitants on Klamath river, where a few of them still remain; and the Iruwai of Scott valley, with a population of about 420 in seven villages. The Sastean Indians had a reputation of being skilled in warfare, and in 1855 they and the Rogue river Indians participated in the rebellion of the Oregon tribes. This revolt ended in their subjugation, and most of their number have since been placed on Grande Ronde and Siletz reservations, Oregon, where in 1885 they numbered about sixty-seven, including seventeen half-bloods. Although commonly called Shasta, or Shastika, the more correct form of the name is Sásti, a term probably containing the Palaihnihan word *tchastl*, signifying three. They have also been called Saiwash, but their aboriginal appellation is Kútikĕkanaí. The Sastean language seems to show a slight affinity with that of the Palaihnihan Indians. See Powers's *Tribes of California* (in *Contributions to North American Ethnology*, iii., Washington, 1877). F. W. Hodge.

Satan [= Lat. = Gr. Σατᾶν = Heb. *Sātān*, liter., adversary, deriv. of *sātān*, be adverse, persecute]: a name which occurs only three times in the later books of the Old Testament as the proper name of a power or personality: in Zach. iii. 1, as opposing the heavenly purification of Joshua, the high priest; in Job i. 6–9, 12; ii. 1–4, 6, as one of the heavenly court and as the tempter of men; and in 1 Chron. xxi. 1, as leading David astray to number the people. It is true that the popular fancy pictured the waste places to be full of malignant spirits (Sēīrīm, Shēdhīm, Līlīth, Azazel, etc.); but the idea of God was conceived of by the prophets as too high to admit of any power being able to oppose or even to complement his power. With increased theological speculation on the problem of evil, however, the malignant spirits were developed into *a* malignant spirit. The change is readily seen in 1 Chron. xxi. 1. In the parallel older narrative (2 Sam. xxiv. 1) it is God himself who leads David astray. It seems probable that the philosophical dualism of Zoroaster had some influence upon this development. In the *Avesta*, Ahriman (Auro-Mainyu), as the principle of evil, is coeval, coequal, but not coeternal with Ahura-Mazda. The parallelism becomes more complete in the later development of this idea in the Zoroastrian doctrine on the one hand, and in the Jewish and Christian on the other. Ahriman is called the arch-devil (Devāna Devo); he has under him a whole army, spreads lies, and is the origin of evil, death, and darkness; but, in the end, right will triumph and evil be destroyed. In the Apocrypha we find only two mentions of Satan: Sirach xxi. 27; and Wisdom ii. 24, where he is said to be the author of death. In Talmudic theology Satan is represented as the chief of all hurtful influences, is identified with the serpent, is said to have been born at the same time as Eve. He not only excites evil inclinations, but is identified with them. In order to lead man astray he takes on various forms. He then becomes his denouncer (κατήγορος). He is also, at times, the angel of death. In the New Testament we find the fullest development of this idea. Satan appears there under the names of Σατανᾶς, διάβολος, ἀντίδικος, ἔχθρος, ἀντεκείμενος, κατήγωρ, ὁ δράκων ὁ μέγας, Βεελζεβούλ, Βελίαρ, as the personification of evil, exciting to sin, and sowing lies. He is a supernatural being, who sinned even before creation, and attempts to lead men astray by all manner of guile. He stands at the head of a host of beings like unto him who enter into the physical body of man and beast, producing all manner of sickness. He has also power to bring death. But over Christ he has no power, for he has come to destroy the work of Satan: and as far as man becomes like Christ—without sin—in so far Satan has no power over him. At the end of this æon he will reign for a short time, only to feel again the power of Christ. The early Church endeavored to soften this apparent dualism (cf. Marcionites, Manichæans) by supposing that Satan was a fallen angel, an idea found also in Talmudic theology. See Devil and Zoroaster; also Cheyne, *Origin and Rel. Contents of the Psalter* (New York, 1891, p. 282); Kohut, *Jüd. Angel. und Daemonologie* (Leipzig, 1866, p. 62); *Real-Encycl. für protest. Theol. und Kirche* (Leipzig, 1885, vol. xv., p. 358); Weber, *Syst. der altsyn. Theol.* (Leipzig, 1880, p. 243). Richard Gottheil.

Sata'ra: ancient town of British India; capital of a district of the same name, in lat. 17° 41′ N., lon. 74° 1′ E. (see map of S. India, ref. 3–C). It has a fort, and is noted as one of the most salubrious and pleasant stations of the Deccan. Pop. (1891) 29,601. The district of Satara, with an area of about 5,000 sq. miles, and 1,075,000 inhabitants, came into the hands of the British in 1848, the rajah who had reigned under British authority dying without heirs.

Satellites: See Solar System, Jupiter, Mars, Moon, Neptune, Saturn, and Uranus.

Satin [from O. Fr. *satin*, from Ital. *setino*, deriv. of *seta*, silk < Lat. *sæta*, hair, whence Germ. *seide* and Fr. *soie*]:

a smooth and lustrous fabric of silk, of Chinese invention. Of the warp threads only one in every five or ten is raised to allow the shuttle to be passed, but each thread is raised in regular succession as the shuttle is thrown. It is woven with the right side uppermost.

Satin Bower-bird: See BOWER-BIRD.

Satinet: a coarse fabric, of which the warp is cotton and the weft woolen; originally, an inferior variety of satin.

Satin-spar: a fibrous variety of carbonate of lime, of snowy whiteness, found in England, Scotland, and elsewhere, which when polished has a luster resembling that of satin. A fibrous kind of GYPSUM (*q. v.*), also called satin-spar, is softer than the above, and is frequently made into ornaments resembling cat's-eye.

Satin-wood: a name given to several kinds of ornamental wood. The best is from Guiana, and is the wood of *Ferolia guianensis*, now included in the genus *Parinarium*. Florida satin-wood is from *Xanthoxylum floridanum*, a kind of prickly-ash tree. The West India satin-wood is from different trees, some of it of the very best and others of the poorest quality. The rich and fragrant satin-wood of India is usually of good quality. It comes from the *Chloroxylon swietenia*, a cedrelaceous tree which yields a sort of wood-oil. Satin-wood is used in making workboxes, hair-brushes, and cabinet-work. Revised by L. H. BAILEY.

Satire [viâ O. Fr. from Lat. *sa'tira*, *sa'tura* (sc. *lanx*, dish), a dish filled with various kinds of fruits, food composed of various ingredients, a mixture, medley, liter., fem. of *satur*, filled with food, sated]: a form of composition, which, as an attack on the weakness and wickedness of humanity, belongs to all mankind and to universal literature. Prose is at its service as well as poetry; it may take the shape of sermon as well as song. It may be dramatic, as in comedy, mask, and mummery. It may be epigrammatic, as in lampoon and pasquinade. It may be indirect, as in parody and travesty. It may be a formal diatribe; it may be an informal skit. Satire is older than comedy, for the *silli* of XENOPHANES (*q. v.*) were satirical and every phase of satire was represented in Greek literature. But the great models of satirical art are found in Roman literature. Whenever satire as literature is mentioned Horace and Persius and Juvenal come up to the mind, and the satire is assuredly most congenial to the Italian temperament, ancient and modern. Nor were the Romans slow to claim satire as their especial province. *Satura quidem*, says Quintilian (x., 1, 93), *tota nostra est*, and the loss of the Greek forerunners has enabled the Romans to make good their claim here as in the whole field of didactic poetry to which satire stands related as does the application to the sermon. The first appearance of *satura* in Roman literature is in the *saturæ* of ENNIUS (*q. v.*), where it is evidently a medley in verse; the *Saturæ Menippeæ* of VARRO (*q. v.*), of which we have considerable fragments, are in prose and verse, as is the so-called *Satiricon* of PETRONIUS ARBITER (*q. v.*).

The subjects of Ennius and of Varro covered a wide range, and their miscellaneous character corresponds to the original meaning of the word. In the hands of Lucilius the *satura* was largely used as an instrument for personal attack on the characters of those who had stirred the poet's indignation, and, though the fragments of Lucilius show that motley was the wear of his muse also, still the Lucilian satire has narrowed the range of the word, just as the mocking epigram has prevailed over all the other Greek forms, and just as elegiac has become synonymous with plaintive. In its function, then, the satire was assimilated to that especial form of the Old Attic comedy which dealt with personal abuse, the form known as the ἰαμβικὴ ἰδέα; and when the native historians of Roman literature followed the established fashion of paralleling Roman with Greek and tried to adjust the growth of Roman comedy to Aristotle's schemes for Greek comedy, the *satura* naturally took the place of the Old Attic comedy, and the resemblance was emphasized by Horace and Persius themselves. Cratinus, Aristophanes, and Eupolis were claimed as brothers of the same guild. In view then of the largely doctored accounts given by the Romans, both of their history and their literature, scholars may be forgiven for questioning the very existence of the dramatic *satura*, which is said to have been a manner of acted lampoon, akin to the rude *versus Fescennini* of the populace; and it has been recently maintained that this is only another Roman adaptation, another reconstruction of early Roman literary history after Greek models, just as so much Roman political history has been reconstructed after Greek models. Still it is not to be denied that there is a dramatic element in the classic satires of Rome. It comes out in sundry of the satires of Horace and is awkwardly conspicuous in Persius, but perhaps both these poets are simply living up to a theory. In Juvenal, the third of the great Roman satirists, the dramatic element is not a marked feature, and his declamatory rhetoric has had more influence on modern satire than Horace's *bonhomie*, or the priggish wisdom of Persius. By concentration, then, and crystallization the satire proper came to be as we still have it. Poetry became the medium and the hexameter the form, and though the satirical spirit might manifest itself in prose-fiction with interlarded verse, as in Petronius, or in the various measures employed by Catullus and Martial, satire as such had received its type, and that type is still potent. The accepted satire is in verse and that verse the heroic verse of the nationality—in French the alexandrine, in English the decasyllabic. French satire is represented by Boileau, English satire by Dryden and Pope, for Dryden and Pope are the models, not Butler—*Absalom and Achitophel* and the *Dunciad*, not *Hudibras*. Of course, if the term satire is widened to meet the definition given at the outset of the article it will be necessary to include a vast body of literature: Lucian and Apuleius, *Reynard the Fox*, *Tyll Eulenspiegel* (*Howleglas*), the *Piers Plowman* of Langland, the *Epistolæ Obscurorum Virorum*, and so on, down through moralists, essayists, and novelists without number, of all nationalities and of every century. Momus, the spirit of mockery and fault-finding, the son of Night, appears early in the list of Greek divinities, and his worship and his influence are universal. B. L. GILDERSLEEVE.

Satire Ménippée, să'teĕr'mā'neĕ'pā': a famous French satire, so called from the Greek philosopher Menippus, who used in his works the form of prose interspersed with verse, in which it is composed. It is due to the collaboration of Pierre Le Roy, Jacques Gillot, Nicolas Rapin, Jean Passerat, Florent Chrestien, and Pierre Pithou, and appeared in 1594, after having circulated privately in manuscript. It was aimed against the league, and its fuller title was *De la Vertu du Catholicon d'Espagne et de la tenue des Estats de Paris*. It reflects the temper of the bourgeoisie, worn out by the civil strife, and putting the peace and unity of their country above party. Good editions are those of Ch. Read (1876) and C. Labitte (1880). A. G. CANFIELD.

Satisfaction: See ACCORD AND SATISFACTION, JUDGMENT, MORTGAGE, PAYMENT, and RELEASE.

Satow, să'ō, Sir ERNEST MASON, K. C. M. G.: scholar and diplomatist; b. in London in 1842. Appointed student interpreter in Japan in 1861, he was present at the action at Kagoshima, Sept., 1863, and acted as interpreter at the bombardment of Shimonoseki, Sept., 1864. In 1876 he was promoted to be second secretary of legation at Tokio, and in 1883 received the decoration of the cross of St. Michael and St. George. During this period he had obtained a profound acquaintance with the language, history, and antiquities of Japan. In 1884 he was transferred to Siam as agent and consul-general at Bangkok, and became minister resident in the following year. He was transferred to Montevideo in 1888, and in 1893 became envoy extraordinary and minister plenipotentiary to Morocco, and in 1895 to Japan. He has published an English-Japanese dictionary, and has contributed valuable articles to the *Transactions of the Asiatic Society of Japan*. J. M. DIXON.

Satpura, săt-poo'răă [from Sanskr. *çata-*, hundred + *pu'ra-*, castle, fortified town]: a name originally restricted to the mountains which divide the Nerbudda and Tapti valleys, Northern India, but now generally applied to the great range or table-land which, commencing E. of the famous Amarkantak plateau, runs nearly up to the western coast. Accepting Amarkantak as the eastern boundary, the Satpuras have a range from E. to W. of about 600 miles, and in their greatest depth exceed 100 miles from N. to S. The shape of the range is almost triangular; from Amarkantak, 3,328 feet above the level of the sea, an outer ridge runs S. W. to a point in the Bhandara district. The average height at the crest of the chain is but little under 2,000 feet above the sea; the highest peak, Dhupgarh, in Hoshungabad, rises as high as 4,454 feet. Nearly the whole range consists of trap; toward the W. a series of craggy peaks is met with.

Satrap [viâ O. Fr. from Lat. *sa'trapes* = Gr. σατράπης, from O. Pers. *khṣatrapāvā*; *khṣatra-*, rule, power + *pā-*,

protect]: the ruler of a satrapy or province of ancient Persia. On the decline of the old kingdom some of the satrapics became independent monarchies.

Sat'suma: a province of Japan, at the southern end of the island of KIUSHIU (*q. v.*); chief town KAGOSHIMA (*q. v.*). The ruling family of Shimadzu has been represented during the nineteenth century by men of singular ability. Under them was reared a race of soldiers and statesmen who contributed the chief element in the downfall of the shogunate, and have, with the clan of Choshu, ruled Japan ever since. Satsuma ware owes its origin to Korean settlers, transported at the close of the sixteenth century. The art reached its perfection about 1840. This ware is of a cream color, and has a crackled surface.

Satsŭporo: See SAPPORO.

Satterlee, HENRY YATES: See the Appendix.

Satterlee, WALTER: See the Appendix.

Saturday [O. Eng. *Sæterdæg*, *Sæterndæg*, *Sæternesdæg*, liter., Saturn's day; Lat. *Satur'nus*, Saturn + O. Eng. *dæg*, day]: the seventh and last day of the week. It is the Jewish Sabbath, and is called *Dies Sabbati* in the Roman Catholic breviary.

Saturn (Lat. *Saturnus*): the ancient Latin god of planting and sowing, and hence of agriculture in the widest sense, the discovery of which was ascribed to him. He was conceived of as a mythical King of Latium, under whose peaceful reign the blessings of agriculture were first disclosed to the human race. His memory was cherished most faithfully by the laboring people and was perpetuated in the great popular festival of the SATURNALIA (*q. v.*), the observances of which were suggestive of the old Saturnian reign of plenty and equality. In later Roman mythology he was identified with the Greek Cronos. G. L. HENDRICKSON.

Saturn: the sixth planet in order of distance from the sun, and the third of the superior planets. It travels at a mean distance of 887,000,000 miles from the sun. Saturn circuits its orbit in a period of 10,759·2198 days, or 29 years 167·2 days. Its synodical period, or the interval between successive oppositions, exceeds a year by about 12¾ days on the average. Its volume exceeds the earth's about 700 times, but the mean density is so small that its mass exceeds the earth's only about 93 times. In fact the mean density is less than that of any other member of the solar system (except, of course, the comets), being only ·13 when the earth's is taken as unity; if the density of water be taken as the unit, that of Saturn is about ·73, or less than the density of mahogany. Its mean diameter is about 70,000 miles, its compression about $\frac{1}{10}$, so that the polar diameter is about 3,500 miles less, and the equatorial diameter about 3,500 miles greater. Saturn is distinguished among all the planets by the remarkable complexity of structure and by the number of subordinate bodies of which it is the center. The gigantic orb is girt by a mighty system of flat rings, visible even in a very small telescope, the span of which from outside to outside amounts to 167,000 miles, or more than six times the circumference of the earth. There are two chief bright rings, the outermost nearly 10,000 miles in width, the innermost about 17,500 miles in width, while between them there is a gap about 1,500 miles across. Inside the system of bright rings there is a dark ring (discovered by the elder Bond, of Harvard Observatory), which has a breadth of about 8,700 miles. Between this ring and the planet intervenes a space more than 10,000 miles in breadth. After a careful investigation, in which Laplace, Peirce, Bond, and Clerk Maxwell have taken part, astronomers have been led to the conclusion that the rings are not continuous bodies, but consist of multitudes of small satellites, mixed probably with vaporous matter, traveling in flat flights around the central orb. This is, in fact, the only possible interpretation of the actual existence and continuance of the rings; for no system of continuous rings could continue to travel in dynamical equilibrium around Saturn, or bear the strains to which the tremendous attractive power of Saturn would subject them. The globe of Saturn is marked, like that of Jupiter, by belts, but they are less distinct. The tint of the planet as a whole is yellowish, but the belts show considerable variety of color. An equatorial belt, nearly always seen, is a creamy white; the dark belts on either side are commonly cinnamon-colored; while the polar regions show a faint tinge of azure. As in the case of Jupiter, the conclusion to which we are led by the careful study of these belts and of the probable condition of Saturn's globe is, that we do not see a solid or liquid orb, but only the outer parts of a deep and cloud-laden atmosphere. In fact, the general evidence in Saturn's case is identical with that of Jupiter, and there are some points which afford even more convincing evidence as to the condition of these planets.

Satellites—Saturn is attended by eight satellites, which move in orbits outside the ring. All but the outer one move in the plane of the ring. The brightest of all is Titan, which was therefore the first discovered, having been found by Huyghens as far back as 1656. The faintest satellite is Hyperion, next outside of Titan, which was discovered by Bond, of Cambridge, Mass., and two days later by Lassell, in England, in 1848. This satellite exhibits a remarkable peculiarity in its perturbations by Titan, resulting in a revolution of its pericenter occurring in less than twenty years, and in a curious libration between the two bodies. These perturbations form a very interesting chapter in celestial mechanics, which has so far defied the efforts of the best mathematicians to work out a complete and satisfactory solution.

The outer satellite of all is Iapetus, which has the remarkable peculiarity of being much brighter on one side of the planet than on the other, showing that it performs a revolution on its axis in the same time that it revolves around the planet, and that it is much whiter on one side than on the other.

The positions of the satellites of Saturn can be found at any time from a diagram given annually in *The American Ephemeris*. The following is a list of these satellites, with their times of revolution:

ELEMENTS OF SATURN'S SATELLITES.

NAME.	Sidereal revolution.	Distance in radii of Saturn.
	d. h. m.	
Mimas	0 22 37	3·360
Enceladus	1 8 53	4·312
Tethys	1 21 18	5·339
Dione	2 17 41	6·839
Rhea	4 12 25	9·552
Titan	15 22 41	22·145
Hyperion	21 7 7	28·000
Iapetus	79 7 53	64·359

S. NEWCOMB.

Saturna'lia [= Lat., liter., neut. plur. of *Saturna'lis*, pertaining to Saturn, deriv. of *Satur'nus*, Saturn]: the old Latin festival of the god Saturn, celebrated in ancient Rome with feasting and mirth. Slaves were permitted freedom of speech and act, and all classes threw off care and toil. During the republic it was celebrated on Dec. 17; Augustus made it embrace the 17th, 18th, 19th, but popularly it included seven days. Of these seven days, the first two were the true Saturnalia, and the three following were the Opalia, in honor of Ops, while the last two were called Sigillaria, from the *sigilla* or clay toys exchanged as presents at that time. The Christian Christmas festival has retained in many parts of the world traces of the observances of the Saturnalia.
Revised by G. L. HENDRICKSON.

Saturnian Verse: See METRES.

Sat'yr-drama: in Greek literature, the fourth play of the tetralogy, which was made up of a tragic trilogy and this afterpiece. It received its name from the chorus, which was regularly composed of satyrs. The action was taken from mythology and not from everyday life, and the tone was merry. The satyr-drama held most faithfully, of all dramatic forms, to the original character of the Dionysiac festival, and may be regarded as a survival of the time preceding the perfected organization of tragedy. It was, in fact, a tragedy drunk with new wine, and in the Æschylean stage of the trilogy the subject of the satyr-drama was so chosen as to burlesque the fundamental theme and thus relieve the tension of the spectators. Æschylus, whose tragic strain often comes perilously near the line of travesty, was the greatest master of the satyr-drama, but the only extant specimen of a complete satyr-drama is the *Cyclops* of Euripides, made familiar to English readers by the translation of Shelley, who was attracted to it by the spirit of revolt.
B. L. GILDERSLEEVE.

Satyrs [from O. Fr. *satire* < Lat. *sa'tyrus* = Gr. *σάτυρος*, satyr]: in Grecian mythology, the companions of Dionysus, dæmons of the forest, akin to the mountain nymphs and the

dancing Kuretes. In their earliest form they were caricatures of the elder or bearded Dionysus: they were half-animal, and were depicted in early vase-paintings with long sharp-pointed ears, long horse-tails, long hair, and long, pointed beards. They were half-animal, not only in form, but in character: they were lustful and sensual, and vase-paintings represent them as ravishers of the nymphs and Bacchantes, and even of Iris. This antique type of satyr was supplanted by a less sensual type, which was created by Praxiteles in his famous statue, and has remained the norm of the Satyr. In the Satyr of Praxiteles we have the Puck of antiquity, the figure of a lusty youth, in which the animal nature is brought out by the goat-ears, the teat-like protuberances (*oscilla*) on the neck, the animal cast of countenance, stump nose, bristly hair, thick lips, cynical smile, and diminutive tail. In some cases sprouting horns on the forehead indicate a transition stage between the Satyr and Pan and Panisks. The Satyr must be carefully distinguished from Pan and Silenus, and especially from the Faunus of the Romans, a creation that arose from their confounding the Satyrs and Pans. J. R. S. Sterrett.

Saugerties, saw'ger-teez: village: Ulster co., N. Y.: on the Hudson river at the mouth of Esopus creek, and on the West Shore Railroad: 12 miles N. of Kingston, the county-seat (for location, see map of New York, ref. 7–J). It is in an agricultural region, has good water-power for manufacturing, and ships large quantities of bluestone, limestone, and agricultural products. There are 7 churches, 4 graded schools forming Union Free School District No. 10, a parochial school, a Young Men's Christian Association with library and reading-room, a national bank with capital of $200,000, a state bank with capital of $125,000, a savings-bank, manufactories of paper, blank books, brick, and wood-pulp, and a daily, a monthly, and 2 weekly periodicals. Pop. (1880) 3,923; (1890) 4,237; (1900) 3,697.

Editor of "Daily Post."

Saugor: island and town of India. See Sagar.

Sauk Center: city (founded in 1857): Stearns co., Minn.: on the Sauk river, and the Gt. North. and the N. Pac. railways: 117 miles N. W. of St. Paul, the State capital (for location, see map of Minnesota, ref. 8–C). It is in an agricultural region, has several flour-mills and other manufactories, and contains 10 churches, public graded and high schools, private academy and training school, a national bank with capital of $50,000, 2 private banks, and 2 weekly newspapers. Pop. (1880) 1,201; (1890) 1,695; (1900) 2,220.

Editor of "Herald."

Sauk Rapids: village (located in 1850): capital of Benton co., Minn.: on the Mississippi river, and the Gt. North. and the N. Pac. railways: 75 miles N. W. of St. Paul, the State capital (for location, see map of Minnesota, ref. 8–D). It has excellent water-power and extensive quarries of fine granite, is engaged in farming and dairying, and contains 6 churches, high school, German Lutheran school, steam sawmill, planing-mill, feed-mill, and 2 weekly newspapers. Pop. (1880) 598; (1890) 1,185; (1900) 1,391.

Editor of "Sentinel."

Saul [from Heb. *Shā'ūl*, liter., asked for]: the first King of Israel, a son of Kish, of the tribe of Benjamin; was anointed by Samuel; fought with great success against the Philistines, Moabites, Ammonites, Edomites, and Amalekites, and governed well in the earlier part of his reign, but afterward became possessed of "an evil spirit from the Lord," committed great cruelties, and fell, together with three of his sons, in the battles of Mt. Gilboa against the Philistines, about 1055 B. C. The history of the latter part of Saul's reign is simply a part of the history of David. For further details concerning Saul, see the articles David and Jews.

Saulcy, sō see', Louis Félicien Joseph Caignart, de: numismatist and Hebraist: b. at Lille, France, Mar. 19, 1807; studied at the École Polytechnique; was appointed Professor of Mechanics at the military school of Metz in 1838, and shortly after keeper of the museum of artillery; gained celebrity first as a numismatist by his *Essai de Classification des Suites monétaires byzantines* (1836); studied Assyrian and Celtic inscriptions, and wrote *Les Campagnes de Jules César dans les Gaules* (1850), but devoted himself more especially to Hebrew antiquities; visited the Holy Land in 1850, and wrote *Voyage autour de la Mer morte et dans les Terres bibliques* (2 vols., 1852–54); *Études sur la Numismatique judaïque* and *Histoire de l'Art judaïque* (1858); *Voyage en Terre-Sainte* (1865); *Les Derniers Jours de Jérusalem* (1866); *Histoire d'Hérode* (1867); *Étude chronologique des Livres d'Esdras et de Néhémie* (1868); and *Sept Siècles de l'Histoire judaïque* (1874). D. in Paris, Nov. 4, 1880.

Saulsbury, Willard: U. S. Senator; b. in Kent co., Del., June 2, 1820; educated at Delaware and Dickinson Colleges; was admitted to the bar 1845; was attorney-general of Delaware 1850–55, and U. S. Senator 1859 to 1871, when he was succeeded by his brother Eli (b. Dec. 29, 1817; d. Mar. 22, 1903), who was re-elected for third term Jan. 16, 1883. In 1874 Willard Saulsbury was appointed chancellor of Delaware. D. at Dover, Apr. 6, 1892. Another brother, Gove, was Governor of Delaware 1865–71.

Sault Sainte Marie, soo sānt-mā ree. Fr. pron. sō sānt-maā ree: village; port of entry; district of Algoma, East Ontario, Canada; on the St. Mary river, the St. Mary Falls Ship-canal, and the Canadian Pac. Railway; opposite the city of the same name in Michigan; 622 miles W. of Montreal (see map of Ontario, ref. 6–H). It has a water-power canal, electric-light plant, a pulp and paper mill operated by water-power (cost over $1,000,000), branches of the Imperial Bank of Canada and the Canadian Bank of Commerce, schools for Indian boys and girls, and two weekly newspapers. The village is in an agricultural and mineral region, is a popular summer resort, and is the seat of the Anglican Bishop of Algoma and of the Roman Catholic Bishop of Northern Canada. Pop. (1891) 2,414. Chase S. Osborn.

Sault Sainte Marie: city; capital of Chippewa co., Mich.; on the St. Mary river, near the outlet of Lake Superior, the ship-canal around the rapids, and the Duluth, S. Shore and Atlantic, and the Minneapolis, St. P. and S. Ste. Marie railways (for location, see map of Michigan, ref. 2–I). It is connected with a village of the same name on the Canadian side by an international railway bridge, 1¼ miles long, which cost $1,000,000. Navigation between Lakes Superior and Huron is facilitated by a lock and canal, which cost about $1,000,000. The U. S. Government is building a second lock, which will be the largest in the world, and will cost with improved approaches $5,000,000. The annual tonnage passing through the canal is greater than that of the Suez Canal. The city has direct connection by the bridge with the Canadian Pacific railways. There are 6 churches, 6 public-school buildings, public-school property valued at $75,000, parochial-school property valued at $8,000, 2 national banks with combined capital of $150,000, a State bank (savings) with capital of $50,000, a building and loan association, a monthly and 2 weekly periodicals, water and sewer plants, electric lights and street-railways, and an assessed valuation of $1,600,000. The industrial establishments include 23 sawmills, 2 cigar-factories, 2 brick-yards, 2 machine-shops, foundry, flour, shingle, and planing mills, shipyard and marine railway, and a branch of the State fish hatchery. Pop. (1880) 1,947; (1890) 5,764; (1900) 10,538. Chase S. Osborn, editor of "News."

Saumaise: See Salmasius.

Saumur, sō mūr': town of France, department of Maine-et-Loire: on the Loire: 30 miles S. E. of Angers: is famous for its rosaries made of cocoanut-shells, has manufactures of linens and cambrics, and trades in wine, corn, hemp, and spirits (see map of France, ref. 5–D). It was the seat of the celebrated Protestant academy founded in 1598 by the national synod of Montpellier, and suppressed by a royal edict of Jan. 8, 1685. That academy developed the first fertile school of criticism in modern theology. Pop. (1896) 16,440.

Saunders: See Santal-wood.

Saunders, Alvin: See the Appendix.

Saunders, Frederick: author; b. in London, Aug. 14, 1807; established himself in the publishing business in New York in 1836, and subsequently was for some time an assistant editor of the New York *Evening Post*. In 1859 he received the appointment of assistant librarian of the Astor Library, which office he continued to hold until the beginning of 1876, when he was made chief librarian or acting superintendent. He has published *Memories of the Great Metropolis* (1852); *Salad for the Solitary* (1854); *Salad for the Social* (1856); *Pearls of Thought* and *Mosaics* (1858); *Festival of Song* (1865); *About Women, Love, and Marriage* (1868); *Evenings with the Sacred Poets* (1871); a revised and illustrated edition of *Salad for the Solitary and the Social* (1872; new ed. 1883); *The Story of some Famous Books* (1887); and *The Story of the Discovery of the New World by Columbus* (1892).

Saunders. ROMULUS MITCHELL: jurist: b. in Caswell co., N. C., Mar. 3, 1791: studied at the University of North Carolina, but did not graduate: resided some years in Tennessee, where he was admitted to the bar 1812: returned to North Carolina; was a member of the Legislature 1815–20, and Speaker of that body two years: member of Congress 1821–27 and 1841–45: attorney-general of North Carolina 1828: president of the board of commissioners on claims against France 1833: judge of the Supreme Court of the State 1835–65, and deposed by Gov. Holden: minister to Spain 1846–50: again a member of the Legislature, and took a leading part in promoting the construction of railways in North Carolina. D. at Raleigh, Apr. 21, 1867.

Saunders. THOMAS BAILY: See the Appendix.

Saunders. THOMAS WILLIAM: legal writer: b. in England, 1813 (or 1814): entered the Middle Temple in 1832; called to the bar 1837: was employed as a revising barrister 1840–60: recorder of Bath 1860–78. He was a magistrate of the Thames police court from 1878 until within a few weeks of his death, and was remarkable for the leniency of his sentences. D. at Bournemouth, Hants, Feb. 28, 1890. He wrote numerous works, among the more important of which are *Law and Practice of Municipal Registration and Election* (2d ed. 1873): *Law and Practice of Orders of Affiliation, and Proceedings in Bastardy* (9th ed. 1888): *Practice of Magistrates' Courts* (5th ed. 1882): *Treatise on the Law of Warranties and Representations upon the Sale of Personal Chattels*: and *Treatise upon the Law Applicable to Negligence*. F. STURGES ALLEN.

Saunderson. NICHOLAS: mathematician: b. in Thurlestone, Yorkshire, England, in 1682: lost his sight by an attack of smallpox in infancy, but was carefully instructed by his father: learned Latin and Greek at academies: was taught the higher mathematics by private tutors, and displayed such mastery of all the allied sciences, including optics, that in 1707 he lectured upon them at the University of Cambridge, and on the recommendation of Sir Isaac Newton was in 1711 chosen to succeed Whiston as Lucasian Professor of Mathematics. D. Apr. 19, 1739. After his death appeared his *Elements of Algebra* (1740), to which was prefixed a biographical sketch by his son John. His *Method of Fluxions* appeared in 1756.

Sauppe, sowp pe, HERMANN: classical scholar: b. in Wesenstein, near Dresden, Saxony, Dec. 9, 1809: studied philology in Leipzig: was appointed professor at the University of Zurich in 1838, director of the gymnasium in Weimar in 1845, and professor at the University of Göttingen in 1856, where he remained till his death, Sept. 15, 1893. He edited (with Baiter) *Oratores Attici* (2 vols.): Philodemi, *De vitiis*, lib. x.: Plato's *Protagoras*, with German notes: Eugippi, *Vita S. Severini* for the *Monumenta Germaniæ* (1877). He is also the author of the famous *Epistola critica ad Godofredum Hermannum* (1841), and wrote numerous valuable articles on Greek epigraphy. His library was purchased by Bryn Mawr College, Pennsylvania. See Wilamowitz, *Nachrichten der Göttinger Gesellschaft der Wissenschaften* (1894), pp. 36–49.

Sauret. EMILE: See the Appendix.

Sau'ria [Gr. *σαῦρος*, lizard]: the group of reptiles commonly known as lizards. See LIZARD.

Saurin, *sō răn'*, JACQUES: preacher: b. in Nimes, France, Jan. 6, 1677: removed to Geneva after the revocation of the Edict of Nantes: studied theology; was chosen pastor of the Walloon church in London in 1701, and in 1705 of the Walloon church in The Hague, where he died Dec. 30, 1730. He was a powerful preacher, and several collections of his sermons have been often reprinted and translated into German and English. His *Discours sur les Événements les plus mémorables du Vieux et Nouveaux Testaments* (1720) also became very popular under the name of Saurin's Bible. There are English translations of his sermons, e. g. 2 vols., New York, 1860. See his *Life*, by E. A. Berthault (Paris, 1875). Revised by S. M. JACKSON.

Saurop'sida [Mod. Lat.: Gr. *σαῦρος*, lizard + *ὄψις*, look, appearance]: a group of vertebrates containing the reptiles and birds, which are thus united on account of many structural peculiarities which mark them off from the mammals on the one hand and from the fish-like forms (*Ichthyopsida*) on the other. In their development they have both amnion and allantois. (See EMBRYOLOGY.) In the adult the lower jaw is united to the skull by a quadrate bone: a parasphenoid bone is lacking: there is a single occipital condyle for articulation with the neck: and the cornoid bone, except in limbless forms, is well developed. They are either oviparous or ovoviviparous. Both have a tendency to develop scales on the surface of the body. Though birds and reptiles are seemingly very different, in the Mesozoic age there were many structural resemblances between them. J. S. K.

Sauru'ræ [Mod. Lat.: Gr. *σαῦρος*, lizard + *οὐρά*, tail]: a sub-class of birds characterized by a tail of many vertebræ, each vertebra bearing a single feather on either side. The digits of the hand are free from one another and clawed: the jaws furnished with teeth: the pelvis not ankylosed with the sacrum: the sternum small. The only known member of the group is the *Archæopteryx lithographica*, from the Jurassic slates of Solenhofen, Bavaria. See ARCHÆOPTERYX. F. A. L.

Saury, Saury-pike, or Skipper: a fish (*Scomberesox saurus*) of the family *Scomberesocidæ*. These fishes go in great shoals and are very active, leaping far above the surface of the water. Although small, they are esteemed for the table.

Sausali'to: town: Marin co., Cal.: on San Francisco Bay, and the N. Pac. Coast Railroad: 6 miles N. of San Francisco (for location, see map of California, ref. 7–B). It is a yachting, fishing, and bathing resort, and is principally engaged in agriculture, dairying, and stock-raising. A fine walk, leading around the promontory by way of Lime Point to Point Bonita, the north horn of the Golden Gate, affords good views of the entrance to San Francisco Bay. The town is the southern terminus of the railway, and has regular steamboat connection with San Francisco. Pop. (1880) 478; (1890) 1,334; (1900) 1,028.

Saussier. FÉLIX GUSTAVE: See the Appendix.

Saussure, *sō sür'*, HORACE BÉNÉDICT, de: physicist and geologist: b. in Conches, Switzerland, Feb. 17, 1740: studied under his uncle, Charles Bonnet, and under Haller, and was appointed Professor of Physics and Philosophy at the University of Geneva in 1762. In 1765 he began a series of scientific mountain excursions, crossing the Alps fourteen times by eight different routes, ascending Mont Blanc in 1787 and Monte Rosa in 1789, encamping for seventeen days on the Col du Géant, and visiting the Jura, Vosges, and Auvergne Mountains, Germany, England, Scotland, and Italy. The result was a multitude of the most valuable observations on the minerals, botany, geology, and meteorology of the countries he visited. These were published in his *Voyages dans les Alpes* (4 vols., Geneva, 1779–96). Among his minor works are *Sur l'Hygrométrie* (1783) and *De l'Eau* (1771). In 1786 he resigned his chair, but after the annexation of Geneva to France was appointed Professor of Natural History in the central school of the department of Léman. D. in Geneva, Jan. 23, 1799.

Sauzet. MARC: See the Appendix.

Savage. JAMES, LL. D.: antiquary: b. in Boston, Mass., July 13, 1784: graduated at Harvard 1803: was active in politics for a few years, after which he devoted himself to literary work. Besides publishing many pamphlets on historical and political subjects, he edited several works of importance relating to New England history. He compiled on the basis of Farmer's *Register* a Genealogical *Dictionary of the First Settlers of New England, showing Three Generations of those who came before May, 1692* (Boston, 4 vols., 1862–64), a work of great value, displaying extraordinary industry and research, but confused in plan, unequal in execution, and disfigured by the exhibition of spleen against many of the parties to the colonial controversies of the seventeenth century. D. in Boston, Mar. 8, 1873.

Savage. MINOT JUDSON: clergyman and author: b. in Norridgewock, Me., June 10, 1841: educated at Bowdoin College and Andover Theological Seminary, where he graduated in 1864: was a Congregational missionary in California: pastor of churches in Framingham, Mass., and Hannibal, Mo.: in 1873 became a Unitarian and took charge of a church in Chicago: and pastor of the Church of the Unity, Boston, 1874–80, when he succeeded Dr. Robert Collyer as pastor of the Church of the Messiah, New York. Among his numerous works are *Christianity the Science of Manhood* (Boston, 1875): *The Religion of Evolution* (1876): *Life Questions* (1879): *Poems* (1882): *Beliefs about the Bible* (1883): *My Creed* (1887): and *Evolution of Christianity* (1892).

Savage. RICHARD: poet: claimed to be the illegitimate son of Anne, Countess of Macclesfield, by Richard Savage,

Earl Rivers, alleging that he was born in London, Jan. 10, 1698; was reared in poverty. He obtained a tolerable education in a grammar school at St. Albans, and was afterward apprenticed to a shoemaker; but having displayed literary tastes, he went to London about 1716, where he obtained the patronage of Steele, and of Wilks and Mrs. Oldfield, the actors, and assumed the name of his alleged father. In 1717 he translated from the Spanish a play, *Woman's a Riddle*, which had a run of twelve nights; produced in 1723 a successful tragedy, *Sir Thomas Overbury*; in 1726 a volume of *Miscellaneous Poems and Translations*; in 1728 *The Bastard, a Poem*, which speedily ran through five editions; and in 1729 his best work, *The Wanderer, a Moral Poem*. In 1727 he was condemned to death for killing a man in a tavern brawl, but was pardoned in opposition to the wishes of his alleged mother; was then taken into the house of Lord Tyrconnel, but soon quarreled with his protector; subsisted thereafter upon money subscribed by Pope and his literary circle; obtained from Queen Caroline an annual stipend of £50 in consequence of some verses he had written on her birthday; resided several years at Bristol, where he was thrown into prison for debt Jan., 1743. D. there Aug. 1, 1743. He is now best remembered by the pathetic *Life* written by his friend Johnson. For an exposure of the improbability of Savage's story, see W. Moy Thomas in *Notes and Queries* (1858). Revised by H. A. Beers.

Savanilla: See Sabanilla.

Savan'na [from Span. *sábana*, large cloth, sheet, savanna (in this sense also *sabana*, with accent on second syllable) < Lat. *sa'banum* = Gr. *σάβανον*, linen cloth, towel]: a grassy plain in a tropical region, yielding pasturage in the wet season, and often having a growth of under-shrubs. It corresponds to the prairie of more northern latitudes. The word is chiefly used in tropical America.

Savanna: city; Carroll co., Ill.; on the Mississippi river, and the Chi., Mil. and St. P., and the Burlington Route railways; 10 miles W. of Mt. Carroll, the county-seat (for location, see map of Illinois, ref. 2–D). It is an important shipping-point, and has several manufactories, a State bank, and two weekly newspapers. Pop. (1890) 3,097; (1900) 3,325.

Savan'nah: city; port of entry; capital of Chatham co., Ga.; on the Savannah river and the Central of Ga., Seaboard Air Line, Plant System, and Southern railways, with regular lines of steamships to Baltimore, Phila., New York, and Boston; 18 miles above the mouth of the river (see map of Georgia, ref. 5–K). It has an excellent landlocked harbor, which has been improved by the U. S. Government since the war of 1861–65 by an expenditure approximating six millions of dollars, with 26 feet of water between the city and the bar. The city is built on a bluff 40 feet above the level of the river; has an area of 6 sq. miles; was laid out on a plan original with the founder, and is adorned with a large variety of ornamental trees and shrubbery. It has a thorough system of sewerage and drainage, and a water system supplied by 30 artesian wells.

Streets and Buildings.—The streets are laid out at right angles to each other, are lighted with electricity, and have over 25 miles of electric railway. There are 120 miles of streets and lanes, 27 miles being paved. There are fine shell and chert roads radiating from the city in all directions to the suburban resorts. Among the principal public buildings are the city-hall, erected in 1799; court-house; U. S. custom-house; U. S. court-house and post-office, built entirely of marble; Telfair Academy of Arts and Sciences, on the site of the residence of the Governor in colonial days; Hodgson Hall, in which are the library and collections of the Georgia Historical Society; the Independent Presbyterian church, the armories of the First Regiment of Georgia Infantry, First Regiment of Georgia Cavalry, Savannah Volunteer Guards, and the Chatham Artillery, next to the oldest artillery organization in this country; the Cotton Exchange and Board of Trade buildings; and the Savannah Theater, erected in 1818.

Parks and Resorts.—Savannah has 31 public squares and parks, with a total area of 63 acres. The principal park, located in the heart of the city, is Forsyth Park, 10 acres, noted for its beautiful fountain and the variety of its trees and flowers. Adjoining it is the Parade-ground, 21 acres, in the center of which stands a Confederate monument. The Parade-ground is used for military and other displays. Johnson Square contains a monument to Gen. Nathanael Greene, of Revolutionary fame, and fronting it is Christ Church, which John Wesley founded. Court-house Square contains a monument to William W. Gordon, the first president of the Central of Georgia Railway, erected by the railway, and a memorial to the Indian chief Tom-o-chi-chi, erected by the Colonial Dames. In Madison Square stands a granite and bronze monument to Sergt. Jasper, of Revolutionary fame. Monterey Square contains a tall marble shaft to Count Pulaski. The principal seaside resort is Tybee island, at the mouth of the river, fronting the ocean, with a beach extending five miles. At the northern extremity of the island is Fort Screven, one of the most extensive fortifications on the South Atlantic coast. Bonaventura, 4 miles S. E. of the city, one of the four cemeteries, is famed for its avenues of ancient live oaks, whose branches are draped with the gray Spanish moss.

Churches and Schools.—The city is the seat of a Roman Catholic bishopric, and contains 41 churches of various denominations. On the site of Christ Church, the oldest Protestant Episcopal edifice, John Wesley founded the first Sunday-school in America. The city has enrolled in the public schools 10,500 pupils; it has a public high school, 12 public-school buildings, and school property valued at over $400,000. There are three libraries; 15 charitable institutions; 20 or more social and literary clubs; 6 hotels; and 2 daily and 3 weekly newspapers and 2 monthly periodicals.

Finances and Banking.—In 1900 the city had a net debt of $3,196,350, and an aggregate assessed valuation of $37,108,077. There are 2 national banks with a combined capital of $800,000; 6 State banks with a capital of $2,250,000; 1 savings and trust company with a capital of $125,000, and 16 building and loan companies.

Business Interests.—Savannah is the third largest cotton-shipping port in the U. S., and is the largest naval-stores shipping port in the world. Besides cotton and naval stores it exports largely lumber and rice, and ships large quantities of fruit and vegetables to the Northern markets. In 1900 its exports of domestic merchandise aggregated in value $49,530,225 foreign, and $45,399,100 coastwise; and its imports of foreign goods, $512,456. Its principal manufactures are fertilizers, cotton-seed oil, soap, railroad cars, beer, yarn, rice-cleaning, foundry, machine, and boiler works. The city has over 200 manufacturing establishments, with a capital of over $4,000,000, and employing over 5,000 persons.

History.—The city was settled by Gen. James Edward Oglethorpe in 1733; repelled a British attack in 1776; was captured by the British in 1778; was besieged by Americans and French, 1779; and was held by British until the close of the war of the Revolution. It received a charter in 1789. In 1796 and 1820 it suffered severely by fire. At the beginning of the war of 1861–65 the forts in the harbor were seized by the State authorities, and during the war the city was a Confederate military post. General Sherman invested the city in Dec., 1864; the Confederates evacuated it and the Union army took possession on Dec. 21. Pop. (1880) 30,709; (1890) 43,189; (1900) 54,244.

Savannah: town; capital of Andrew co., Mo.; on the Chi., Gt. West. and the Burlington Route railways; 14 miles N. E. of St. Joseph (see map of Missouri, ref. 2–D). It is in an agricultural, fruit-growing, and stock-raising region, and contains 8 churches, a graded public school with high-school department, 2 State banks, 4 newspapers, a large flour-mill, and a creamery. Pop. (1890) 1,288; (1900) 1,886.

Editor of "Republican."

Savannah River: a stream which forms the boundary-line between Georgia and South Carolina. From its source to its mouth on Tybee roads its channel is 450 miles long, while the distance in a direct line is only 250 miles. With its tributaries it drains an area of over 8,000 sq. miles. The Savannah is a turbid stream, and the current in the upper portion of the river and its tributaries is rapid and carries a great deal of silt, particularly during the season of freshets. Bars are therefore formed in the broader portions of the river where the current is less rapid. At Savannah the mean rise and fall of tide is 6½ feet. The tidal wave ordinarily ascends to a point about 28 miles above Savannah. The river is navigable to Savannah for vessels drawing 26 feet of water, and by small vessels to Augusta, 231 miles.

Savart Wheel: See Recording Apparatus, Psychological, in the Appendix.

Savary, sȧȧ'vȧȧ'ree', Anne Jean Marie René, Duke of Rovigo: general; b. at Marcq, department of Ardennes, France, Ap. 26, 1774; entered the army in 1790; served on the Rhine, and in Egypt; was raised to the rank of colonel after the battle of Marengo, and in 1803 became general of brigade,

having in the meanwhile shown his skill as an administrator while head of the secret police. In 1804 he presided, as commander of the troops of Vincennes, over the execution of the Duke of Enghien. His greatest military exploit was the victory at Ostrolenka (Feb. 16, 1807) over the Russians, for which the emperor gave him a great dotation and made him Duke of Rovigo. His greatest diplomatic success was his intrigue at the Spanish court in 1808, which resulted in Joseph Bonaparte's ascending the throne of Spain. From 1810 to 1814 he was minister of police. After the fall of Napoleon he wished to accompany him to St. Helena, but was arrested on board the Bellerophon and kept in captivity at Malta. He escaped, went to Smyrna, returned in 1819 to Paris, and was finally reinstated in his titles and honors. In 1823 he again left France, and took up his residence in Rome, having fallen out with the French court on account of his *Sur la Catastrophe de Mgr. le Duc d'Enghien*, in which he made Talleyrand accountable for the execution of the duke. Louis Philippe recalled him, and made him, Dec. 1, 1831, commander-in-chief of Algeria, where he showed great activity. D. in Paris, June 2, 1833. His *Mémoires* (8 vols., 1828) give a history of the First Empire. F. M. C.

Savary, Nicolas: traveler and Orientalist; b. at Vitré, Brittany, France, in 1750; studied at Rennes and Paris; spent three years (1776–79) in Egypt and two years (1779–81) among the Greek islands; afterward lived in Paris till his death Feb. 4, 1788. Published *Letters on Egypt* (3 vols., Paris, 1781–85) and the *Koran* in French, with a *Life of Mohammed* (2 vols., Paris, 1783). Though an able scholar, he sacrificed clearness and accuracy to elegance and style, and his translation of the Koran is inferior to that of Kasimirski. E. A. Grosvenor.

Save, saav: a river of Austria; rises in the province of Carniola, flows through Croatia, forms the boundary between Slavonia and Bosnia, and joins the Danube at Belgrade after a course of 660 miles; navigable for 200 miles.

Savigny, sää'vēēn'yee', Friedrich Karl, von: jurist; b. at Frankfort-on-the-Main, Germany, Feb. 21, 1779; studied jurisprudence at Marburg, Göttingen, Leipzig, Halle, and Jena; was appointed professor at Marburg in 1800, at Landshut in 1808, at Berlin in 1810; was made a member of the court of cassation in Berlin in 1809; member of the council of state 1817; member of the revision of the Rhine province 1819; minister of justice in 1842; retired in 1848. D. in Berlin, Oct. 25, 1861. He was the leader of the historical school in jurisprudence, and exercised a great influence, both on the study of law and on legislation in Germany. His lectures on Roman law attracted large audiences, although his views of the Roman law system as the highest standard and most consummate model, and of our time as incapable of developing the idea of right in adequate forms, are considered extravagant. His principal writings are *Das Recht des Besitzes* (1803); *Vom Beruf unserer Zeit für Gesetzgebung und Rechtswissenschaft* (1814); *Geschichte des römischen Rechts im Mittelalter* (6 vols., 1815–31); *System des heutigen römischen Rechts* (8 vols., 1840–49); *Das Obligationenrecht* (2 vols., 1851–53), besides a number of minor essays, mostly historical, collected in his *Vermischte Schriften* (5 vols., 1850). Much of his writings has been translated into English. His biography was written by Rudorff (Berlin, 1863). Revised by F. Sturges Allen.

Savile, sāv'il, Sir Henry: scholar; b. at Over Bradley, near Halifax, England, Nov. 30, 1549; educated at Brasenose and Merton Colleges, Oxford becoming fellow of the latter and lecturer on mathematics; traveled on the Continent in 1578, and on his return became Greek and mathematical tutor to Queen Elizabeth 1578. He was made warden of Merton 1585, provost of Eton 1596; was knighted by James I. 1604, and founded at Oxford the Savilian professorships of geometry and astronomy 1619, giving his library for their use. D. at Eton College, Feb. 19, 1622. He translated the *History* and the *Agricola* of Tacitus (1581), edited the *Latin Chronicles* of English history (1596), and brought out a magnificent edition of the complete works of Chrysostom (8 vols., 1610–13).

Saville, George: See Halifax, Marquis of.

Savin [O. Eng. *safinæ*, *savine*, from Lat. *sabi'na*, savin, shortened from *Sabi'na her'ba*, savin, liter., Sabine herb]: a berry-bearing evergreen shrub, *Juniperus sabina*, of the order *Coniferæ*, growing on rough lands of Europe and Asia, and found also in Canada, but rarely in the U. S. It has a strong, almost fœtid scent, which frequently causes headache. Its leaves abound in an acrid essential oil isomeric with turpentine oil. Savin oil and tops are sometimes used by abortionists, but, if effectually, only at the utmost peril of the patient's life. It is sometimes useful in chronic rheumatism, amenorrhœa, and other diseases. H. A. H.

Savings-banks: institutions for receiving and securely investing the moderate savings of industry, under provisions for their repayment on demand or at short notice. They are managed as a rule by persons having no interest in the profits of the business, which are divided at stated intervals among the depositors.

Origin and Early History.—The first savings-bank appears to have been founded at Brunswick, Germany, in 1765. In the latter part of the eighteenth century several banks of this kind were established in different parts of Germany and Switzerland. They were introduced to the notice of the English public by Jeremy Bentham, who in 1797 proposed a well-devised system of "frugality banks," to constitute a branch of the pauper system of the Government. In 1798 the Rev. Joseph Smith, of Wendover, proposed to the poor of his parish to receive from them during the summer sums as small as twopence, which he would return to them in the winter season with an addition of one-third as a reward for their providence. Of course this was more benevolence than banking. The scheme of Mrs. Priscilla Wakefield, of Tottenham, inaugurated in 1799, embraced the deposit of moneys by women and children only, to whom pensions were to be granted when they reached a certain age. Moneys were allowed to be withdrawn only in exceptional cases. In 1801 the scheme was somewhat expanded, and a savings-bank incorporated as a feature. A more practical organization of this effort was effected in 1804. An undertaking was organized at Bath in 1808, under the patronage of Lady Isabella Douglas, for the benefit of domestic servants only, which approached more nearly the ideal of savings-banks, as subsequently defined and understood, than those previously considered.

The first savings-bank of the modern type in Great Britain was organized by the Rev. Henry Duncan, of Ruthwell, Scotland, in 1810. Its success, as compared with previous efforts, was marked and decisive, and the fame given to it through the writings and labors of Dr. Duncan directly promoted the organization of savings-banks upon a similar plan in various parts of the kingdom. The Edinburgh savings-bank, though claiming an earlier origin, appears to have been established in 1814. It adopted a less complex and more popular form of organization and procedure than that of Dr. Duncan, and this became the model upon which savings-banks were organized thereafter.

The period of exclusively voluntary or unincorporated organization in the establishment of savings-banks in Great Britain terminated in 1817, when two acts were passed by Parliament designed to encourage, protect, and regulate these institutions in Ireland and England. These acts were virtually, if not in terms, repealed in 1828 by a new act, which was thereafter recognized as the "governing statute" concerning savings-banks. This statute was modified and amended from time to time until 1863, when an entire revision and consolidation of the laws relating to savings-banks was effected. The course and character of the legislation affecting this interest may be briefly but sufficiently outlined as follows: Trustees have at all times been prohibited from deriving any profit from the transactions. The moneys received were to be deposited in the Bank of England or of Ireland to the credit of the commissioners for the reduction of the national debt, and by them were to be invested in 3 per cent. bank annuities. The Government guaranteed to the trustees a specific rate of interest on the moneys deposited by them to the credit of the commissioners. This rate, under the acts of 1817, was £4 11*s.* 3*d.* per cent., but was subsequently reduced to £3 16*s.* 0½*d.*, and finally to £3 5*s.* per cent. per annum. The rate of interest to be paid to depositors was at first left to the discretion of the trustees, but was afterward limited so as not to exceed £3 0*s.* 10*d.* per cent. The rate paid has varied in different institutions, and still varies from the limit fixed by law to as low as £2 10*s.* per cent. Deposits were limited originally to £100 the first year, and £50 in any year thereafter; this was afterward changed, and the limit fixed at £30 in any year and £150 in all, or £200 including interest. Depositors were also prohibited from keeping an account in more than one savings-bank, but might transfer an account from one bank to another. The significance of these restrict-

ive provisions will be seen in the fact that in the years from 1817 to 1872 the interest paid by the Government to savings-banks exceeded that which it had received from investments on their account by the sum of £4,169,427 10*s.* 5*d.* As an incentive to industry and economy, and a check to pauperism, the Government could afford to bestow this bounty upon savings-banks, but only upon terms that would tend to exclude from any considerable share in it the opulent classes, whom the liberal interest allowed and the security afforded by savings-banks would naturally attract. Trustees in England are made liable only for their own personal malfeasance, but in Ireland they are made liable for losses, unless by their rules they limit their liability to a fixed sum, which is not to be less than £100. The Government has never conceded its liability to make good the losses sustained by savings-banks, though in one instance of exceptional hardship Parliament appropriated £30,000 as a partial restitution to depositors.

The following table gives the number of depositors and the balance to the credit of savings-banks, including interest, on the books of the national debt commissioners in quinquennial periods from 1817 to 1882. The year 1861 is also included, as marking the highest limit reached by savings-banks before their decadence. This began under competition with the post-office savings-banks, from which, however, the savings-banks afterward recovered:

Year ending Nov. 20.	Number of depositors.	Amount to credit of savings-banks.	Year ending Nov. 20.	Number of depositors.	Amount to credit of savings-banks.
1817.....	*9,291	£231,028	1857.....	1,366,560	£35,255,722
1822.....	*204,584	6,546,690	1861.....	1,609,103	41,790,783
1827.....	*395,000	14,188,708	1862.....	1,558,189	40,809,578
1832.....	440,861	14,416,885	1867.....	1,385,782	36,792,912
1837.....	636,339	19,711,797	1872.....	1,425,147	40,000,462
1842....	875,086	25,406,642	1877.....	1,509,847	44,238,686
1847.....	1,096,086	30,236,632	1882.....	*1,552,983	*44,594,451
1852.....	1,209,934	31,912,413	1887.....	.....	*47,262,222

* Partly estimated.

Since 1887 the deposits of trustee savings-banks have been decreasing, while those of the post-office savings-banks have been rapidly growing.

Post-office Savings-banks.—In 1861 a system of post-office savings-banks was established, which, however, was little more than an expansion and adaptation to existing conditions of the scheme of Patrick Colquhoun, made prominent by Whitbread in 1807. No arbitrary interference with the existing system of savings-banks was attempted, but these were left to hold their own in competition with the new system as best they could. The practical operation of the latter may be briefly stated: Certain post-offices throughout the United Kingdom are designated at which sums of not less than one shilling or some multiple thereof will be received for transmission to the central office in London. Not exceeding £30 in one year, or £150 in all, or £200 including interest, is received from any one person. The depositor receives a book in which his deposits are entered, and a receipt for each deposit is also forwarded to him in due course from the central office. The moneys are invested in the public funds, and deposits of not less than £1 or multiples thereof receive interest at the rate of 2½ per cent. per annum. The Government is responsible for the repayment of all moneys received, thus affording to depositors perfect security. A depositor may apply at any post-office savings-bank in the kingdom for the purpose of withdrawing money, and may direct payment of the same to be made to him at that or at any other post-office savings-bank. His order is forwarded to the Postmaster-General, by whom a warrant for the designated amount is drawn upon the postmaster where payment is to be made, which is forwarded to the depositor, who presents the same, together with his book, and receives his money.

The system was inaugurated by opening in England and Wales 301 postal savings-banks, which number was increased before the close of the year to 1,629. The system was extended in the following year to Ireland and Scotland. In 1866 the number of postal savings-banks in the United Kingdom was 3,369, or more than five times the highest number under the old system; on Mar. 31, 1882, the number was 6,645, and on Mar. 31, 1891, it was 10,063. In the ten years from Sept., 1861, to Sept., 1871, there had been deposited, including interest, £44,198,743, withdrawn £28,044,539, leaving due depositors £16,154,204. During the calendar year 1881 there was deposited £11,345,957; interest credited, £826,990; withdrawn, £9,469,668; balance due depositors Dec. 31, £36,194,495. In 1892 the number of postal savings-banks was 21,940, the amount deposited was £42,145,981, and the total amount due depositors £130,118,605.

Penny savings-banks, military savings-banks, and savings-banks for seamen have been established as auxiliaries of the general system, for the purpose of meeting the special needs of classes for which the ordinary savings-banks did not hold out adequate inducements or facilities. The penny savings-banks have commonly been tributary to the larger institutions, making them the depositories of their aggregate accumulations. The military and seamen's savings-banks have been conducted independently. Their statistics are unimportant, and fail to exhibit any distinctive features concerning the thrift of the classes they represent, for large numbers of these prefer to deposit in the regular institutions.

Savings-banks in the U. S.—Shortly after the successful inauguration of savings-banks in Great Britain upon a popular and practical plan these institutions began to attract attention in the U. S. The first organization of which there is record was effected in the city of New York, Nov. 29, 1816. The first to go into practical operation was in Philadelphia, which as a purely voluntary association began to receive deposits Dec. 2, 1816, which would indicate an organization effected prior to that in New York. The first to become incorporated was in Boston, Dec. 13, 1816, and it organized and began business in the spring of 1817. Thus the U. S. anticipated Great Britain in giving to this interest the sanction and protection of law. The savings-bank of Salem, Mass., was next incorporated Jan., 1818, and commenced business in April following. The savings-bank of Baltimore opened as a voluntary association for receiving deposits on Mar. 16, 1818, and was duly incorporated in December of that year. The example of these cities and towns was rapidly followed by others.

The plan of organization of savings-banks is not altogether uniform. In some States there is a large body of corporators, empowered to enlarge their number indefinitely, who elect from their number annually a board of trustees or directors, to whom the management of the institution is committed. In others the corporators are a defined and limited number, who are themselves the trustees and responsible for the management. These are commonly empowered to fill vacancies that occur, though in some cases this is done by designated authority outside of the board. In the Northeast savings-banks are managed by trustees for the depositors; in other parts they are frequently managed by corporations with capital stock.

AGGREGATE SAVINGS-DEPOSITS OF SAVINGS-BANKS, WITH THE NUMBER OF DEPOSITORS AND THE AVERAGE AMOUNT DUE TO EACH BY STATES, TERRITORIES, AND GEOGRAPHICAL DIVISIONS IN 1899–1900.

STATES, TERRITORIES, AND DIVISIONS.	Number of depositors.	Amount of deposits.	Average to each depositor.
EASTERN:			
Maine	183,103	$66,132,677	$361 18
New Hampshire	136,544	53,896,711	394 72
Vermont	118,354	38,290,394	323 52
Massachusetts	*1,491,143	533,845,790	358 01
Rhode Island	142,096	73,489,533	517 18
Connecticut	393,137	174,135,195	442 94
Totals	2,464,377	$939,790,300	$381 35
MIDDLE:			
New York	2,036,016	$922,081,596	$452 89
New Jersey	*202,682	57,886,922	285 60
Pennsylvania	*361,220	105,416,854	291 84
Delaware	20,300	5,027,395	247 65
Maryland	171,130	57,857,976	338 09
District of Columbia	3,360	421,313	125 29
Totals	2,794,708	$1,148,691,356	$411 02
SOUTHERN:			
West Virginia	12,369	$1,926,407	$144 20
North Carolina	*8,550	1,717,158	200 84
South Carolina	*25,150	5,086,451	202 24
Florida	877	225,395	257 01
Louisiana	10,518	3,284,892	312 31
Texas	2,980	584,424	196 12
Tennessee	19,687	2,015,472	102 37
Totals	80,131	$14,840,199	$185 19

* Partially estimated.

AGGREGATE SAVINGS-DEPOSITS—CONTINUED.

STATES, TERRITORIES, AND DIVISIONS.	Number of depositors.	Amount of deposits.	Average to each depositor.
WESTERN:			
Ohio	*99,592	$44,535,975	$409 43
Indiana	21,091	5,650,961	267 93
Wisconsin	2,945	568,187	192 93
Minnesota	51,418	12,066,170	234 67
Iowa	*160,773	58,208,115	362 05
Totals	335,819	$121,029,408	$360 40
PACIFIC:			
California	*216,534	$158,167,462	$730 45
Utah	6,522	2,252,124	345 31
Totals	223,056	$160,419,586	$719 19
Totals United States	5,898,091	$2,384,770,849	$404 33

* Partially estimated.

Of the total of 1,002 banks reporting, 652 in 15 States were organized under the mutual system, and 350 in 13 States as stock banks with capital stock aggregating $19,892,294.

While there is much diversity among the several States in their policy concerning investments, the favorite and best approved securities are the stocks of the U. S. or of States in undoubted credit, the bonded obligations of cities and counties, and mortgages of real estate. The investments of the savings-banks of the U. S. in 1899–1900 were as follows: Real estate loans, $914,066,518; loans on other securities, $43,738,808; U. S. bonds, $111,118,450; State stocks and bonds, $513,971,965; railway securities, $230,488,662; bank stocks, $34,607,547; real estate, $56,651,224; other resources, $220,224,460; total, $2,624,873,634. The total liabilities, aside from savings-deposits, were $240,102,785.

Legislation in the U. S. has followed the English precedent of imposing restrictions upon the amount which might be deposited by one person in any savings-bank, but the occasion which made such restriction necessary in England has never existed. To this may be attributed the fact that the effort has never been attended by marked success, savings-banks having seldom regarded these restrictions whenever they have deemed it desirable to evade or to defy the law imposing them. The only really effective restriction of this nature is that imposed by those savings-banks which, for reasons of their own, have preferred to deal only with small individual accounts; but with every savings-bank in the country open to any depositor the restrictions of the law, if rigidly enforced, would be the occasion of inconvenience rather than of hardship.

The original theory of savings-banks was that their earnings, after paying expenses, were to be ratably divided among the depositors. To this was afterward supplemented the idea of reserving a small sum for the purpose of meeting any losses which might occur, thus forming a surplus in order to promote security. In late years a practice has grown up of agreeing to pay a given rate of interest. This is a departure from true savings-bank principles. The disasters that have fallen upon savings-banks are in nearly every instance traceable to the attempt to fulfill promises concerning interest. Subject to such general restraints as the law may impose, each savings-bank regulates the dividends or interest allowed according to its own discretion. In the early history of savings-banks 4 per cent. was a common rate, with extra dividends once in three or five years. During the civil war, and for many years after, 6 per cent. was the prevailing rate. The disasters that followed and the general lowering of interest on good securities have led to the adoption of the old rate of 4 per cent., and in some banks as low as 3 per cent.

GROWTH OF SAVINGS-BANKS IN THE U. S. SINCE 1820.

YEAR.	Number of banks.	Number of depositors.	Deposits.
1820	10	8,635	$1,138,570
1830	36	33,085	6,973,304
1840	61	78,701	14,051,520
1850	108	251,354	43,431,130
1860	278	693,870	149,277,504
1870	517	1,630,846	549,874,358
1880	629	2,335,582	819,106,973
1890	921	4,258,893	1,524,844,506
1895	1,017	4,875,519	1,810,597,023
1900	1,002	6,107,083	2,449,547,885

The savings-bank system of Canada is largely under Government management. The statistics of the post-office and Government savings-banks of the Dominion for 1899 are as follows: Deposits, with interest, $12,276,094; withdrawals, $12,145,498; balances, $50,241,715. Besides these there are a few private savings-banks and a number of ordinary banks which perform to a considerable degree the savings-bank functions.

The savings-bank system of France dates from 1818, but was first regulated by law in 1835. At the close of 1900 the number of depositors was 7,105,958, and the amount deposited 3,220,463,500 francs. In the postal savings-banks at the same date the number of depositors was 3,318,469, and the amount of deposits 929,454,282 francs; on Dec. 31, 1893, the accounts numbered 2,095,622, and the aggregate deposits 607,871,925 francs. The system of savings-banks is highly developed in Austria, Italy, Switzerland, Denmark, and some parts of Germany. A recent unofficial estimate gives the following figures:

COUNTRIES.	Number of depositors.	Amount of deposits.
Austria	1,850,000	$613,000,000
Italy	1,970,000	346,000,000
Prussia	.....	720,000,000
Scandinavia	1,600,000	220,000,000
Switzerland	1,600,000	118,000,000

Revised by A. T. HADLEY.

Savoie: a department of France. See SAVOY.

Savo'na (anc. *Sabatium*): town and seaport of Italy, province of Genoa; 26 miles by rail S. by W. of Genoa (see map of Italy, ref. 4–B). It has a large inland and maritime trade, extensive manufactures, metallurgic foundries, and shipbuilding interests. The old maiolica of Savona is still prized. Savona is of ancient origin. Its mediæval history is intimately connected with that of Genoa. Pop., including suburbs, 30,000.

Savonaro'la, GIROLAMO: religious reformer; b. at Ferrara, Italy, Sept. 21, 1452. He was intended for the medical profession, and his early studies were directed accordingly. Before the age of twenty he had become so shocked by the vices of the brilliant court of Ferrara, and by the degraded state of morals and religion around him, that he resolved to retire to a monastery; but respect for his father's wishes and love for his mother delayed his purpose for some years. In 1475, however, he entered the Dominican convent in Bologna, where he passed seven years. He was then sent to preach in Florence, where Lorenzo de' Medici was at the height of his power, but his first appearance as a preacher was a failure. He went elsewhere, but in 1490 he returned to Florence, and was successful. His reputation as a popular preacher rose rapidly, and he was soon listened to with admiring respect by many of the greatest men of that great age, such as Michelangelo Buonarroti, Pico della Mirandola, etc., as well as by the thousands of humbler citizens who thronged the churches where he preached. In 1491 he was elected prior of San Marco, and at the same time he refused the largess sent to his convent by Lorenzo, who had hoped to buy his silence. His rebukes, hurled alike at the highest and the lowliest wrongdoer, roused a deadly hostility against him. He asserted both the right and the obligation of the Christian teacher to instruct his hearers in their civic as well as other duties, and his bold exercise of this right drew upon him the increased ill will of Lorenzo. In his last hours, however, the offended prince turned to him for consolation, and in 1492 an interview took place between Fra Girolamo and the dying Lorenzo, when, it is said, the priest refused to grant absolution. Nor was the heroic reformer more indulgent to tyranny and vice in the Church than in the state. He launched the most scathing denunciations against the shameful corruption then scarcely less conspicuous in the higher ecclesiastics than in the pope, Alexander VI. With the prophet's "Thus saith the Lord," he threatened Church and state with the speedy vengeance of heaven if they did not repent. His followers in Florence, known as *Piagnoni* ("the weepers," because professed penitents), multiplied; he pressed his reforms more vigorously, his enemies the *Arrabbiati* (the enraged) grew bitterer and fiercer. The pope remonstrated, a cardinal's hat was offered, on conditions, but he was not to be moved. In 1495 he was summoned to Rome, but, knowing what awaited him there, evaded the summons. Finally an order from the Vatican forbade him to preach. He submitted at first, then disobeyed, declaring himself un-

able to resist the prophetic spirit which compelled him to speak his Master's words. The sentence of excommunication followed (1497). The *Arrabbiati* got possession of Florence. Fra Girolamo's letters to foreign sovereigns, urging them to call a council to dethrone the Borgia and elect a new pope, fell into the hands of his enemies. On Apr. 7, 1498, occurred the famous attempt at a "trial by fire," to decide whether he was divinely commissioned, but its fiasco turned the people against him, and on the night of the following day the convent of San Marco was attacked by an infuriated mob. The signoria sent thither officers to demand the surrender of the prior, who, with two of his brethren, was conveyed to the dungeons of the Bargello, and brutally tortured the same night. These barbarities were continued for weeks, and suspended only when the life of their victim was in danger. In the delirium of agony Savonarola sometimes gave confused answers as to his prophetic gifts, but no confession of guilt could be extorted from him. His destruction, however, was inevitable. The pope threatened Florence with an interdict and with every other form of vengeance if she spared the hated friar. Sentence of death was pronounced on May 22, 1498, and the next day he and his two friends and fellow monks Domenico and Silvestro were publicly hanged and then burned in the Piazza della Signoria and their ashes thrown into the Arno. The judgment of history has acquitted Savonarola of the charges brought against him in his own day, and the sincerity of his faith and the disinterestedness of his aims are as unquestioned as the purity of his life and the power of his intellect. Even the Roman Catholic Church, through Popes Paul V. and Benedict XIV., has declared his works irreproachable, and placed him among the servants of God. In the convent of San Marco are preserved various objects of interest once belonging to the martyred prior, such as his Bible filled with annotations by his own hand, etc., and a portrait, probably by his friend Fra Bartolommeo. He was of middle stature, dark complexion, plain in feature, pallid and worn with abstinence; his expression severely noble, but benevolent, and when animated his keen dark eyes glowed like flames. It is incorrect to speak of him as "a reformer before the Reformation," for he had no thought of leaving or opposing the Church. Yet his insistence upon the Bible as the surest guide to the knowledge of spiritual things, and his protests against the corruptions of the Church, had unquestionable influence in hastening the Reformation which followed so shortly after. Among the many works of Savonarola the best known is his *Triumphus Crucis de Veritate Fidei* (Florence, 1497; Eng. trans. *Triumph of the Cross*, London, 1868; also translated *Sorrow and Hope: Meditation on the 31st Psalm, written in Prison*, 1894). The principal *Life* of Savonarola is by Prof. Pasquale Villari (2 vols. 8vo, Florence, 1860; translated into English by Horner, London, 1863; 2d ed. 1888), with full references to authorities and a list of Fra Girolamo's works, both published and unpublished; see also W. R. Clark's *Life and Times of Savonarola* (1878). Revised by S. M. Jackson.

Savory: popular name of the *Satureja hortensis* (summer savory) and of the *Satureja montana* (winter savory), labiate garden-herbs of Old World origin, employed in domestic cookery for their flavor.

Savoy: formerly a political division of the kingdom of Sardinia, and originally the family possession of the dynasty now reigning in Italy. In 1860 it was ceded to France, and it is divided into the two departments of Savoie and Haute-Savoie. Savoy is the loftiest mountain region of Europe, containing the highest peak, Mont Blanc. Bounded N. by the lake of Geneva and E. by Piedmont, it is covered by the Graiian Alps, and entirely broken up into mountains and valleys. It contains very little arable land, but that which it contains is most carefully cultivated, planted with vines and mulberry-trees, and generally produces wheat enough for home consumption. The mineral wealth of Savoy is not great, though coal, lead, iron, etc., are found, and to some extent worked. But the pastures which cover the mountains are very important, and feed large herds of cattle and sheep; dairy-farming is the principal occupation. The area of the two departments is—Savoie, 2,224 sq. miles, with (1896) 259,790 inhabitants; Haute-Savoie, 1,667 sq. miles, with (1896) 265,872 inhabitants. The Savoyards are an honest, industrious, intelligent, and hospitable race, deeply attached to their native country. They emigrate in large numbers, but when they have amassed enough wealth they return to live in their fatherland.

Savoy Conference: a conference between Episcopalians and Presbyterians held in London soon after the Restoration. The Episcopalians were determined to restore the Church of England to what it was before the civil war, but the Presbyterians, who mainly had been in possession of church benefices and church power for many years, contended for some modification of the former system. A royal commission was issued on Mar. 25, 1661, appointing certain Church of England and Presbyterian divines to confer together, and gave them authority to review the Book of Common Prayer, to compare it with ancient liturgies, to consult respecting exceptions made to it, and by agreement to make alterations such as would satisfy tender consciences and restore unity to the Church. The instrument appointed "the master's lodgings in the Savoy," London, as the place of meeting. As the terms of the commission specified advice and consultation as purposes of the meeting, friendly conference seemed necessary; but the Episcopal party manifested no disposition for anything of that kind. They required written communications from their opponents stating their exceptions to the Liturgy, and to them gave answers both uncourteous and captious, not indicating any disposition to conciliate, but foreclosing the possibility of removing Presbyterian objections. They said: The alterations asked, if allowed, would be a virtual confession that the Liturgy was an intolerable burden, a cause of schism, and would justify past nonconformity. Taking such ground, it mattered not what the objections made might be—none was admissible; and therefore to advise and consult was a thing out of the question. It had been arranged that, while the rest of the Presbyterian brethren employed themselves in drawing up *exceptions* against the Book of Common Prayer, Baxter should prepare *additions*. In one fortnight he accomplished his task and presented his reformed Liturgy. The author tells us that he compared what he did with the Assembly's Directory, the Book of Common Prayer, and Hammond l'Estrange; but he seems to have borrowed little or nothing from these sources, beyond introducing or allowing the use of the creeds—sometimes the use of the Athanasian Creed—the *Te Deum*, and the Psalms in order for the day. A rejoinder to the bishops' answers touching exceptions made to the Liturgy followed on the part of the ministers, but no effect was produced by it. At last it was settled that there should be a formal debate, to be conducted by three persons on each side. Strangers were allowed to be present, and the room was full of auditors, young Tillotson, the eminent preacher and archbishop of later days, being among them. The debate turned upon vague abstractions and upon subtle theological distinctions, occasionally interrupted by outbursts of temper and uncivil personalities. As might be expeeted, the hall of the Savoy Palace became an arena for logical gladiatorship, the object of the meeting was a strife for victory, and the end of the conference was hopeless disagreement. Baxter's *Reformed Liturgy* was reprinted, edited by Charles W. Shields, under title *The Book of Common Prayer as Amended by the Presbyterian Divines of 1661* (Philadelphia, 1864; 2d ed. New York, 1883).
Revised by S. M. Jackson.

Savoy Declaration: an ecclesiastical document, deriving its name from the Savoy Hospital in London, where it was framed. Before the death of Oliver Cromwell a meeting was convened by notice from the clerk of the council of state, addressed to the Congregational elders resident in London. Cromwell, though not favorable to the proceeding, yet permitted it; but the ministers did not meet until after his decease; then they assembled in the Savoy Sept. 29, 1658, to declare the principles of their faith and polity. The business was disliked by people about the court, who feared it might lead to fresh divisions between the Independents and Presbyterians. There might be political intrigues at the background of the movement, for Cromwell said in reference to some of its projectors, who were republican officers, "They must be satisfied, or we shall all run back into blood again." At all events, when the meeting came to be held nothing was done which the Protector would have disapproved. The Declaration did not clash with the sentiments of broad charity so dear to his heart. As to doctrine, the Declaration is substantially the same as the Westminster Confession. Its specialty consists in its outline of ecclesiastical order. Whereas the covenants or mutual agreements into which Congregationalists had entered at the formation of their churches in the time of the civil wars generally contained some references

to further light breaking in upon them from God's word, there is in the Savoy Declaration no language of that kind; and it seems to be assumed in the document that Congregationalism, as to the knowledge of its principles, had by that period attained to something like completeness.

JOHN STOUGHTON.

Savoy, The: a spot between the Strand and the Thames Embankment, London, remarkable for its ancient buildings and historical associations. The Savoy Palace was first built by Peter, Count of Savoy, uncle of Eleanor of Provence, queen of Henry III. It came into the possession of John of Gaunt, and within its walls John, King of France, was confined after the battle of Poitiers (1356). In 1381 it was burned during Wat Tyler's insurrection. It was rebuilt toward the close of the reign of Henry VII., who made it a hospital or refuge for 100 poor people. It afterward became a resort for abandoned characters, until the reign of Queen Anne, when the institution was dissolved, and the buildings began to fall into ruin. In 1811 the shattered walls were swept away, with the exeeption of the chapel royal built in 1515. The chapel was much injured by fire in 1864, but was restored at the expense of Queen Victoria. See *Memorials of the Savoy*, by W. J. Loftie.

Saw [M. Eng. *sawe* < O. Eng. *sage*: O. H. Germ. *sega* (> Mod. Germ. *säge*)]: a thin plate of metal usually having sharp, angular teeth upon one edge, used for dividing materials by a cutting, crumbling, or abrasive action.

This tool has been known and used from a very remote period. W. M. Flinders Petrie has discovered indisputable evidence that bronze saws having jeweled teeth were used by the ancient Egyptians for cutting the hardest stones, and a two-handled saw of iron (3 ft. 8 in. long by $4\frac{5}{8}$ inches wide) was found by Layard at Nimroud. Saws are mentioned in the Bible. Some of the Christian martyrs in apostolic times "were sawn asunder." The Grecian carpenters had saws that were quite similar to some in use at the present time. In a painting discovered at Herculaneum two genii are shown at the end of a bench supported by two four-legged "horses." The piece of wood to be sawn through is secured by cramps in the shape of the figure seven; the ends pass through, and are seen below the bench. The saw has a perfect resemblance to our frame-saw. Cicero, in his oration for Cluentius, speaks of an ingenious saw with which a thief sawed out the bottom of a chest. Pliny says that among the Belgæ saws were used for cutting white building-stone. The saws of the Japanese and other Oriental nations have their teeth so shaped that the saw cuts when pulled by the workman, and not when pushed; such saws are superior, inasmuch as they are not liable to flexure and consequent breakage by the force employed, and can be made much thinner, and therefore require less strength to operate than the saws used in Europe and Amcriea.

The uses to which saws are put suggest their classification into rip-saws and cross-cut saws. The first have their teeth especially adapted for dividing materials in a direction parallel to their fibers. In the second class the teeth are designed for cutting at right angles to the direction of the fibers. There are over 100 varieties in each of these classes, each made with reference to the execution of a specific kind of work. These several varieties may be arranged in four groups, viz., reciprocating saws, circular saws, cylinder or drum saws, and endless-band saws.

The reciprocating saw is the oldest, and there are more of this variety used than of all others combined. Circular saws, having jewels for teeth, were known to the ancient Egyptians, who used such saws in shaping small stones, but there is no evidence that they were used by them for cutting wood. Circular saws were used for cutting the spaces between the teeth of wheels for clocks and watches (the teeth being afterward shaped by a file) many years before they were applied to the cutting of wood, and may properly be regarded as anticipating the tool called a mill, commonly used for such purposes. The circular saw was patented in England by Samuel Miller on Aug. 5, 1777, although it is claimed it was used in Holland nearly a century before. The use of this form of saw has become indispensable in wood-working establishments. Cylinder or drum saws are, it is supposed, the invention of Hippocrates (b. 460 B. C.), and were first used by him in the operation of trepanning the skull. Such saws are largely used for cutting out button-blanks, sheaves for blocks, and similar forms. They are also used for making curved staves for barrels, tubs, pails, and other articles of woodenware.

The endless-band saw (sometimes called ribbon-saw) consists of an endless band or ribbon of steel, one edge of which is provided with teeth of a form suitable for the work expected of the saw, which in use is strained over two large wheels placed one over the other, and is made to move by turning one of these wheels, the wood to be divided being pressed forcibly against the descending portion of the saw. The band-saw was invented in 1808 by William Newberry, of London, England. Notwithstanding the many valuable features of the invention it did not attract attention until its principle was embodied in a sawing-machine invented by Thouard, of Paris, in 1846; but it is to the persistence of M. Périn, another Frenchman, that the world is indebted for the practical development of this invention. W. F. DURFEE.

Sawakin: See SUAKIM.

Sawfish: See PRISTIDÆ.

Saw-fly: a hymenopterous insect of the family *Tenthredinidæ*. See ENTOMOLOGY and HYMENOPTERA.

Sawmill: usually a building containing mechanism for operating saws; the term is also applied to the combination of a saw with its actuating machinery.

Marble was cut by power-saws as early as A. D. 360, and it is not at all improbable that mills for preparing lumber were also in use at that time. The ancient method of procuring boards, planks, and joists, was to split round logs with wedges, and then hew the rough lumber resulting to the required dimensions. This process is still used in making certain kinds of lumber, such as staves for heavy casks and strips for wooden hoops.

The first reliable evidence of the employment of sawmills for cutting lumber relates to one at Augsburg, Bavaria, in 1322. Soon after the discovery of Madeira, in 1420, sawmills were erected there for the purpose of making lumber for exportation to Portugal. In 1427 there was a sawmill in the city of Breslau, and in 1490 the magistrates of Erfurt established one in a forest which they had purchased. The first sawmill in Norway was built about 1530, and the number of such mills rapidly increased in that country. A sawmill was in operation at Lyons, France, as early as 1555. On the Danube, near Ratisbon, in 1575, there was a sawmill having "gang-saws" by which several boards were cut at the same time. A work published at Lyons in 1578 by Jacobi Bessoni gives illustrations of two forms of sawmills having gang-saws; in one of these the saws have teeth on each edge. The first sawmill in Holland was erected at Zaandam in 1596. A sawmill was first operated in Sweden in 1653. The building of sawmills in England was violently opposed, because it was thought that the hand-sawyers would be deprived of their means of living; one erected in 1653, near London, had to be abandoned, and it was not until over one hundred years later (in 1768) that another attempt in this direction was made. A wealthy timber-merchant, under the patronage of the Society of Arts, caused a sawmill driven by wind to be constructed at Limehouse. This mill was destroyed by a mob, but, the damage having been made good by the Government, it was rebuilt and allowed to run without interference. Some years earlier a sawmill had been erected at Leith, in Scotland. Probably the first sawmills in America were the three, driven by wind, which were erected at New Amsterdam (now New York) in the year 1633; one of these was located on Nut (now Governor's) island. In 1706 the first sawmill in Canada was built on the river Richelieu, near Montreal, by a Mr. Sawyer, of Lancaster, Mass. (who had been made prisoner by the Indians), as the ransom of himself and son. In 1803 there was a steam-sawmill in New Orleans run by an engine built by Oliver Evans, of Philadelphia. This mill was burned by the hand-sawyers.

All these mills were of the vertical reciprocating type; their saws were strained in a strong rectangular frame, or gate, to which a vertical reciprocating movement was given by a crank on a revolving shaft, usually placed below it. The gate was moved in and kept from swerving by suitable vertical guides. The log to be cut was secured upon a sliding carriage automatically moved a certain distance at each stroke of the saw, until finally the saw had cut its way from end to end of the log. In mills in which but one saw was used the log had to be moved laterally after each cut a distance equal to the thickness of the lumber required; this necessitated as many longitudinal movements of the log as there were cuts made, but in the best mills which had abundant motive power several saws (called a gang), placed the thickness of the intended lumber apart, were strained in the

same gate, and then the entire log could be cut into boards by a single traverse of the carriage.

In the more recent gang-saw mills there are two gates, in one of which there are but two saws, through which the log is first passed and made parallel-sided; it is then turned upon one of these sides and passed through the second gate, in which there is a sufficient number of saws to cut the log into the desired thickness of boards or planks.

Circular saws, driven by steam or water power, have been largely used for the manufacture of lumber, especially in the U. S., where their use for that purpose originated in a patent granted on Mar. 16, 1820, to Robert Eastman and J. Jaquith, of Brunswick, Me. Multitudes of other patents for circular-saw mills have been granted, covering more or less valuable improvements, but this form of mill remains a very wasteful means of converting timber into lumber.

The band-saw has been adapted to the sawing of logs, and is used to a large extent on the Pacific coast of the U. S. for utilizing the large timber of that region; this form of saw is less wasteful and works rapidly. W. F. Durfee.

Sawyer, Leicester Ambrose: biblical scholar; b. at Pinckney, N. Y., July 28, 1807; graduated at Hamilton College, Clinton, N. Y., 1828; studied theology; was ordained as a Presbyterian minister in 1832, and from 1840 to 1847 was teacher in Central College, Ohio, after which he preached in several places; subsequently was editorially connected with the Utica *Morning Herald*. Author of *Elements of Biblical Interpretation* (New Haven, 1836); *Mental Philosophy* (1839); *Moral Philosophy* (1845); *A Critical Exposition of Baptism* (Cincinnati, 1845); *Organic Christianity, or the Church of God* (1854); and *The Reconstruction of Biblical Theories, or Biblical Science Improved* (1862). In 1838 he began a new translation of the entire Bible, which he completed about 1862. The New Testament was published at Boston, Oct., 1858. The prophetical books of the Old Testament were issued Dec., 1860, and the book of Daniel, with the apocryphal additions, was separately issued in 1864. The remaining (earlier) portions of the Old Testament were not published. Revised by W. H. Whitsitt.

Sawyer, Philetus: U. S. Senator; b. at Whiting, Vt., Sept. 22, 1816; went to Wisconsin 1847; engaged in the lumber business at Oshkosh on an extensive scale; was a member of the Legislature 1857 and 1861; mayor of Oshkosh 1863–64; was a delegate to the Loyalists' convention 1866, and sat in Congress as a Republican from 1865 to 1875, when he declined a re-election. He served on several important committees connected with the business interests of the Northwest, and became chairman of the committee on Pacific railways. He was U. S. Senator from Wisconsin 1881–93.

Sawyer, Thomas Jefferson, D. D.: clergyman; b. at Reading, Vt., Jan. 9, 1804; graduated at Middlebury College 1829; was pastor of a Universalist church in New York 1830–45, and again 1852–61, having in the interval been principal of the Liberal Institute at Clinton, Oneida co., N. Y.; taught theology in the same institution; resided on a farm at Clinton 1861–69, after which he became Professor of Theology in Tufts College, Medford, Mass., an institution which he had been instrumental in founding (1852), as he had also been in the establishment of the theological department of the St. Lawrence University (1856). He has defended the doctrines of Universalism in public discussions with clergymen of other denominations, and some of these polemics have been published, the most important being the discussion with Rev. Isaac Westcott, entitled *The Doctrine of Eternal Salvation* (New York, 1854). In opposition to the views of Henry Ward Beecher, he published *Who is our God? the Son or the Father?* (1859).—His wife, Caroline M. Fisher, b. at Newton, Mass., Dec. 8, 1812, was married 1832; has written much in prose and verse for periodicals, especially *The Christian Messenger*; published several translations from the French and German, and edited *The Ladies' Repository*, a Universalist monthly magazine. She also published the *Poems* of Mrs. Julia H. Scott (1854), preceded by a *Memoir*.

Saxe, John Godfrey: poet and humorist; b. at Highgate, Vt., June 2, 1816; graduated at Middlebury College 1839; was admitted to the bar at St. Albans 1843; practiced law in Franklin County 1843–50; was editor of the Burlington *Sentinel* 1850–56; was State's attorney of Vermont one year, after which he devoted himself chiefly to literature and to popular lecturing; was Democratic candidate for Governor 1859 and 1860. Author of several volumes of humorous poems, the longest of which were delivered at college commencements and other anniversary occasions. His published works include *Progress* (1846); *New Rape of the Lock*; *The Proud Miss McBride*; *The Money King* (1859); *Clever Stories of Many Nations*; *The Masquerade* (1866); and *Leisure Day Rhymes* (1875). More than forty editions of his collected poems have been issued in the U. S. and in England. D. at Albany, N. Y., Mar. 31, 1887.

Revised by H. A. Beers.

Saxe, Marshal: the name by which Maurice, Count of Saxony, is generally known. He was born at Goslar, Oct. 28, 1696; a son of Augustus II. the Strong, Elector of Saxony and King of Poland, and Aurora von Königsmark. In his twelfth year he was in the army of Prince Eugene, and in 1711 received formal recognition from his father, who raised him to the rank of count, but his debaucheries and dissipations, in which he surpassed even his father, developed as early and as rapidly as his brilliant talents. He served in a campaign against the Turks in 1717, and two years later went to France, bought a regiment, was appointed *maréchal de camp*, and studied with great energy mathematics, mechanics, and fortification. In 1726 the estates of Courland elected him duke, but, declining the proposed marriage with the duchess, he maintained his ducal authority against her opposition with great difficulty, supporting a small army by means of the money lent him by Adrienne Lecouvreur, the actress. In 1727 he withdrew to Paris. At the outbreak of the Austrian War of Succession he offered his services to his native country, but by the fault of Count Brühl they were not accepted, and he received a French command. He took Prague by storm in 1741, and fought with great distinction in Bohemia, Bavaria, and on the Rhine; but his fame as a great general he gained chiefly by his campaigns in Flanders from 1744 to 1748. He won a brilliant victory at Fontenoy May 11, 1745, and at Raucoux Oct. 11, 1746. He took Brussels, Bergen-op-Zoom, and Maestricht, and conquered the whole of Belgium. The enthusiasm of the French people and king knew no bounds; honors were heaped upon him; he was made marshal-general of all French camps and armies, and presented with the palace and estates of Chambord, where he led a princely life, and died Nov. 30, 1750. His *Rêveries*, written in 1731, but afterward revised and much enlarged, is full of ingenious and audacious ideas; his *Lettres et Mémoires*, published in 1794, have also some interest. Revised by F. M. Colby.

Saxe-Al'tenburg: a duchy of the German empire; area, 511 sq. miles; pop. (1900) 194,273; budget of 1895, 3,847,110 marks; public debt (July, 1893), 887,450; is situated N. E. of the Thuringian Forest, and consists of two separate parts, called the eastern and the western district. Capital, Altenburg. By the division of 1485 the country fell to the Albertine line. In 1553 it was returned to Duke Johann Friedrich the Magnanimous, of the Ernestine line, and was under dukes of its own from 1603 to 1672, when the reigning family became extinct, and it fell to Saxe-Gotha. As this line too became extinct the country fell, according to the convention of Nov. 15, 1826, to the Duke of Saxe-Hildburghausen, who gave up his own country, Hildburghausen, and became Duke of Saxe-Altenburg. His descendants are still reigning. Revised by M. W. Harrington.

Saxe-Co'burg and Gotha, -gō'tăă: two duchies which together form a constitutional and hereditary monarchy, under the sovereignty of a duke, and an independent member of the German empire; area, 755 sq. miles, of which 217 sq. miles belong to Coburg and 538 sq. miles to Gotha; separated from each other by the Thuringian Forest—Coburg to the S. and Gotha to the N. Pop. (1900) 229,567. Capitals, Coburg and Gotha. Each duchy has a legislative chamber of its own (Gotha 19 and Coburg 11 deputies). These deputies also form a common diet for the united duchies. Coburg has a budget of 1,233,200 marks, with a debt of 3,213,829 marks: Gotha, a budget of 4,204,150, and a debt of 140,198. There is also a budget of 2,012,182 marks, common to the two duchies. Since the accession of Duke Ernst II. in 1844, these two small duchies have formed the starting-point for much intellectual progress. The union of the two countries dates from 1826. The house of Saxe-Coburg, founded in 1680, became extinct in 1699. The contest concerning the heritage ended in 1720. The Duke of Saxe-Saalfeld received the country. The Dukes of Saxe-Saalfeld-Coburg reigned to 1826, when they ceded Saalfeld to Meiningen, and received Gotha, whose own dynasty had died out. Ernst II. was succeeded in 1893 by his nephew, the Duke of Edinburgh.

Revised by M. W. Harrington.

Saxe-Lau'enburg: the name of the Saxon duchy of LAUENBURG (*q. v.*), from the twelfth to the eighteenth century.

Saxe-Mei'ningen: a duchy of the German empire; area, 953 sq. miles; pop. (1900) 250,683; budget, receipts, 7,195,990 marks; expenses, 6,415,090; public debt in 1892, 11,788,074 marks; is situated to the S. of the Thuringian Forest. Capital, Meiningen. The reigning line was founded in 1681 by Bernhard, third son of Ernst the Pious. In 1826 Duke Bernhard acquired the duchy of Hildburghausen, with Saalfeld and other estates, but, having sided with Austria in 1866, he was compelled to abdicate, and was succeeded by his son Georg. Revised by M. W. HARRINGTON.

Saxe-Wei'mar: a grand duchy of the German empire; area, 1,388 sq. miles; pop. (1900) 362,018; annual budget 1893–95, 8,733,584 marks; public debt, 5,083,671 marks in 1891. It consists of three districts—Weimar, Neustadt, and Eisenach—situated along the Rhön and the Thuringian Forest. The capitals are Weimar and Eisenach, and there is a university at Jena. The reigning line descends from William, the third son of Johann III., the ancestor of the living Ernestine line. In 1672 the house was divided into the lines of Weimar, Eisenach, and Jena. That of Jena became extinct in 1690, and the countries were again united in 1741 under Ernst August. The congress of Vienna enlarged the country with 31 geographical sq. miles and 77,000 inhabitants, and made it a grand duchy. In 1853 Carl Alexander began to reign. Revised by M. W. HARRINGTON.

Saxifrage [viâ O. Fr. from Lat. *saxi'fraga* (sc. *her'ba*, plant), maidenhair, liter., fem. of *saxi'fragus*, stone-breaking; *sa'xum*, stone + *fran'gere*, *fractum*, break; applied to some plants as growing in clefts of rocks, to others as supposed solvents of stone in the bladder]: a name popularly applied to a very great number of plants of widely different characters, though properly limited to plants of the genus *Saxifraga* (family *Saxifragaceæ*). This large genus comprises many alpine and high northern species, some of them highly ornamental in culture. Some species were once used in medicine, but none have active properties. The U. S. has numerous species, some of which are natives of Europe also. The early saxifrage (*S. virginiensis*) is a very common spring flower in the eastern U. S. The swamp-saxifrage or meadow-plantain (*S. pennsylvanica*) is common in wet grounds in the same region, and its radical leaves are gathered and boiled as potherbs in spring.

Revised by CHARLES E. BESSEY.

Saxifrage Family: the *Saxifragaceæ*; a group of about 650 species of dicotyledonous herbs and shrubs, comprising the true saxifrages, hydrangeas, gooseberries, currants, grass-of-Parnassus, mock-oranges (*Philadelphus*), and numerous other plants, many of them ornamental and some useful. Not a few are astringent. The family is moderately represented in the U. S. The true *Saxifragaceæ* are most nearly related to the *Rosaceæ*, from which they differ in the definite stamens, endospermous seeds, and in the tendency to consolidation of the carpels, and to possession of opposite leaves without genuine stipules.

Revised by CHARLES E. BESSEY.

Saxo Grammat'icus: historian; b. in Denmark, date unknown. He was probably secretary to Bishop Absalon, from whom he received valuable assistance in his work. His *Gesta Danorum*, or *Historia Danica*, consists of sixteen books, and reaches to the year 1186. The last six books contain reliable historical material; but his representation of the heathen age, based on Runic inscriptions, old songs, the writings of the Icelanders, etc., is uncritical in the extreme. His surname he received from the correctness and elegance of his Latin, which excited the admiration even of Erasmus. His work was first printed in Paris in 1514 under the direction of C. Pedersen. The best edition is that by P. E. Müller (3 vols., Copenhagen, 1839–58). It was translated into Danish by Vedel in 1575, by Schonsbölle in 1752, and by Grundtvig in 1818. C. Pedersen is also said to have made a translation, which has been lost. The classical Danish version is Vedel's. D. after 1208. Revised by D. K. DODGE.

Saxon: See DUTCH LANGUAGE.

Saxon, Low: See PLATTDEUTSCH.

Saxons [Lat. *Saxones*; Celtic, *Sassenach*, *Saisnaig*, perhaps from *Sachs*, a battle-knife]: a Low German tribe that dwelt on both sides of the Elbe in its lower course and on the islands near its mouth (*Insulæ Saxonum*). They were first mentioned in history in 287 A. D., when they appeared off the coast of Gaul. Their name survives in Saxony, Prussian Saxony, the minor Saxon states, etc. (On the relations of the Saxons to the Angles of Britain, see ANGLO-SAXONS.) They were early colonists of Normandy and France, where they were soon compelled to give way before the Franks. There is a large number of so-called Saxons in Transylvania, descendants of the Low German colonists introduced in 1143 and 1247 by the Hungarian kings. They are one of the dominant races of that region, and preserve the use of the German language, which, however, is considerably corrupted. At home the Saxons enlarged their territory by conquest north and northwest to the North Sea, the Yssel, and the Rhine, and east to the Weser and Werra, the southern Harz, the Elbe, and the lower Saale. After many years of heroic contest with Charlemagne in defense of their national religion and national independence they were forced to accept Christianity and to acknowledge the supremacy of the Holy Roman empire.

Saxony: province of Prussia, between Hanover, Brandenburg, Silesia, Hesse-Nassau, the kingdom of Saxony, and Thuringia; area, 9,746 sq. miles; pop. (1895) 2,698,549. The western portions are occupied by the Hartz Mountains; the rest is low and level, sloping northward and watered by the Elbe and its affluents. The soil is very fertile and very well cultivated, and many branches of manufacture are developed with great energy and success. Capital, Magdeburg.

Revised by M. W. HARRINGTON.

Saxony, Kingdom of: a part of the German empire, comprising an area of 5,787 sq. miles, with (1900) 4,199,758 inhabitants. It lies between Prussia and Austria, a position fraught with great political difficulties and the principal cause of most of the historical vicissitudes of the country. It belongs to the North German mountain region, two-fifths of the surface being mountainous (Erzgebirge S., Lausitzergebirge E., with the Saxon Switzerland), two-fifths hilly, and one-fifth lowland. The principal river is the Elbe, with its affluents, the Black and the White Elster, the Mulde, and the Pleisse. The population is very dense, 725 per sq. mile; 56,000 Wends, nearly all settled in the government of Bautzen, live among the Germans, who belong partly to the Franconian and partly to the Thuringian tribes. The country is divided into four governments, with population (1895) as follows: Bautzen, with 385,010 inhabitants; Dresden, with 1,067,757; Leipzig, with 945,179; Zwickau, with 1,389,672. The principal towns are—Leipzig, with 399,963 inhabitants; Dresden, with 336,440; Chemnitz, with 161,017; Plauen, with 55,191; Zwickau, with 50,391; Freiberg, with 29,287; Zittau, with 28,132; and Glauchau, with 24,914. With respect to creed, there are 3,611,670 Lutherans, 140,285 Roman Catholics, 10,538 Reformists, 15,059 of other Christian sects, and 9,902 Jews. Agriculture is carried on with a high degree of perfection. Wheat, rye, oats, barley, millet, etc., are cultivated; also flax. The vine is grown along the Elbe. Cattle-breeding is important; sheep especially are very numerous. The arboriculture is excellent; 28 per cent. of the total area is covered with forest. Mining is an old occupation here, especially in the Erzgebirge, and is very flourishing. Silver, iron, gold, lead, sulphur, arsenic, zinc, etc., are produced; 4,200,000 tons of coal and about 950,000 tons of brown coal are annually raised. Manufacturing industry is much developed; Chemnitz, Zwickau, Plauen, Zittau, Bautzen, and Leipzig especially are important. Linen, cotton, and woolen goods, paper, chemicals, metal ware and machinery, straw goods, porcelain, musical and mathematical instruments are manufactured. Leipzig has large type-foundries and printing-establishments. The commerce is also very comprehensive; its principal center is Leipzig, which is also the seat of the highest commercial court of Germany. The most important financial institutions are the Bank of Leipzig, the Saxon Bank in Dresden, and the Agricultural Bank of Bautzen. The kingdom is better provided with railways than any other part of Germany; 1,738 miles were in operation in 1892. Public education stands very high; the numerous educational institutions comprised, in 1891, a university in Leipzig, a mining academy in Freiberg, an academy of arboriculture at Tharand, a polytechnic school in Dresden, an industrial school at Chemnitz, 5 commercial schools, 38 schools for the exact sciences, 15 gymnasiums, and 2,171 Evangelical and 39 Roman Catholic public elementary schools. The Government is a constitutional monarchy, established in 1831 and modified in 1849, 1851, 1860, 1861, 1868, and 1874. In all foreign affairs and in many important interior questions the authority of the German empire has wholly superseded that of

the particular Saxon Government, which is independent with respect to the interior administration. The reigning king is Albert, who ascended the throne Oct. 29, 1873; the representation of the people is composed of two chambers. The finances are in good order. The budget estimate for each of the years 1892–93 was 97,683,109 marks, with a special revenue and disbursement of 51,405,100 marks, relating to public works. More than half the total revenue is derived from state domains, forests, and railways, the last alone giving, in 1892, a net revenue of 30,597,450 marks. The total debt in 1892 was 625,780,750 marks, nearly all incurred in the acquisition of railways and telegraphs, and the promotion of other works of public utility. The total income of all classes of the population was estimated in 1892 at 1,584,950,632 marks, an increase of 17,000,000 marks over the preceding year. The army forms the Twelfth Corps of the German imperial army. The Saxon colors are green and silver.

History.—That German tribe which the Romans called Saxones was in ancient times settled between the Eider, the Elbe, and the Trave. Charlemagne made war upon them 772–804, and subjugated them, and Saxony became a dukedom, belonging to the Frankish and afterward to the German empire. Under Otto the Magnificent, Thuringia was united to it, and Otto's son, Henry, became King of Germany in 919. His successor, the Emperor Otto I., gave the dukedom of Saxony to Hermann Billung. Under the house of the Billungs, Saxony made war upon the Emperor Henry IV. in 1073, but in 1106 the house became extinct, and under the Emperor Lothar, in 1125, the country came into the possession of Duke Henry of Bavaria. His son, Henry the Lion, increased the dukedom, but when he was placed under the imperial ban his dominions were scattered, and, after being reduced to a small piece of land, the dukedom of Saxony was given to Margrave Bernhard of Ascania. The house of Ascania branched off in 1260 into two lines, of which one, the Wittenberg, became extinct in 1422, while the other, the Lauenburg, reigned until 1680. The title of Duke of Saxony followed the Wittenberg branch; it was changed in 1355 to that of elector, and both land and title were bestowed on Frederick the Valiant, Margrave of Meissen, in 1423. Thus the name of Saxony, which originally designated a tribe, became a princely title, and was transferred to countries with which it had no historical connection. Since 1088 the house of Wettin has reigned in the margraviate of Meissen. In 1485 the grandsons of Frederick the Valiant, Ernst, and Albert, divided the inherited countries, so that Ernst received Thuringia, and Albert, Meissen, and two lines were thus formed, which still flourish, the Ernestine and the Albertine, of which the former reigns in the Saxon duchies, the latter in the kingdom of Saxony. After the Peace of Westphalia, in 1648, the rise of Brandenburg became an impediment to the development of the electorate. The Elector Augustus embraced Roman Catholicism in 1697, became King of Poland, and involved Saxony in war with Charles XII. of Sweden. His successor, Augustus, sided with Maria Theresa of Austria against Frederick of Prussia, and in the Seven Years' war Saxony suffered heavy losses. Under Frederick Augustus III. (1763–1827) the country again began to rise, though it had some very hard years also during this period. As a member of the German empire it took part in the war against France, and concluded an alliance with Prussia in 1806, but after the defeat at Jena it concluded an alliance with Napoleon and entered the Confederation of the Rhine, after which the elector received the title of king. By the Peace of Tilsit the King of Saxony obtained the duchy of Warsaw, which had just been established, and portions of Prussia and Austria, but after the battle of Leipzig he was taken prisoner by the allied Russians, Prussians, and Austrians, and at the Congress of Vienna (1815) was deprived of 7,720 sq. miles of territory. In the long period of peace from this moment, and up to 1866, the country became very prosperous, though a narrow and short-sighted policy of government presented many obstacles to its development. The revolutionary years of 1848–49 brought many great and beneficial reforms to Saxony. Aug. 9, 1854, King John ascended the throne, and both he and his minister, Beust, made a most stubborn opposition to the Prussian policy, and showed a decided partiality for Austria as the leader of the small states. The war of 1866 brought the independence of Saxony in imminent danger, and the king, John, saved his crown only by entering the North German confederacy, over which Prussia presided, by paying 30,000,000 marks in war indemnity, and by dismissing Beust. The liberal party in Saxony hailed this event with enthusiasm, but the party consisting of the court, the nobility, and the army officers continued hostile to Prussia. In 1870–71 the Saxon soldiers fought under the leadership of the crown prince, afterward King Albert, as true allies by the side of the Prussians, and the interior development of the country has not only kept pace with that of the rest of Northern Germany, but in some respects even advanced beyond it. A new modification of its constitution took place Oct. 12, 1874, giving to the lower house of representatives a more democratic character, while the upper house is still strongly aristocratic in its membership. Revised by M. W. HARRINGTON.

Saxton, JOSEPH: inventor; b. in Huntingdon co., Pa., Mar. 22, 1799. His mechanical ingenuity was early shown by improvements in the machinery in his father's nail-factory. At the age of eighteen he went to Philadelphia, and there invented a machine for cutting the teeth of chronometer wheels, an original escapement with a compensating pendulum, and made the clock which marks the time from the belfry of Independence Hall. In 1828 he went to London, where he resided for nine years. He was placed as chief assistant in the Adelaide Gallery, then the great scientific repository, and while there constructed a magneto-electric machine by which the first magnetic spark was produced. He also constructed the apparatus used by Wheatstone in his experiments on the velocity of electricity in its passage through a wire. He next invented a locomotive differential pulley, by means of which high speed may be given to vehicles by horses traveling at a slow rate, and a medal-ruling machine for tracing lines on metal or glass, representing by an engraving the design on the face of the medal. He returned to the U. S. to superintend the construction of the machinery and balances for the Philadelphia mint, and subsequently was placed in charge of the construction of the standard weights and measures for the U. S. This position he filled with ability, furnishing the State capitals and the custom-houses with accurate sets of weights and measures. A gold medal was awarded him at the London Exhibition of 1851 for a large class-balance of extreme precision. He was one of the original corporators of the National Academy of Sciences. Among his many ingenious devices and inventions, the mirror-comparator for comparing and the tracing-machine for dividing standard measures, his deep-sea thermometer, used in the exploration of the Gulf Stream by the U. S. Coast Survey, his self-registering tide-gauge, and his immersed hydrometer, deserve especial mention. D. at Washington, D. C., Oct. 26, 1873.
Revised by R. H. THURSTON.

Saxton, RUFUS: soldier; b. at Deerfield, Mass., Oct. 19, 1824; graduated at the U. S. Military Academy July 1, 1849, as brevet second lieutenant of artillery; from 1855 to 1859 was on coast-survey duty, and for a year was assistant instructor of artillery tactics at West Point. On the outbreak of the civil war he was stationed at St. Louis, and participated in dispersing the Confederate force at Camp Jackson, May 10, 1861; appointed assistant quartermaster U. S. army May 13, 1861, he served on the staff of Gen. Lyon as chief quartermaster until transferred in July to the staff of Gen. McClellan in West Virginia. In September he accompanied the expedition to Port Royal, S. C.; appointed brigadier-general U. S. volunteers in Apr., 1862, he commanded at Harper's Ferry when threatened by Jackson; assigned to duty as military governor of the department of the South July, 1862, where he was engaged in organizing Negro laborers and troops, and as commissioner of the Freedmen's Bureau until Jan., 1866, when he was mustered out of the volunteer service; brevet major, lieutenant-colonel, colonel, and brigadier-general. In 1872 he became deputy quartermaster-general U. S. army, with rank of lieutenant-colonel; in 1882 assistant quartermaster-general, with rank of colonel; retired Oct. 19, 1888. Revised by JAMES MERCUR.

Say, JEAN BAPTISTE: economist; b. in Lyons, France, Jan. 5, 1767; was educated for a commercial career, and spent a part of his youth in England; found employment on his return to Paris on Mirabeau's paper, *Courrier de Provence*, and afterward as secretary to Clavière, Minister of Finance; edited from 1794 to 1800 *La Décade*; became a member of the tribunate in 1799; published his celebrated *Traité d'Économie politique* in 1803, and enjoyed a great reputation when his thorough disagreement with Napoleon's policy compelled him to retire into private life. He established a large spinning-mill, and published in 1815 *Catéchisme*

d'Économie politique and in 1816 *De l'Angleterre et des Anglais*. After the fall of Napoleon he again took an active part in public life, and was appointed professor at the École des Arts et Métiers in 1819, and at the Collège de France in 1831. D. in Paris, Nov. 15, 1832. He was the first writer to popularize the doctrines of Adam Smith on the Continent. His lectures were published 1828–30 under the title *Cours complet d'Économie politique*.

Say, Jean Baptiste Léon: economist; b. in Paris, June 6, 1826; grandson of Jean B. Say; studied political economy; took an active part in conducting the *Journal des Débats*; was appointed prefect of the department of the Seine in 1871, and elected a member of the Legislative Assembly; was Minister of Finance in 1872, 1875, and 1877, president of the international monetary conference which met at Paris in 1878, minister to Great Britain in 1880, and in the same year president of the Senate; Feb. 11, 1886, he was elected a member of the French Academy. D. in Paris, Apr. 21, 1896. Author of *Théorie des changes étrangers*; *Histoire de la Caisse d'escompte*; *La Ville de Paris et le Crédit foncier*; *Examen critique de la situation financière de la Ville de Paris*, etc.

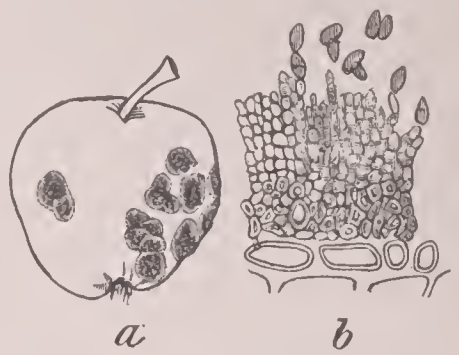
Say, Thomas: zoölogist; b. in Philadelphia, Pa., July 27, 1787; was one of the founders, and the first curator, of the Philadelphia Academy of Natural Sciences; accompanied Maclure, Peale, and Ord in their scientific exploration of Georgia and Florida 1818; was zoölogist to Maj. Long's expeditions to the Rocky Mountains 1819–20, and to St. Peter's river 1823; published *Vocabularies of Indian Languages* (Philadelphia, 1822); issued his principal work, *American Entomology*, in 3 vols. (Philadelphia, 1824–28); removed with Maclure and Owen to New Harmony, Ind., 1825, as one of the founders of that socialistic experiment; remained there after the separation of his associates; published 7 numbers of a great work on *American Conchology* (1830–34), with colored plates. D. at New Harmony, Oct. 10, 1834. His *Comptete Writings on Conchology* was edited by William G. Binney (New York, 8vo, 1858), and his *Complete Writings on Entomology* was issued by Le Conte (New York, 2 vols. 8vo, 1859). Say must be regarded as the father of American systematic zoölogy. Revised by J. S. Kingsley.

Sayce, Archibald Henry, LL. D.: philologist; b. at Shirehampton, England, Sept. 25, 1846; graduated at Oxford in 1869, where he became a fellow of Queen's College; was appointed Deputy Professor of Comparative Philology at Oxford in 1876, which office he resigned in 1890. He has worked in a great variety of fields, classic, biblical, Assyrian, Hittite, Vannic, Egyptian, and has published a number of books and essays. Among these are *Introduction to the Science of Language* (2 vols., 1880); *The Ancient Empires of the East* (1884); *The Hibbert Lectures for 1887* (on the religion of the ancient Babylonians); and *The Records of the Past* (new series, 6 vols., 1888–92). D. G. Lyon.

Sayre, Lewis Albert, M. D.: surgeon; b. at Madison, N. J., Feb. 29, 1820; graduated at the University of Transylvania in 1837. Having selected the medical profession, in 1839 he entered the office of Dr. David Green in New York; in 1842 took the degree of M. D. in the College of Physicians and Surgeons; was appointed resident physician of Bellevue Hospital, New York, in 1859, and soon after was elected Professor of Orthopædic Surgery in the Bellevue Hospital Medical College. In 1843 he advocated free incision for the treatment of suppurative diseases of the joints; and in 1852 first exsected the head of the os femoris and portion of the acetabulum with success—an operation that he performed oftener probably than the whole profession besides. He inaugurated important steps in the treatment of hip-joint disease and caries of the vertebræ, lecturing on these subjects in the U. S. and Europe, and may be said to be the founder of orthopædic surgery as a specialty. Dr. Sayre was the author of several monographs on orthopædic surgery. In 1872 the King of Sweden appointed him a Knight of the Order of Vasa. D. Sept. 21, 1900. Revised by S. T. Armstrong.

Scab: a disease of sheep much resembling the itch which sometimes afflicts the human species. Like that disease, it is caused by the presence of a minute acarus or spider-like mite. Sulphur ointment, arsenical washes, tobacco-water, and mercurial ointments are all useful, and the disease can generally be cured without difficulty. It may be suspected when the sheep rub themselves much or have bare and scurfy patches upon the skin.

Scab (in plants): the popular name of several diseases, characterized by a roughening of the surface of the affected part. *Apple-scab* is a disease in which the fruit becomes more or less covered with black scab-like spots, varying from mere specks a millimeter in diameter to blotches nearly or quite an inch in diameter. It is caused by a minute hyphomycetous fungus (*Fusicladium dendriticum*) of the family *Dematiceæ*, which grows upon the surface and in the superficial cells of the leaves and fruit. According to Prof. Scribner, whose figures we reproduce, the loss in some States from the apple-scab amounts to one-half the crop. Spraying the trees in the spring with poisonous solutions (iron or copper sulphate) is beneficial.—*Pear-scab* is a similar affection of the pear, caused by the same or a very nearly related fungus known as *F. pirinum*.—*Grape-scab*, or more properly anthraenose, occurs upon the leaves, twigs, and berries of the grape, forming brownish or grayish scabs with darker margins. It is one of the most destructive of the grape diseases and is caused by a minute melanconiaceous fungus (*Glœosporium ampelophagum*, or, according to de Bary, *Sphaceloma ampelinum*) which attacks the superficial cells of the affected parts. The application of poisonous solutions by spraying has been found beneficial.—*Potato-scab* is a disease of the tubers of common potatoes in which the surface becomes more or less covered with rough warty scabs, greatly injuring their appearance and value. Careful investigations by Prof. Bolley show that it is caused by bacteria which invade and destroy the outer cells. As a consequence, the tuber develops masses of cork-like cells to close the wounds resulting from the action of the bacteria. Soaking the potatoes before planting for an hour and a half in a solution of corrosive sublimate in water (1 to 1,000) will destroy the bacteria. The planting should be upon ground free from contamination.—*Beet-scab* is a disease of sugar-beets similar to the potato-scab, and, as shown by Prof. Bolley, caused by the same species of bacteria. The scabby patches occur upon the upper portion of the beetroot, and greatly disfigure it. It is therefore necessary in growing sugar-beets to avoid the use of fields in which scabby potatoes have been grown.—*Wheat-scab* is a disease of the heads of wheat in which they turn pale yellow, wholly or in part, the kernels shriveling and drying up. The chaff also becomes coated over with a sticky growth, which the microscope shows to be a hyphomycetous fungus, probably *Fusarium tritici*. Early sowing upon well-prepared soil tends to decrease this disease. See F. L. Scribner's *Fungus Diseases of the Grape* (U. S. Dept. Agric., 1886); *Fungus Diseases of the Grape and other Plants* (1890); J. C. Arthur, *Wheat Scab* (Bull. Purdue Univ. Expt. Station, 1891); H. L. Bolley, *Potato Scab and Beet Scab* (Bull. N. Dak. Expt. Station, 1891). Charles E. Bessey.



Apple-scab: *a*, an affected apple, reduced; *b*, section showing the parasite, much enlarged.

Scabbard-fish: the *Lepidopus argyreus*, a species of the family *Trichiuridæ*, distinguished by the elongated, ribbon-like body, pointed head, formidably armed mouth, elongated dorsal and anal, and well-developed and forked caudal fin. The species is an open-sea fish, and rather rare on the coasts of Europe.

Scabies, or **Itch** [*scabies* is Mod. Lat., from Lat. *sca'bies*, scurf, mange, itch]: a parasitic disease of the skin. It affects chiefly the hands, more especially the webs of the fingers, their inner surfaces, and the back of the hand. Less frequently it extends to the arms, and rarely the feet, legs, and abdomen are affected. The scalp may be invaded, but the face is exempt. This disorder infests children, the peculiar insect being transmitted from person to person by contact at school or play, and its lodgment being facilitated by neglect to wash perspiration and dirt from the hands. Persistent and annoying itching is experienced; careful inspection detects small red elevations, points of irritation, papular at first; soon these become vesicular or watery at the tip, and often from scratching are rendered pustular, and later scaly. Closer inspection discloses small red lines connecting these vesicles or branching from them into adjacent healthy skin. These red lines are subcuticular channels,

produced by the burrowing of the itch-insect beneath the cuticle or scurf-skin, and the vesicles are the result of inflammation to which its presence and irritation have given rise. The insect will not be found in the fluid or cavity of the vesicle, but by laying open the diverging canals with a fine needle may often be found at its end. This parasitic insect is known as the *Acarus scabiei*, or *Sarcoptes hominis*. It is a whitish insect, from $\frac{1}{100}$th to $\frac{1}{50}$th of an inch long. The male is migratory in his habits, and small. His head is provided with two mandibular organs and four palpi or bristles; the adult male has eight legs. The female is sedentary in habits, and more easily found, especially at the ends of channels, where she lays her eggs. The acarus makes its progress beneath the epidermis by means of suckers or disks upon its legs, and by aid of bristles upon its back, directed backward. Hahnemann ascribed itch to a supposititious cause, a subtle humor, which he termed *psora*, and which he regarded as the cause of multitudinous ailments of all kinds; but the microscope has established the parasitic nature of the disease. The treatment of scabies consists in killing the parasites. Remedies producing this end are termed parasiticides. Chief among these is sulphur, in ointment, powder, or vapor. Sulphurous acid is a convenient application. Carbolic acid, kerosene, petroleum, strong alkalies, and solution of corrosive sublimate are also efficacious. Even when cured as a specific disease, the redness and vesicles may linger, a chronic condition of irritation. Soothing ointments are then indicated.

Revised by W. Pepper.

Scad: the *Trachurus trachurus*, a fish of the family *Carangidæ*, distinguished by its elongated, fusiform body, completely plated lateral line, and silvery color. When fresh it is scarcely edible, but it takes salt well, and when pickled is very good. Many are taken in the British seas. The name has been extended to congeneric species, as well as to species of the genera *Trachurops* and *Decapterus*.

Scadding, Henry: See the Appendix.

Scævola, sev′ō-lăă: a cognomen common among the members of the plebeian family of the Mucii in ancient Rome. The two most prominent members of the family were Quintus Mucius Scævola, the Augur, and Quintus Mucius Scævola, the Pontifex, both celebrated as jurists, and nearly contemporary. The former was tribune of the people in 128 B. C., prætor in 121, consul in 117, and died soon after the outbreak of the war between Marius and Sulla. Cicero, who was born in 106 B. C., states that after assuming the garb of manhood (*toga virilis*) he was taken by his father to Scævola to be instructed in law, and that he remained in close attendance upon him until his death. The Pontifex Scævola was tribune in 106 B. C., and consul in 95. He was proscribed and put to death by the party of Marius in the year 82. Cicero, who, after the death of Scævola the Augur, attached himself to the Pontifex, characterizes him with the epigrammatic phrase that of jurisconsults he was the most eloquent, and of orators the most deeply versed in the law. Revised by G. L. Hendrickson.

Scagliola, skăl-yō′lăă [from Ital. *scagliuo′la*, liter., dimin. of *sca′glia*, scale]: an imitation of marble, made by mixing ground gypsum with glue, coloring it, applying it to the surface to be marbleized, and setting into the soft mass, if it be desired, bits of various ornamental stones. When hard the surface is smoothed and polished. It is an admirable imitation of the more costly marbles, but is not durable, especially in damp places.

Scala, skaa′lăă (Lat. *Scaligeri*): the name of a celebrated Italian family which reigned in Verona from 1260 to 1387. After a long series of internal disturbances, tyranny alternating with anarchy, Mastino della Scala succeeded in 1260 in making himself master of the city. He ruled with firmness and wisdom; the city prospered, and, although he was assassinated in 1277, the power continued in his family for more than a century. Under Cangrande (1311–29) the fortune of the family culminated. He was confirmed in his possessions, to which were added Vicenza, Padua, Treviso, etc., by the Emperor Henry VII. At his court lived Dante, and many of the most magnificent architectural monuments of the city were erected during his reign. Most of his successors, Cangrande II., Paolo Alboino, and others, were worthless and infamous tyrants, and in 1387 Galeazzo Visconti of Milan expelled Antonio della Scala. The male line of the family, which flourished in Bavaria under the name of Scaligeri, became extinct in 1598; the female is still flourishing in the families of Dietrichstein and Lamberg.

Scala Nova (anc. Νεάπολις): town; in Asia Minor, vilayet of Aïdin; 7 miles S. W. from the ruins of Ephesus (see map of Turkey, ref. 5–D). It has a good harbor, and is the main port of the towns in the valley of the Meander. Pop. 7,500.

Scalchi, Sofia: See the Appendix.

Scald: See Burns and Scalds.

Scaldhead: See Favus.

Scale [from Lat. *sca′la*, flight of steps, for **scadla*, deriv. of *scan′dere*, climb]: a mathematical instrument used in plotting and in other branches of applied geometry. It consists of a slip of wood or other material divided into parts in accordance with some mathematical law. The common ivory ruler of the instrument-maker has a great variety of scales stamped on its faces, of which the *scale of equal parts* and the *scale of chords* are of most frequent use.

Scale of Equal Parts.—This consists of a number of inches, or aliquot parts of an inch, laid off along a line. The representative fraction gives the ratio between the scale and the object it represents. Thus if the scale is of 1 inch to 8 miles the representative fraction is 1 : 506,880. The first part, counting from the left, is subdivided into ten equal parts, the 0 of the scale being at the beginning of the second part. The *principal divisions* are numbered from the 0 toward the right, and the *subdivisions* toward the left. This scale is used, in connection with a pair of dividers, for laying off and measuring the lines of a drawing. The diagonal scale is used to further divide the subdivisions. If the division is into tenths, ten parallel lines at equal distances are drawn above the simple scale, and the perpendiculars are erected at the ends of the division. Then from the points of subdivision on the uppermost line parallel lines are drawn to the corresponding points one subdivision to the right on the base line. The intercepts of these diagonals on the lines parallel to the base determine the length of the farther subdivision.

Scale of Chords.—This scale is used for laying off and for measuring the angles of a drawing. It is constructed by laying off from the left-hand extremity of a given line the chords of all the arcs from 0° up to 90°, corresponding to some assumed radius. The extremity of each chord is marked by a corresponding number; the origin of the scale and the extremity of the chord of 60°, which is equal to the radius, are marked in a more conspicuous manner than the other divisions. To lay off an angle, the vertex and one side being given, take the chord of 60° as a radius, and from the vertex of the angle as a center describe an arc cutting the given side; then from the point in which this arc cuts the side as a center, with a radius equal to the chord of the arc corresponding to the given angle, describe a second arc cutting the first; join this point of intersection with the given vertex; the last line will make the required angle with the given side. The method of measuring an angle by means of the scale is obvious.

Scale: in music, the regular series of sounds, or degrees on the stave, which form the gamut. The scale in its simplest form consists of seven steps or degrees, counted upward in regular order from a root or prime, to which series the eighth is added to complete the octave. By reverse motion the same notes form the descending scale; and by the addition of other notes above or below in a continuous order the scale may be extended to seven, eight, or more octaves. The *diatonic* scale is that which consists of the tones and semitones of the octave in their natural order and relation; as, for example, A, B, C, D, E, F, G, A. (For the origin of this scale, see the article Gamut.) Of the diatonic scale, only two varieties are in use in modern music—viz., the *major* and the *minor*. The chief characteristic interval in both these scales is the *third*, which is one semitone greater in the major than in the minor. In ancient music several other diatonic scales were in use as described under the head of Mode (*q. v.*). The word scale means also the entire range or compass of sounds producible by any given instrument, as the scale of the violin, flute, organ, or piano. It is also applied by organ-builders to a graduated rule, plan, or scheme showing the lengths and diameters of the various pipes comprised in any stop. In like manner the length and thickness of the strings of a piano are regulated by a carefully graduated scheme called the *scale*; hence the terms new or improved scale refer to changes adopted by manufacturers in regard to the length and thickness of the strings.

Revised by Dudley Buck.

Scale-carp: See Carp.

Scales (of fishes): See ANATOMY, COMPARATIVE (*Mucodermal System*).

Scal'iger, JOSEPH JUSTUS: classical scholar; tenth child and third son of Julius Cæsar Scaliger; b. at Agen, Guyenne, France, Aug. 4, 1540. He was carefully educated by his father, and studied in Bordeaux and Paris (under Turnebus 1565), and was professor in Geneva 1572–74. The succeeding twenty years were spent in travel and on the estates of his patron, de la Rochepozay. In 1593 he accepted a call to the University of Leyden, where he remained till his death Jan. 21, 1609, in undisputed possession of the throne of learning, but embittered by the venomous attacks upon his character which SCIOPPIUS (*q. v.*) hurled against him in the *Scaliger Hypobolimæus* (1607). Scaliger has been justly styled the "most richly stored intellect that ever spent itself in acquiring knowledge." He mastered no fewer than thirteen languages, and his acquirements in mathematics and the sciences generally were profound, and his acquaintance with classical antiquity all-embracing. He opened new regions of research for the classical scholar, being virtually the founder of epigraphy, numismatics, and chronology as sciences. His critical talent was of the highest order, and there is scarcely an ancient author whose text has not been benefited by Scaliger's genius, although he has said of himself "Melius morbos quam remedia novimus." His most celebrated works are *Festus* (1575); *Catullus, Tibullus, Propertius* (1577), a work unfortunately marred by a wanton disregard of MS. tradition; twenty-four indexes to Gruter's *Thesaurus Inscriptionum Latinarum* (1601), a colossal and epoch-making achievement; *De emendatione Temporum* (1583) and *Thesaurus Temporum* (1606), immortal masterpieces and the basis of all subsequent chronological research, the restoration of the lost portions of the *Chronicon* of Eusebius being perhaps the greatest triumph of conjectural skill on record, for when the missing parts were discovered in an Armenian translation they were found to coincide with Scaliger's reconstruction. See Jacob Bernay's *Joseph Justus Scaliger* (Berlin, 1855), pp. 319 (list of his works, pp. 267–305); L. Mueller, *Geschichte der class. Philologie in den Niederlanden*, pp. 222–227; M. Pattison, *The Lives of the Two Scaligers*, in *Essays*, vol. i., pp. 196–244. ALFRED GUDEMAN.

Scaliger, JULIUS CÆSAR: classical scholar; b. at Riva, Lake Garda, Italy, Apr. 23, 1484; the son of Benedetto Bordone, a miniature-painter of Padua. The latter assumed or received the name Della Scala (de l'Escale) from the street in which he lived, for the genealogy by which his descent from the noble family of the Della Scalas was made out is a pure fabrication, though obstinately upheld by his illustrious son. The elder Scaliger, according to the account given by his son, served as a page under Maximilian I., and as a soldier of fortune in the armies of François de Valois. He studied medicine, and after living for some time at Venice settled down at Agen, France, in 1529, as physician to the bishop of the diocese. D. Oct. 21, 1558. He was a man of great learning and a versatile Latin poet, but of a very irritable and pugnacious nature. His best-known works are, besides seven books of poetry (1561), commentaries on Hippocrates, *De insomniis* (1538); Aristotle, *De plantis*; Theophrastus, *De Causis plantarum* (1566); and a grammatical work, *De causis Linguæ Latinæ* (1540). His attack on Erasmus (*Oratio pro Cicerone contra Erasmum*, 1531) is characterized by a most virulent invective, remarkable even for an age so tolerant of personal vituperation. See Joseph Scaliger, *De vetustate et splendore gentis Scaligeræ et Jul. Cæs. Scaligeri vita* (Leyden, 1591); Janus Dousa, *Vita Julii Cæsaris Scaligeri* (1594); A. Magen, *Documents sur Julius Cæsar Scaliger et sa famille* (1880). ALFRED GUDEMAN.

Scallop [from O. Fr. *escalope*, a shell; cf. Dutch *schelp*]: a common name for molluscs of the family *Pectinidæ*. The shell, the two valves of which are usually unequal, is circular in outline, the straight hinge having ear-like lobes at either end. There are many species, most of them being used for food. The Eastern markets of the U. S. are supplied by the *Pecten irradians*, which abounds on the south shore of Cape Cod and southward. Only the muscle which closes the shell is used for food. A scallop-shell was formerly worn by pilgrims to show that they had been to the Holy Land. J. S. KINGSLEY.

Scalp: the outer covering of the top of the human head, consisting of the hairy integument, the flattened tendon of the occipito-frontal muscle, and subcutaneous cellular tissue. Wounds of the scalp are peculiarly liable to take on an untoward kind of inflammation, and their treatment requires great care. The removal of the scalp of a dead (or even a living) enemy as a token of triumph is one of the customs of many tribes of North American Indians.

Scaly Ant-eater: See MANIDIDÆ.

Scaman'der (in Gr. Σκάμανδρος): a stream in the plain of Troy. Homer says that it was called *Xanthus* by the gods, but *Scamander* by men; it is probable, however, that it received the name Xanthus from the yellow or brownish color of its water, which was believed to have the power of dyeing the wool of sheep which drank of it. According to Homer, it arose from two sources, one of hot, and the other of cold water. To-day, at all events, the waters of the sources of Scamander do not differ in temperature. The river is still called Mendere-Su by the Turks. J. R. S. S.

Scammony [viâ O. Fr. from Lat. *scammo'nea, scammonia* = Gr. σκαμμωνία]: a cathartic drug obtained from the *Convolvulus scammonia*, a twining plant of the family *Convolvulaceæ*, indigenous in Greece, Syria, Anatolia, and Southern Russia. The root of this convolvulus contains a milky juice which, collected from the cut surface of a fresh root, dries into a slate-colored lump, hard and brittle, and constitutes the drug in question. At the time of collection the juice is much adulterated, so that scammony varies greatly in purity. The purest quality is called virgin scammony. The active principle of scammony is a resin which may be used in medicine instead of the crude drug. Scammony has been known from a remote period. It is a powerful drastic cathartic, and in overdose is capable of exciting dangerous inflammation. Its principal advantage is the fact that an emulsion of the drug is nearly tasteless, but it is very seldom used except in combination with other purgatives. Resin of scammony is an ingredient of the U. S. compound extract of colocynth, and therefore of the compound cathartic pill. Revised by H. A. HARE.

Scamozzi, skăă-mōt'sĕĕ, VINCENZO: architect; b. at Vicenza, Italy, in 1552. His father, also an architect, grounded him in his art. He then studied at Venice with Palladio and Sansovino, and in 1579 he went to Rome to study ancient monuments. In 1583 he returned to Venice to establish himself, and was commissioned by Marc Antonio Barbaro to erect a monument to his family in the Church of the Carità. This work was so much approved of that Scamozzi immediately was appointed to finish the library of St. Mark's. The Cornaro Palace on the Grand Canal, Venice, is his work, also the Trissino Palace at Vicenza. The second or uppermost story was added to the Palazzo Strozzi, at Florence, by Scamozzi, and he built the Ravaschieri Palace at Genoa. His designs were in request all over Europe, for he was acknowledged to be one of Italy's best architects. He published several works, and had completed six parts of his *Ideas of Universal Architecture*, when he died in Venice, Aug. 7, 1616. W. J. STILLMAN.

Scan'derbeg: soldier and patriot; b. 1404. His real name was George Castriotes, and he was fourth son of John Castriotes, despot of Northern Albania. The four brothers were given as hostages to Murad II. in 1423, when he invaded Albania. The three elder died from poison, but the beauty and brightness of George rendered him a favorite of the sultan, who made him a janissary and gave him the title of Iskender (Alexander) Bey; hence his popular name of Scanderbeg. He gained great distinction in the Ottoman campaigns in Asia, but when his father died in 1432 the sultan incorporated Albania as a province. Scanderbeg was offended and indignant, but bided an opportunity for freedom and revenge. In 1443 he was sent as second in command of a large army into Hungary. He so manœuvered as to give the victory to the Hungarian Huniadi, and fled with a few followers to Croia. Previously he had compelled the sultan's secretary to sign an order, bidding the Ottoman commander of Croia to give up his office to the bearer of the order, and had then killed the secretary to prevent discovery. He thus obtained possession of the chief Albanian fortress. Abjuring Islam, he called upon his countrymen to rise against their Mussulman masters. The country responded; even the rival, semi-independent Albanian chiefs forgot their jealousies and agreed to pay him tribute. During seventeen years Scanderbeg successfully resisted the whole power of the Ottoman empire, fifteen times defeating armies always far more numerous than his own, commanded by the ablest generals and often by Murad II. or his successor, Mohammed

II., in person. In 1461 the sultan, hopeless of victory, acknowledged the independence of Albania and Epirus. Persuaded by the pope to violate the treaty and attack the Ottomans, Scanderbeg won eight splendid victories, the last, with 24,000 men, over Mohammed II., who had 100,000. He died at Alessio, Jan. 17, 1468, and was buried at Scutari in Albania. When in 1477 the Ottomans captured Scutari, they broke open his tomb, divided his bones into fragments as precious relics, had them set in gold and silver, and wore them around their necks as talismans to give intrepidity and success. Despite his ferocity and lack of faith, Scanderbeg is deservedly honored and revered as the "hero of Albania."

E. A. GROSVENOR.

Scandina'via: a name applied by the Romans to a supposed great island N. of Germany, probably the southern point of Sweden, extended by moderns as a geographic name for the peninsula between the Baltic Sea and Gulf of Bothnia on the one hand, and the North Sea and Atlantic Ocean on the other. It includes Norway, Sweden, and part of Finland. The name is sometimes used in an ethnographic sense, when it also includes Denmark. See NORWAY, SWEDEN, DENMARK, FINLAND, and LAPLAND. M. W. H.

Scandinavian Languages: the name applied collectively to the Teutonic languages of the Scandinavian north, inclusive of settlements from Scandinavia, notably Iceland and the Faeroes. With Gothic and West Germanic Scandinavian forms the Teutonic branch of the Indo-European family of languages. An earlier classification made Scandinavian and Gothic East Germanic as opposed to West Germanic, but, although coincidences in some points exist, no other relationship than the one at present assumed is probable. The linguistic territory of Scandinavian is Norway, Sweden, including parts of Finland and Esthonia, Denmark, including the adjoining northern parts of Schleswig and the Danish dependencies of the Faeroes, Iceland, and Greenland. At an earlier period Scandinavian was, at least for a time, the language of conquered territory elsewhere—viz., in Swedish settlements in Russia from the ninth to the eleventh century; in Norwegian settlements in the Orkneys and Shetlands from 800 to 1800; in the Hebrides, Northern Scotland, and the Isle of Man from 800 into the fifteenth century; and in Ireland from 800 to 1300; in Danish settlements in England from the ninth into the eleventh century; and in Danish and Norwegian settlements in Normandy from 900 until after 1000. From the Shetlands, Ireland, Scotland, England, Normandy, and Russia there is, however, no extant monument from ancient times.

In its historical development Scandinavian falls chronologically into several periods. Common Norse, the first, extends from the earliest time down to the beginning of the Viking age in 700. It is the homogeneous parent language of the north before it shows traces of dialectic differences. The second period is coincident with the so-called Viking age, from 700 to 1050. Instead of a single language, three dialects appear—Old Norwegian, Old Danish, and Old Swedish, including the sharply defined dialect of the island of Gotland, Old Gutnic, to which was added after the settlement of Iceland, principally from Western Norway, in the ninth century, a fourth, Old Icelandic. This dialectic separation, furthermore, proceeded in such a way that two groups were formed—an eastern, made up of Old Danish and Old Swedish, together, accordingly, called East Norse, and a western, comprising Old Norwegian and Old Icelandic, together called West Norse. At the end of the Viking age these dialects again had differentiated into languages, properly so called, whose early or "old" period extends to the Reformation, or about the year 1530, at which time the modern or "new" period begins. The whole development of the Scandinavian languages down to the Reformation is commonly included under the one term Old Norse. In Scandinavia itself, in the Viking age and later, *dǫnsk tunga*, Danish language, was applied to the language of the entire north; in the same signification *norrønt mál*, Norwegian language, also occurs in Norway and Iceland, but it is usually limited specifically to West Norse.

Common Norse is only scantily preserved in Scandinavian loan-words adopted by the neighboring Lapps and Finns in the early centuries of the Christian era, and in something over a hundred runic inscriptions in the earlier Germanic alphabet of twenty-four characters, the oldest of which date from about the year 500. Of the Teutonic dialects Common Norse even more than Gothic stands nearest in essential points to Common Teutonic. Important differences between Scandinavian and Gothic observable in the earliest time are: Norse retention of final *a*, *i*, *u* of stem in substantives, syncopated in Gothic; Norse *a*-stems end genit. sing. *-as*, dat. sing. *-e*, Goth. *-is*, *-a*; *an*-stems end genit. and dat. sing. *-an*, Goth. *-ins*, *-in*; *u*-stems end dat. sing. *-iu*, Goth. *-au*; *r*-stems end nom. pl. *-iR* (*R* palatal liquid), Goth. *-jus*; 1 sing. pret. of weak verbs ends *-o*, Goth. *-a*. The most important points of coincidence with Gothic are the development of Teutonic *jj* to Gothic *ddj*, Norse *ggj*; Teutonic *ww* to Gothic *ggw*, Norse *ggw*; Teutonic *z* to Gothic *s*, Norse *R*.

During the Viking age (700–1050) it is possible to obtain for the first time a tolerably complete view of the language. The sources of information are, as in the earlier period, loanwords, and not only in Finnish-Lappish, but in Keltic, Russian, and Anglo-Saxon. Runic inscriptions, besides, occur in great numbers over the whole Scandinavian north, written after the middle of the ninth century exclusively in the shorter or Old Norse alphabet of sixteen characters. To these, after the end of the ninth century, is to be added a literature consisting of the oldest Eddic lays and early Skaldic poetry cited in Icelandic MSS. of the thirteenth century, until then orally transmitted and still preserving an archaic form. The Viking age was not only pre-eminently a period of rapid organic change, but local differentiations occur also at an early period, as has already been noted, in two well-defined groups, and after the introduction of Christianity, which marks the end of the period, there are four languages instead of the one at its beginning. After the middle of the twelfth century a native literature begins in Icelandic-Norwegian, soon abundant enough to show comprehensively the facts of the language. The alphabet used is essentially the Latin. From the runic alphabet þ, thorn, was retained, and the Anglo-Saxon ð was borrowed. To indicate new vowel-conditions the MSS. use, but inconsistently, various digraphs and modified forms. Vowel-length in the oldest MSS. is indicated by accent.

Old Norse in the literary period exhibited the following phonetic conditions:

A. Sonants:

Vowels: Palatal. Short: *i*, *j*, *e* (*ę*), *y*, *ø*. Long: *í*, *é*, *ǫ*, *ý*, *ǿ*.
Guttural. Short: *a*, *o*, *u*, *v*, *ǫ*. Long: *á*, *ó*, *ú*, *ǫ*, *ǿ*.

In the function of sonants (only in unstressed syllables):

Nasals: *m*, *n*.
Liquids: —, *l*, *r*.

Diphthongs: *ei*, *au*, *øy* (*ey*); *ja*, *jo*, *jǫ*, *ju*, *já*, *jó*, *jǿ*, *jú*; *va*, *ve* (*vę*), *vi*, *vǫ*, *vá*, *vé*, *vǽ*, *ví*, *vǫ́*.

All vowels and diphthongs may be nasalized. *e* has a twofold value: close Teutonic *e*, whose corresponding long form is *é*; open *e*, by umlaut from *a*, whose long form is *ǽ*. The two values fall together in most MSS. *ø* has a twofold value: short close *ö* from close *e* or *o*, the long form *ǿ*; or short open *ö* from open *e* or *ǫ*, the long form lacking. *ö*, which is used in most printed texts, was borrowed from German in the sixteenth century.

B. Consonants:

CLASSES OF CONSONANTS.	Labials.	Interdentals.	Dentals.	Palatals and gutturals.
Explosives: voiced....	*b*	——	*d*	*g*
voiceless..	*p*	——	*t*	*k*
Spirants: voiced.....	*f*, *v*	ð	——	*g* (i. e. ȝ)
voiceless....	*f*	þ	*s*	*h*, *g*
Nasals	*m*	——	*n*	*n* (i. e. ŋ)
Liquids..... ...	——	——	*l*, *r*	——
In the function of consonants.....	*u*, *v*, (*w*)	——	——	*i*, *j*

There was, in addition, breath (laryngeal) *h*; *ts* is represented by *z*; *ks* by *x*.

The consonants occur long (geminated), with the exception of the spirants where *s* is the only one lengthened. *ff* occurs in loan-words. Common Norse palatal (dorsal) *R* (Teutonic *z*) is merged in Old Norse *r*.

Of the Common Teutonic vowels Old Norse maintained, under circumstances, in direct continuity: Short: *a*, *e*, *i*, *o*, *u*. Long: *â*, *ê*, *î*, *ô*, *û*. Diphthong *au*. Teutonic *ǽ*, is represented throughout by Old Norse *á*, by *i*-, *R*-umlaut *ǽ*. Teutonic *ai* by Old Norse *á*, by *i*-, *R*-umlaut *ǽ*; by *i*-umlaut *ei*, which in its turn as final is contracted to *é*, and sporadically is

shortened to *e*. Teutonic diphthongs *eu*, *eo* in Common Norse interchanged and went over into *iu*, *io*, which became later *jú*, *jó*.

Of the Common Teutonic consonants Old Norse maintained in direct continuity: *b*, *d*, *g*, *bb*, *dd*, *gg*; *p*, *t*, *k*, *pp*, *tt*, *kk*; ð, *g* (ȝ); *f*, þ, *s*, *ss*, *h*; *m*, *n*, *n* (ŋ), *mm*, *nn*; *l*, *r*, *ll*, *rr*; *j*; *h*. Teutonic *b* is represented as initial by Old Norse *b*; before *k*, *s*, *t* by Old Norse voiceless *f*. Teutonic *z* is Common Norse *R* (palatal). Teutonic *w* is Old Norse *v*.

Within Old Norse itself the combinatory sound-changes that acquired the importance of laws were in detail as follows:

A. *Sonants.—Umlaut.*—Umlaut, which attains an extraordinary development in Old Norse, is primarily a shifting either through palatalization or labialization. Palatal umlaut is either *i*-umlaut caused by a following *i* (*j*), or it is *R*-umlaut caused by an immediately following palatal *r*. The vowels that undergo *i* (*j*)-umlaut are *a*, *á*, *o*, *ó*, *u*, *ú*, *au*, *ai*, *jo*, *ju*, *jú*, which become respectively *e* (*æ*), *ę*, *ø* (close), *ǿ*, *y*, *ý*, *øy* (*ey*), *ei*, *jø* (*ø*), *y* (presumably with *jy* as an intermediate step), *ý* (presumably through *jý*).

The vowels that undergo *R*-umlaut are *a*, *á*, *u* (*o*), *ú*, *au*, *jú*, which become respectively *e* (*ę*), *ǽ*, *ø* (close), *ý*, *øy* (*ey*), *ý* (presumably through *jý*).

Labial umlaut is caused by a following *u* (*o*), *v*. The vowels that undergo *u*-umlaut are *a*, *á*, *e* (open), *e* (close), *i*, *í*, *ei*, *va*, *vá*, *vi*, *ví*, which become respectively *ǫ*, *ǫ́*, *ø* (open), *ø* (close), *y*, *ý*, *øy* (*ey*), *vǫ*, *vǫ́* (*ó*), *y* (presumably through *vy*), *ý* (presumably through *vý*).

In unstressed syllables the only instances of *i*-umlaut are *a*, *u* becoming *e* (open), *y* respectively; of *u*-umlaut, *a* becoming *ǫ*.

The chronology of umlaut is varied. *i*-umlaut originated apparently in the Common Norse period; it had, on the other hand, in the oldest West Norse literature ceased to be an active force. *u*-umlaut was consummated later, but is, nevertheless, to be ascribed to the end of the Norse period.

Fracture.—Fracture occurred, apparently in Common Norse, in the case of Teutonic *e* (in Old Swedish, Old Danish in *e*, *i*) whenever there followed in the next syllable *a*, *o*, *u* (*v*), *á*, *ó*, *ú*, providing that the *e* is not immediately preceded by *v* or *r*. According to the quality of the parasitic vowel, it is either *a*-fracture, *a* > *ea* > *ja*, or *o*-, *u*- (*v*-) fracture, *e* > *eǫ* > *jǫ* (*jo*, *ju*).

Lengthening of Short Vowels.—Every short vowel final originally or by loss of a consonant is lengthened. Compensatory lengthening occurs also under circumstances for the loss of a consonant.

Shortening of Long Vowels.—This occurs frequently, but sporadically. Every long vowel immediately before another vowel could be shortened. In unstressed syllables, late in the Common Norse period, all long vowels of the inflexional ending were shortened.

Loss of Vowels.—In words originally trisyllabic almost every short vowel in the penult was syncopated at an early time. The law of syncope in Old Norse is that in syllables of derivation a short vowel is syncopated wherever by the addition of an ending with an initial vowel it stands in open syllable. In end syllables of words originally disyllabic short ultimate vowel is regularly lost when it had not been protected by two consonants; long vowel is only lost when no consonant stood after it. In words originally trisyllabic the ultimate vowel is only in exceptional cases lost and the vowel of the penult retained. An important result of the loss of the ultimate vowel is the acquirement of sonantal function by *l*, *m*, *n*, *r*, which happens when through this loss an explosive or a spirant stands immediately before them.

Interchange of Vowels.—In unstressed syllables *o* and *u*, *e* and *i* respectively, without regard to origin, are indiscriminately interchanged.

B. *Consonants.—Change in the Form of Articulation.*—The voiced spirants *b*, ð, ȝ toward the end of the Common Norse period as initial became the voiced explosives *b*, *d*, *g*. As the result of the working of the law of vowel-syncope *b* became voiceless *f*; ð became *d* (ðð > *dd*), or þ, which then went over to *t*; ȝ became *g*, which went over to *k*. The voiceless spirants *h*, þ, *f* became, in part in Common Norse, respectively: *h* > (breath) *h* before sonants (*hs*, however > *ks* (*x*)); þ > ð (*d*, *t*) after vowels and *r*, and in unstressed syllables; *f* > (voiced) *f* after vowels and *l*, *r*. The voiced explosives *d*, *g*, probably in Common Norse, became as final *t* (*ld*, *nd*, *ng* > *nt*, *nk* > *tt*, *kk*). As the result of the working of the law of vowel-syncope, *d* > *t* before *s*; *g* > *k* before *s*, *t*. The voiced explosives *k*, *t* in unstressed syllables after vowels frequently became the spirants *g*, ð. This change is exemplified even in the oldest MSS. After 1300 instances are frequent. In later Icelandic the spirants stand regularly as final after-vowels. The half-vowel *v* in the twelfth century is merged in voiced *f*. In the Common Norse period *mn* > *bn*, written *fn*.

Change in Place of Articulation.—The bilabial spirants *f*, *b* became, in the thirteenth century, the corresponding labio-dental spirants, both written *f*. The gutturals, possibly even before the Common Norse period, before palatals were palatalized. The change of spirant *h* to breath *h* has already been noticed.

Change in Quantity. — Lengthening. — Assimilation.—Consonantal assimilation is either regressive or progressive.

Regressive.—Apparently as old as the Common Norse period is the assimilation of the nasals to a following *k*, *t*, *p*: *nk* > *kk*; *nt* > *tt*; *mp* > *pp*. Other assimilations are *ht* > *tt*, with compensatory lengthening of the preceding vowel. Teutonic *zð*, *zn* > (ðð) *dd*, *nn* respectively. The syncope of an unstressed vowel causes the following: *dd*, *ddt* > *tt*; ðt > *tt*; *ggk* > *kk*. Other instances occur sporadically.

Progressive.—Probably in the Common Norse period occurred the assimilation of þ to a preceding *l*, *n*: *l*þ > *ll*; *n*þ > *nn*. As the result of vowel-syncope *t*ð > *tt*. Palatal *R* was throughout originally assimilated with preceding *l*, *n*, *r*, *s* to *ll*, *nn*, *rr*, *ss*, which process, however, through analogy has in many cases been obliterated. According to universal law, if a consonant precedes the long (geminated) consonant that arises through assimilation, the latter is shortened. After a long vowel or diphthong the final consonant may be lengthened; this occurs without exception in the adjective declension in nom., acc. sing. neut. *tt* instead of *t*.

Shortening.—A long consonant immediately following another consonant is invariably shortened. In unstressed syllables old Teutonic gemination is always simplified.

Loss of Consonants.—Teutonic *j* at an early time was lost as initial. Teutonic *w* (*v*) was lost in the following cases: before *o*, *ó*, *u*, and their umlauts; before *l*, *r*, and final. ȝ final in the Common Norse period became *h*, which was then lost according to the rule that *h* medial and final was everywhere dropped. Old Norse *j* is lost except before *a*, *á*, *o*, *ó*, *ǫ*, *ǫ́*, *u*, *ú*. Old Norse *v* is lost before *o*, *ó*, *u*, and their umlauts, before consonants and final. There are many instances of sporadic loss.

East Norse and West Norse.—The principal characteristic correspondences of the languages of the West Norse group, i. e. Old Icelandic and Old Norwegian, as contrasted with East Norse, i. e. Old Swedish and Old Danish, are as follows: West Norse retains *i*-, *R*-, *u*-umlaut in many cases where in East Norse it has been replaced through analogy by the unumlauted form. West Norse has fracture of old *e* alone; East Norse of *e* and *i*. West Norse has *ú* in many words where East Norse has *ó*. West Norse changes to consonantal *i* (*j*) the vowels *é*, *í*, *ý* in the event of hiatus. West Norse assimilates the nasals to a following *k*, *t*, *p* where East Norse in many instances still retains *nk*, *nt*, *mp*.

Within the West Norse group the principal differences between the two languages are as follows: Old Icelandic retains *u*-umlaut before *u* (*o*), in which position in Old Norwegian it has been replaced through analogy by the unumlauted form. Old Icelandic has *ja* where Old Norwegian has a progressive umlaut *jæ* in stressed syllable. Old Icelandic *ǿ*, before the middle of the thirteenth century, became *ǽ*, and *øy* became *ey*; in Old Norwegian they were retained. Old Icelandic changes *ǫ* to *au* before *ng*, *nk*; Old Norwegian retained *ǫ*. Old Icelandic lengthened *a*, *o*, *u* before *l* + consonant, and, later, *a*, *i*, *u*, *y* before *ng*, *nk*; Old Norwegian retains the short vowel. Old Icelandic retains initial *h* before *l*, *n*, *r*, which in Old Norwegian is lost at an early period.

Within the East Norse group differences in the earliest period of the languages are comparatively insignificant. Important characteristics are as follows: Old Danish changes *k*, *t*, *p* after vowels, at first only in initial, to *g*, *d*, *b* respectively; Old Swedish maintains the ancient conditions. Old Danish changes *z* medial and final in many cases to consonantal *u*; Old Swedish has *gh*.

Specifically Scandinavian and characteristic of all members of the group are the following:

The Medio-Passive.—Traces, in a single form only, of the old Teutonic Medio-Passive are still to be found in Common Norse (*heite*). During the Viking age a new Medio-Passive appears, which is peculiar to Scandinavian. It is formed by the enclitic addition of the reflexive pronoun *sik* to the

corresponding active form, which then ends in *-k*, *-sk*, *-zk*. These endings were supplanted early in the thirteenth century by *-z* or *-s*, which somewhat later became *-zt* or *-zst*. Modern Icelandic has *-st*; Swedish and Danish have *-s*.

The Use of the Definite Article.—The definite article *enn* (*inn*) stands before an adjective, but after a substantive, to which it is suffixed with (original) declension of both substantive and article. That it was originally free in the same position is shown by instances in the Old Icelandic Stockholm Book of Homilies, so called, from early in the thirteenth century.

For the history of the individual Scandinavian languages, see DANISH LANGUAGE, ICELANDIC LANGUAGE, NORWEGIAN LANGUAGE, and SWEDISH LANGUAGE.

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Scandinavian Literature: the literary monuments of the Scandinavian language or languages. See SCANDINAVIAN LANGUAGE, DANISH LITERATURE, ICELANDIC LITERATURE, NORWEGIAN LITERATURE, and SWEDISH LITERATURE.

Scandinavian Mythology; the system of myths pertaining to the Scandinavian peoples. It is frequently called Norse or Northern mythology, but might more properly be denominated Teutonic mythology, since its chief deities were worshiped not only in Iceland, Norway, Sweden, and Denmark, but also in Germany and England—in short, by every branch of the Germanic or Teutonic race.

Original Sources.—Some information in regard to this mythology is to be gleaned from the old runic inscriptions found on monumental stones throughout the lands inhabited by Teutonic races, but mainly in the Scandinavian countries. Heathen Germany supplies a few ancient laws and glossaries containing mythological words. Formulas are also preserved by which converts to Christianity renounced the old gods and in which names of heathen divinities accordingly occur. Richer veins of information are such German heroic poems as the *Nibelungen Lied*, the *Gudrun*, the Saxon *Heliand*, and the Anglo-Saxon *Beowulf*. Cæsar, in his *De Bello Gallico*, gives us glimpses of the manner in which the Teutonic Druids preserved their mythological songs and epics, and with Cæsar Tacitus ranks as a source of information. Next after Cæsar and Tacitus come the Christians who wrote in Latin down through the Middle Ages, but they are, as a rule, very silent on the subject of the heathen religion. Among this class of writers Denmark furnishes a remarkable exception in Saxo Grammaticus. The first eight books of his *Historia Danica* contain an outline of Scandinavian mythology, the deities being presented as kings and potentates of early times. Mythological fragments must also be looked for in the customs, habits, speech, traditions, proverbs, ballads, folk-lore tales, and in the usages of the Christian Church throughout Teutonic lands. The chief sources of Scandinavian mythology are to be found in Iceland, and in Icelandic literature the most important documents are the *Elder* and the *Younger Edda*. (See EDDA and ICELANDIC LITERATURE.) The *Younger Edda* gives in prose a succinct account of the Odinic religion. It also contains some poetic quotations not found in the *Elder Edda*.

Interpretations.—Modern Authorities.—Both Snorre and Saxo Grammaticus present the euhemeristic interpretation of the myths, and this view prevailed until late in the eighteenth century. Euhemerism was finally superseded by the so-called physical interpretation making the divinities represent the various forces and phenomena of nature. This theory was most elaborately developed by the Icelander Finn Magnusson in his *Eddalæren og dens Oprindelse* (Copenhagen, 1824–26). More recently an ethical has been combined with the physical interpretation—that is, while accepting the phenomena and forces of nature as the basis of the myths, the scholar seeks to establish its deeper, philosophic, poetic, and moral value to its votaries.

The most prominent writers on Scandinavian mythology of the nineteenth century are Finn Magnusson, *Lexicon Mythologicum* (Copenhagen, 1828); Jacob Grimm, *Deutsche Mythologie* (4th ed. 1875; an Eng. trans. by Stallybrass London, 1880); Karl Simrock, *Deutsche Mythologie* (several editions); Wilhelm Mannhardt, *Germanische Mythen* (1858); P. A. Munch, *Nordmændenes Gudelære i Hedenold* (Christiania, 1847); R. Keyser, *Nordmændenes Religions forfatning i Hedendommen* (Christiania, 1847); N. F. S. Grundtvig, *Nordens Mythologi* (Copenhagen, 1808–32); N. M. Petersen, *Nordisk Mythologi* (Copenhagen, 1849); Benjamin Thorpe, *Northern Mythology* (London, 1851); Rasmus B. Anderson, *Norse Mythology* (5th ed. Chicago, 1891). Finally, special attention should be called to the elaborate investigations made since 1880 by the Norwegian linguist Sophus Bugge (*Studier over de nordiske gude- og helte-sagns Oprindelse*, Christiania, 1890) and by the Swedish scholar Viktor Rydberg (*Undersökningar i germanisk mythologi* (Göteborg, 1886–90). Bugge attempts to show the influence of classical mythology and early Christianity upon Scandinavian myths, while Rydberg, in opposition to Bugge, vindicates the exclusive Teutonic origin, and seeks to establish the harmonious connection between the various myths as parts of an all-embracing mythological epic. In his conflict with Bugge he is ably supported by the German scholar Müllenhoff (*Deutsche Alterthumskunde*, vol. v., 1883). An English translation of Rydberg's work by R. B. Anderson appeared in London in 1889, and bears the title *Teutonic Mythology*.

General Features.—The various forces and phenomena of nature—heat and cold, night and day, the seasons, thunder and lightning, life and death—led the old Teutons to speculate on the rise, development, and fall of all living things. The Scandinavian myths are inferior to the Greek in point of beauty, but, on the other hand, they outrank them in deep significance and wealth of thought. The Greek gods live a happy life, free from care. The life of the old vikings was characterized by constant struggle and warfare, and so their gods too are engaged in an unending conflict with the powers of evil which they never wholly overcome. A peculiar feature of the asa-faith is its eschatology, by which it presents in the clearest manner the idea that the present world must perish and give place to a new and better one. The gods themselves know that they in common with all other beings are sinful and contaminated by evil. They are conscious that they can not escape death and destruction, but they seek in every way to ward off that terrible catastrophe as long as possible. They also know that after the destruction of this world and out of its fragments there are to rise a new heaven and a new earth which are to be more beautiful than the present universe and free from sin and sorrow and care. In the regenerated world gods and virtuous men shall enjoy eternal happiness. The Scandinavian myths form a drama, in which every detail leads up to Ragnarok, the twilight of the gods, which constitutes the final act.

The Creation.—In the beginning (the prechaotic period) there were two worlds, Niflheim to the N. and Muspelheim to the S., and between them was Ginnungagap, the wide abyss. In Niflheim were the well Hvergelmer, from which flowed twelve ice-cold streams, called the Elivogs, into Ginnungagap. Muspelheim, on the other hand, was intensely bright and hot, and in the midst of it sat Surt guarding its borders with a flaming sword in his hand. The Elivogs flowed far into Ginnungagap, where the venom they carried with them became ice. Vapors rose and froze to rime, and in this way were formed many layers of congealed vapor. Meanwhile sparks flew from Muspelheim, and when the heated blasts came in contact with the frozen vapor it melted into large drops, and *by the might of him* (Surt) *who sent the heat* these drops quickened into life and took the form of an immense giant named Ymer and of a great cow named Audhumbla (chaos). Ymer was nourished by the cow's milk, and the cow fed herself by licking the salt rime on the stones, and by this licking she produced in the course of three days a man named Bure. Bure begot a son, named Bor, by the giantess Bestla, daughter of the giant Bolthorn; Bor became the father of three sons, Odin (spirit),

Vile (will), and Ve (holiness). These three brothers slew the giant Ymer, and from his dead body they created the present world (cosmos). Of his flesh they made the earth, of his blood the ocean, of his bones the rocks, of his hair the forests, of his skull the vaulted sky, and of his brains the clouds. On the flat, round earth they built a high wall called Midgard as a protection to the abode of man against the giants. Outside of this wall was Jotunheim, the home of the giants who descended from Ymer. Above Midgard was Asgard, the home of the asas or gods. The vans, who were not of the same race as the asas, originally dwelt in Vanaheim, but after a prolonged warfare peace was declared and asas and vans were united into one family of deities. In the earth and rocks dwelt the dwarfs. The elves lived in Alfheim, and the inhabitants of the lower world had their abodes in Helheim and Niflheim. Dwarfs, elves, and men were created by the gods, were subject to their protection, and owed them obedience and service. The giants and the dwellers in the nether world were the enemies of gods and men. One day three gods, Odin, Hoener, and Loder, found two trees by the seaside, an ash and an elm. Of these they made the first human pair, Ask and Embla, and gave them earth as their dwelling-place.

The Golden Age, the Norns, and the Conflict between the Good and Evil Powers.—Immediately after the creation of the world there was a golden age. The gods met on the plains of Ida, where they built temples and citadels of gold. All household utensils and implements were made of gold. They played with golden tablets, and their happiness was complete. This condition lasted until there came three maidens from Jotunheim. They were the so-called norns (fates), Urd (the past), Verdande (the present), and Skuld (the future). They were the rulers of fate, and time and even the gods were subject to their decrees. With the advent of the norns the active life of the gods began. Henceforth their lives were full of care and trouble. With the norns came avarice, strife, and warfare into the world. From this time on there is constant activity and conflict between all powers until the world shall fall dead. The evolution of the cosmic world consists in a ceaseless strife between the good and the evil powers, neither side gaining a decisive victory over the other. The gods gain temporary advantages and subdue the giants for a time, but the powers of evil gradually increase in strength, the world grows in depravity until the final day comes when all perish in an interneeine feud in Ragnarok, a catastrophe which is most vividly described in the *Eddas*.

Ygdrasil.—One of the most poetic and significant myths in Scandinavian mythology is that of the world ash-tree Ygdrasil, which symbolizes the whole universe. It has three roots extending one into Niflheim, a second into Jotunheim, and a third into Asgard. The branches of Ygdrasil spread over the whole world and aspire above heaven itself. Ygdrasil means the bearer of Odin, and the *Elder Edda* says Odin hung nine nights on this tree and sacrificed himself unto himself. While hanging there he discovered the runes.

The Principal Divinities.—The *Eddas* call the Scandinavian gods asas (as, pl. æsir) and the goddesses asynjas. The chief god is Odin (*q. v.*). As Alfather he is active in every part of the world created by him and his brothers Vile and Ve. No one knows better than he the fate of the world, and hence no one is more interested than he in warding off as long as possible the Ragnarok doom. This can only be done by enlisting all the forces possible on his side. He is accordingly the god of war who sends forth his maid-servants, the valkyries, to gather the faithful heroes slain on every battle-field and to conduct them as einherjes to Valhal, where they are to dwell with Odin, and whence they will follow him to the Ragnarok battle-field. Other prominent asas were Thor, Balder, Hermod, Tyr, Brage, Heimdal, Had, Vidar, Ul, Vale, and Forsete. Njord and Frey were originally vans, but were adopted by the asas. Loke, though of giant race both by father and mother, early formed a foster-brotherhood with Odin, and he too unfortunately was adopted by the asas. While the most of these are gods of war, still some of them also have other functions. Thus Brage is the god of song and eloquence. Njord, as the god of the sea, presides over fishing and commerce. Frey is a sun-god, and rules over harvests and the fertility of the earth. Heimdal represents eternal vigilance. He stands at the Bifrost (rainbow) bridge and proclaims the coming of danger to the gods with blasts from his trumpet called gjallarhorn. Forsete was worshiped as the god of justice. Thor (Thursday—i. e. Thor's day—is named after him) is the god of thunder, and he is foremost in the conflict with the giants. The *Eddas* contain elaborate accounts of his conflicts with the giants Hrungner, Geirrod, Thrym, and others. Balder is the representative of moral purity, wisdom, peace, and good will. While he lived the power of the asas was secure, but when Balder, at the instigation of Loke, was slain the fall of creation could not be prevented. Thus the death of Balder, which is told very fully and with great pathos in the *Eddas*, forms the turning-point in the great drama. Loke is the Mephistopheles of Scandinavian mythology. He is the personification of evil, though he constantly assumes the guise of virtue: but when he has accomplished the slaying of the good Balder he throws off the disguise by which he gained the favor and confidence of the gods. He is then put in chains, but finally gains his liberty, and in Ragnarok is the leader of the hosts of Hel that sally forth to the Vigrid plains.

Of goddesses there are in all twenty-six, and chief among them is Frigg, the wife of Odin. Several goddesses of lower rank serve her in her magnificent hall called Fensal. Thor's wife is Sif, and Balder's is the graceful Nanna. Brage's wife is Idun, who possesses the apples of eternal youth. Freyja (Friday is named after her) is also called Menglad. She is the goddess of love, the Norse Venus. Njord married Skade, and Frey's wife was the giantess Gerd, for whom he gave his trusted sword.

The Giants.—Next in importance to the gods are the giants and giantesses. They are countless in number and are the chief foes of the gods. They bring about the destruction of the world. Loke, himself a giant, became the parent of three terrible children in Jotunheim. These are (1) the Fenriswolf, (2) the Midgard-serpent, and (3) Hel, the giantess of death. The gods knew that these terrible monsters were growing up and would some day cause them great mischief. They therefore bound the Fenriswolf on a barren island and put a sword in his open-stretched mouth, but for this the god Tyr had to sacrifice his right hand. They cast the Midgard-serpent into the ocean, where he encircles the whole earth and bites his own tail. Hel was thrown into Niflheim, and Odin commanded that all who die from sickness or old age should go to her. The giants were older than the gods, and hence surpassed them in knowledge. The wisest one among them is Mimer, who presides over the fountain of wisdom. Many of the giants are represented as good-natured, and fond of gold and silver and other riches. Ægir, the giant of the sea, is the wealthiest of all, and he once entertained all the gods in his magnificent hall in grand style.

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Rasmus B. Anderson.

Scanso'res [Mod. Lat., liter., climbers, from Lat. *scan'dere*, *scan'sum*, climb]: a name applied by Illiger, in 1811, to a group of birds containing those having the toes two before and two behind. The group was purely artificial, containing such dissimilar forms as the cuckoos, toucans, woodpeckers, and parrots, and its members are now distributed among several orders. F. A. L.

Scanzoni, skăănt-sō'nĕĕ, Friedrich Wilhelm, von, M. D.: obstetrician and gynæcologist; b. at Prague, Bohemia, Dec. 21, 1821; graduated M. D. from the University of Prague in 1844; after a tour abroad he returned to Prague, and was appointed assistant obstetrician to the Imperial Royal Lying-in Hospital; later he was appointed assistant to the chair of Obstetrics in the university; in 1850 he was appointed Professor of Obstetrics and Gynæcology in the University of Würzburg, resigning this chair in 1888 to retire to private life. He was a voluminous writer, his better-known works being *Lehrbuch der Geburtshülfe* (Vienna, 1849), a work that passed through many editions and was translated into nearly all the European languages; *Lehrbuch der Krankheiten der weiblichen Sexualorgane* (Vienna, 1857). D. June 12, 1891. S. T. Armstrong.

Scaphi'opus [from Gr. *σκάφιον*, *σκαφεῖον*, spade + *πούς*, foot]: a genus of toad-like animals belonging to the family *Pelobatidæ*; externally recognizable by having teeth in the upper jaw, the fingers and toes without sucking-disks, and

the heel with a flat-edged spur. The spade-foot toads burrow by day and feed at night. In the breeding season they frequent temporary pools, and at this period their voices are very loud. The allied genera belong, with one exception, to the Old World.

Scaph'oid, or **Navic'ular Bone** [*scaphoid* is from Gr. *σκάφη*, boat + *εἶδος*, appearance, form, likeness; *navicular* is from Lat. *navi'cula*, dimin. of *na'vis*, boat]: a name applied to one of the bones of the wrist, and another of the foot, on account of their fancied resemblance to a boat in shape.

Scaphop'oda: See Mollusca.

Scap'ula [Mod. Lat., from Lat. *sca'pulæ* (plur.; sing. not used), shoulder-blades, back]: the shoulder-blade, a bone of the anterior or upper extremity, forming part of the shoulder. It is regarded as a pleurapophysis of the occipital (fourth cephalic) vertebra. In man and nearly all mammals it is normally firmly united to the coracoid bone, which is regarded as a process of the scapula, though representing a hæapophysis of the occipital vertebra. The dorsum of the scapula is marked by a prominent keel or spine. The scapula is developed from seven centers, and is in man not fully ossified till the twenty-fifth year of life.

Scap'ular [from Late Lat. *sca'pula*, shoulder, formed as sing. to Lat. *sca'pulæ*, shoulder-blades]: (1) a garment worn by lay brethren and professed monastics of various Roman Catholic orders. It is a long piece of serge, one end of which falls in front and behind the wearer. Its size, color, and proportions vary. (2) A small concealed emblem worn by many Roman Catholics, who bind themselves to a certain round of religious exercises called the Devotion of the Scapular. There are several scapulars, as that of the Passion and that of the Seven Sorrows of Mary, but the original one, that of Our Lady of Mt. Carmel, was, it is claimed, revealed by the Virgin to the Blessed Simon Stock, an English Carmelite and general of that order, who died in 1265.

Scar'ab, or **Scarabæ'us**: a black or metallic-colored dung-beetle (*Scarabæus ægyptiorum* or *Ateuchus sacer*) found in tropical countries, particularly in Egypt, where it was regarded as the symbol of the god Kheper (*q. v.*), and the emblem of the revivification of the body and the immortality of the soul. This was by virtue of the solar significance of the object, whose Egyptian name (*kheper*) signified to be or exist and also to roll, as of the sun. The daily revolution and reappearance of the sun typified the return of the soul to life. The beetle places its eggs in a mass of ox-dung which it rolls into a ball. The ball is propelled by the beetle with its hind legs. According to Horapollo and early Greek and Syrian writers, the female did not exist, and hence, as procreated by the male only, the scarab was held to be a symbol of the self-begetting and of the immortal, while in the hermetic literature it was regarded as the type of the "only-begotten," of "generation," of "father," of "man," and of the "world." It is evident, however, that these latter ideas are for the most part foreign to the original Egyptian conception.

The Egyptian figures of the scarab were made of gold, silver, precious stones, granite, basalt, steatite, faïence, and paste, and, in the Roman period, of glass. Those in stone, faïence, and paste were usually glazed blue or green. They were inscribed with religious or historical texts, with names of gods, kings, and other persons, and with magical legends and devices which are impossible of clear explanation. It is doubtful whether they were ever intended to be read. They may most conveniently be classified, according to their purpose, as funereal, ornamental, and historical. Funereal scarabs were placed on the fingers or over the heart of the dead, and in the latter case the Ritual of the Dead (*q. v.*) prescribed that certain words should be inscribed on a scarab of green jasper and put in the place of the heart. When buried with the mummy they bore a variety of names or of magical emblems that were to serve for the protection of the dead. Ornamental scarabs were an adoption by the living of the trappings of the dead, and were apparently employed principally as charms. They were strung together lengthwise as necklaces, or used singly as rings or seals, and were inscribed with the name of the reigning sovereign, or some national hero, or with magical or ornamental designs. Historical scarabs comprise all those bearing royal names or historical texts or data. The number of the former is very great, and nearly every king from Menes, the first Egyptian king, to the Roman Antoninus is represented in extant specimens. The favorite names, if frequency and number may form the test, were those of Thothmes III., Amenophis III., and Ramses II. Curiously enough a large proportion of these scarabs date from periods other than that of the Pharaoh in question. From the reign of Amenophis III. come four scarabs which contain actual historical texts, relating to his prowess as a lion-hunter, to the limits of his kingdom (from Nubia to Mesopotamia), to the arrival of his Semitic bride, and to the construction of a sacred lake in his eleventh year, which has intimate connection with the introduction of the solar monotheism of the "heretic" king of the succeeding reign, Amenophis IV., or Khunaten. When Egyptian influence extended to the East, the Phœnicians and others borrowed this design and produced objects to which the name *scaraboids* is usually applied. The design, and in part the symbolism, were also adopted by the Gnostics, and upon their gems they inscribed appropriate legends. The manufacture of forged scarabs is pursued to a large extent in Egypt, to meet the demand of travelers, some of the specimens being made with such skill as to deceive the unwary or even experts. See Birch, *Catalogue of Egyptian Antiquities at Alnwick Castle* (London, 1880); Loftie, *Essay of Scarabs* (London, 1884); Budge, *Catalogue of the Egyptian Collection of the Harrow School Museum* (Harrow, 1887), *The Mummy* (pp. 231 ff., London, 1893), and *Catalogue of the Fitzwilliam Collection* (London, 1894); Murray and Smith, *Catalogue of Gems* (London, 1888); Petrie, *Historical Scarabs* (London, 1889), and his various works, such as *Illahun* (London, 1891), *Hawara* (1889), and *Kahun* (1890); Meyer, *Scarabs* (New York, 1894).

Charles R. Gillett.

Scarborough [O. Eng. *Skardeburge*, fortified rock]: town; in Yorkshire, England; 43 miles N. E. of York and 54 miles N. of Hull (see map of England, ref. 5–J). It rises like an amphitheater from a sandy bay, and is protected on the N. by a promontory which is crowned by an historical castle dating from 1136 and rebuilt by Henry II. Scarborough is one of the principal watering-places of England; it has an aquarium, a museum, a market-hall, a spa, with mineral springs discovered in 1620, and a promenade three quarters of a mile long opened in 1890. The harbor is inclosed by three piers, and has a floating dock and a lighthouse. Jet is manufactured and there is a considerable fishing-trade. Scarborough returns one member to Parliament. Pop. (1891) 33,776.

Scarf-skin: See Epidermis.

Sca'ridæ [Mod. Lat., named from *Sca'rus*, the typical genus, from Lat. *sca'rus* = Gr. *σκάρος*, a kind of sea-fish (*S. cretensis*)]: a family of teleocephalous fishes known as parrot-fishes, from some resemblance of their mandibles to the bill of a parrot. The body is oblong and compressed; the scales large and cycloid; the jaws well exposed, and with the teeth soldered to them, so that they form a cutting edge, but with imbricated series of older worn teeth; dorsal single, with a longer anterior spinous part (containing nine spines), and a shorter posterior portion (with ten articulated rays); anal fin corresponding to the posterior half of the dorsal, and provided with two spines and eight soft rays; pectorals with branched rays; ventrals thoracic, with one spine and five soft rays; the lower pharyngeal bones are ossified together in a solid mass. The species are confined to the tropical regions, and in these latitudes are everywhere to be found on coral-reefs and among the groves of coral. They are reported to browse upon the coral, which they cut by means of their strong trenchant jaws, in order to obtain the living polyp.

A species of the family (*Scarus cretensis*) was known to the Greeks and Romans, and was the subject of several fables. In the reign of Claudius, according to Pliny, Optatus Elipertius introduced it into the Italian sea between Ostia and Campania, where it became abundant. It was regarded, at least for a time, as being the very first of fishes.

Revised by F. A. Lucas.

Scarlati'na, or **Scarlet Fever** [*scarlatina* is Mod. Lat., from Ital. *scarlattina*, liter., dimin. of *scarlatto*, scarlet]: one of the acute eruptive or exanthematous fevers. It is chiefly a disease of childhood, with immunity for adults, increasing as the period beyond puberty lengthens. It is an infectious disease, propagated often by close aggregation of children, as in schools, asylums, or at play; but the contagion retains vitality with great persistence, and may be conveyed by clothing, letters, food, etc. The disease occurs sometimes in local epidemics; at other times with a graver type and great mortality, involving whole communities. In different individual cases, as well as different seasons and epidemics, it

assumes variable degrees, from a trivial disorder to a malignant and hopeless attack. Physicians recognize three marked varieties: (1) *Scarlatina simplex*, simple scarlet fever, in which the rash or eruption is fairly developed, the patient comfortable, and complications do not exist; (2) *S. anginosa*, where an unusual soreness of the throat, with formation of pseudo-membrane resembling that of diphtheria, is present; (3) *S. latens* or *maligna*, a latent form, where the eruption may be absent or doubtful, but grave injury is done by the scarlatinal poison in the blood to the nerve-centers or the kidneys. Like other contagious diseases, scarlatina has its period of incubation or development; four to six days usually intervene between exposure and the consequent attack. The fever develops suddenly, and without premonition, or more often in association with vomiting, nervous excitement, convulsions, or exhaustion indicative of a powerful impression on the nerve-centers. The temperature may rise to 104° or 107° F.; higher in fatal cases. The throat is already florid and tender, the tongue studded with sensitive red papillæ. At the end of twenty-four hours of fever the eruption appears—an efflorescence composed at first of minute red points upon a flushed surface, and later of a uniform scarlet hue. It develops upon the body and neck before the face, but the face, arms, and lower extremities are soon involved, and the cuticle, destroyed by the high temperature of the surface, may begin to fall by the fifth day. This process of desquamation varies. In mild cases, when sponging or bathing has been employed to allay fever, no flaking or falling of the cuticle is seen. In others it may slowly separate in shreds and patches. Still again, the cuticle covering fingers and toes may exfoliate intact, in the form of casts. During and following this desquamation danger is greatest of acute inflammation of the kidneys, the desquamative nephritis constituting the most serious complication of scarlet fever. The mortality is very variable, from 1 in 5 to 1 in 25, according to class of patients and type of epidemic. The chief causes of death are early convulsions, severe throat complications, and uræmic poison and dropsy, from implication of the kidneys. Deafness often results from severe attacks of *S. anginosa*.

Treatment is chiefly directed (1) to confining the temperature within limit by the use of aconite, diaphoretic drinks, blanketing, frequent sponging, or even the wet pack; in very marked cases the use of a cool bath is absolutely essential, and may completely modify the nature of the disease, as is the case also with typhoid fever; (2) to favoring the action of the kidneys by digitalis and emollient alkaline drinks, as flaxseed tea and soda; the inunction of lard, practiced by the Germans, and of butter of cacao, protects the skin and guards the kidneys from congestion; (3) to maintaining the patient's strength and counteracting the poison of the disease. Quinine and tincture of iron are chiefly indicated, in free and frequent doses. The patient should have liberal liquid diet throughout, and mild alcoholic stimulus when convalescing. Local astringent and antiseptic applications for the throat are useful to prevent the anginose form of the disease from developing and to prevent spread of the inflammation to adjoining mucous surfaces. Secondary kidney disorder—dropsy and scanty urine—calls for dry cups over the kidneys, the hot-air bath, elaterium as a purge, digitalis, and alkaline diuretics. Revised by WILLIAM PEPPER.

Scarlat'ti. ALESSANDRO: composer; b. at Trapani, Sicily, in 1659; produced his first opera in 1680 in Rome, in the palace of Queen Christina of Sweden; lived afterward alternately in Rome and Naples as chapel-master; composed 115 operas, of which only the titles of twenty are known, 200 masses, nine oratorios, more than 500 cantatas, and thousands of minor pieces. D. in Naples, Oct. 24, 1725. He was the originator of the overture, and the first composer who gave to orchestral accompaniment an air of separate design.—His son, DOMENICO SCARLATTI, b. 1683, d. 1757, was considered the greatest pianist of his time, held positions in Madrid and Lisbon as court-pianist, and composed operas and many pieces for the piano and harpsichord.

Revised by DUDLEY BUCK.

Scarlet Fever: See SCARLATINA.

Scar'pa, ANTONIO: anatomist; b. at Castello-Motta, Friuli, Italy, June 13, 1747; studied medicine at Padua; traveled extensively; was appointed Professor of Anatomy at Modena in 1772, and in 1783 at Pavia, where he died Oct. 31, 1832. He was one of the greatest anatomists of his time, and wrote a number of works: *Anatomicæ Disquisitiones de Auditu et Olfactu* (1789); *Tabulæ Neurologicæ ad illustrandam Historiam Cardiacorum Nervorum* (1794); *De Anatomia et Pathologia Ossium* (1827); *Sull' Aneurisma* (1804); and *Sull' Ernie* (1807).

Scarpan'to, or Car'pathos: island; one of the Sporades; belonging to Turkey; nearly equidistant between Rhodes and Crete; a mass of naked rocks, some of which rise nearly 4,000 feet; the reputed birthplace of the mythologic Titans. Pop. 3,500. E. A. G.

Scarron, skăă'rōñ', PAUL: writer of burlesque; b. in Paris, France, in 1610; was destined for the Church, but spent his youth in the grossest dissipations, and was in 1637 overtaken by paralysis, which deprived him of the use of his legs. He then took up literature as a means of subsistence, and developed a brilliant talent for burlesque, which owed largely to him the vogue it enjoyed in France in the middle of the seventeenth century. His comedies and poems are forgotten, but his *L'Énéide Travestie* (1648), *Mazarinade* (1649), which during the war of the Fronde he wrote in opposition to the powerful minister Mazarin, and which cost him the pension Anne of Austria had bestowed upon him, and especially his *Roman comique* (1651, translated into English by Oliver Goldsmith 1775), became literary types, and are still read with interest. In 1652 he married Françoise d'Aubigné, afterward Madame de Maintenon, and she, as well as the irresistible humor of her husband, made their home a rendezvous for all the Parisian wits. D. in Paris in 1660. A complete edition of his works, in 10 vols., was published by Bruzen de la Martinière (1737).

Revised by A. G. CANFIELD.

Scazon: another name for choliambus. See IAMBIC METRES.

Scepter [viâ O. Fr. from Lat. *scep'trum* = Gr. *σκῆπτρον*, staff, scepter, deriv. of *σκήπτειν*, prop against, lean on]: a rod or truncheon borne by kings and other magnates as an emblem of authority. It has been employed as part of the regalia of almost all monarchies of which there is any record. The English scepter now in use dates from Charles II.'s time; it is cruciform. The scepter for Scotland dates from the time of James V.

Scepticism, or **Skepticism** [from Gr. *Σκεπτικοί*, the Sceptics, a school of philosophers, liter., plur. of *σκεπτικός*, thoughtful, inquiring, deriv. of *σκέπτεσθαι*, consider]: the doctrine which sets up, as its highest principle, doubt or suspense of judgment in view of the contradictory nature of phenomena. It endeavors to establish the subjectivity of all cognitions, and to show their incompatibility with each other; it infers, as a consequence, the impossibility of knowing truth, and takes its stand simply and solely upon its own individuality. Scepticism therefore deepens and intensifies mental independence, and is regarded as a necessary clearing up preparatory to philosophic thinking. At least since the time of Descartes this has been the case, and some writers—as Herbart, for example—insist upon the point that all beginning in philosophy is sceptical, and, on the other hand, that all scepticism is elementary philosophy. It is most important to note that all scepticism is based upon the observation of method, and in this respect is a higher activity of the mind than the mere dogmatism which it attacks. All modern philosophy is a struggle to found itself upon method, and thus to place its structure above the assaults arising from scepticism. Sceptical arguments emanate neither from the stage of sense-perception nor from that of simple reflection—i. e. neither from the first nor second intention of the mind, so called, but from a third, or rather a fourth, intention, a perception not of external objects, nor of species or genera, but a perception of the activity or process of reflection itself. Hence simple common sense, alike with the deepest speculative insight, may be attacked and undermined by scepticism, but sceptical arguments can have no weight except for those minds that abandon other points of view and give attention to the method of cognition.

The ancient scepticism is directed against sense-perception, and usually counts Pyrrho of Elis as its founder. Gorgias, the Sophist, had reached the doctrine of nihilism; nothing exists; nothing can be known if it does exist. Socrates had asserted that he knew only that he knew nothing. The Megarian Stilpo had shown the contradictions in sense-perception involved in predicating universals of individual objects. The scepticism of the second and third schools of the Middle Academy, founded respectively by Arcesilaus and Carneades, was of a modified type. But Pyrrho, who seems to have learned much from Stilpo, de-

veloped scepticism as a system of philosophy, and made universal doubt the highest principle, and ἐποχή (suspension of judgment) and ἀταραξία (tranquillity of mind, imperturbability) the practical objects to be attained. With Pyrrho, Timon the Sillograph and Ænesidemus are reckoned as the representatives of the old sceptics. The last named collected Pyrrho's arguments in the form of ten tropes, as follows: Knowledge of truth is uncertain, because of the difference (1) in the organization in animals resulting in different modes of knowledge (how can we decide?); (2) in the human constitution in tastes, feelings, desires, capacities, etc.; (3) in the structure of the organs of sense, the same object being white to the eye, sweet to the taste, rough to the touch, etc.; (4) in the mental and physical conditions at different times; (5) in the position, distances, and intervals of objects; (6) in the appearance of objects by reason of their complication with each other; (7) in the appearance of objects owing to their variation in quantity, size of parts, etc.; (8) in objects on account of the general relativity of things known; (9) in the frequency with which objects are observed; (10) in regard to education, all customs, habits, laws, ideas, faith, and theories being derived from it. The later school of sceptics includes Agrippa, Favorinus, Sextus Empiricus, and others. Agrippa reduced the tropes to five: (1) The discordance of opinions renders all uncertain; (2) every proof rests upon grounds which again need proof, and so *ad infinitum*; (3) all our ideas are relative; (4) all systems rest upon hypotheses; (5) the vicious circle, demonstrating the grounds on which the proof rests by that which is proved by them. Sextus Empiricus has left us a complete account of ancient scepticism, and himself sums up the whole as follows: Nothing is certain in itself, as is proved by the diversity of opinion, and nothing can be made certain by proof, since it derives no certainty from itself, and, if based on other proof, leads us either to the *regressus ad infinitum* or to a vicious circle.

Among famous sceptics of later times are Algazel the Arabian, Duns Scotus the Schoolman, Agrippa of Nettesheim, Glanvill, Nicolaus Cusanus, and Hirnhaym, who reject science in the interest of faith. Montaigne, Charron, Sanchez, and Le Vayer revive the ancient scepticism. Hume is the greatest modern sceptic. He saps all dogmatism by making habit or "invariable sequence" the origin of the idea of causality, and thus occasions by way of reaction the rise of the Kantian system and its derived schools, which "criticise the faculty of cognition" and build their structures upon insight into method, and thus eliminate scepticism by making its partial view (of method) a complete one. WILLIAM T. HARRIS.

Scerodite: See SINTERS.

Schabzieger Cheese: See CHEESE.

Schack, shaak, ADOLF FRIEDRICH, Graf von: poet; b. at Schwerin, Mecklenburg, Germany, Aug. 2, 1815; studied law at Bonn, Heidelberg, and Berlin, devoting much of his time to the study of Oriental and European languages; traveled in Italy, Egypt, Syria, Turkey, Greece, and Spain, where he made extensive researches into the history of the Spanish drama; was called to Munich by King Maximilian of Bavaria where he resided up to the time of his death, Apr. 14, 1894. He published *Epische Dichtungen aus dem Persischen des Firdusi* (1853); *Stimmen vom Ganges* (1856); *Gedichte* (1866); *Nächte des Orients* (1874); *Weihgesänge* (1878); *Lotosblätter* (1883); *Memnon* (1885); and a number of epic and dramatic poems. Like Rückert, with whom he may be compared in many respects, he was a master of the poetic form, not only in his translations from Oriental literatures, but also in his original productions, which, moreover, are distinguished by their deep philosophic thought.
JULIUS GOEBEL.

Scha'dow, FRIEDRICH WILHELM, von: painter; b. in Berlin, Sept. 6, 1789. He was a son of J. G. Schadow, the sculptor, and was thoroughly taught. In 1810 he went to Rome with his brother Rudolph, the sculptor, and there was influenced by Cornelius and Overbeck; became a Roman Catholic and a member of the religious and somewhat mystical school which those painters had brought together. In 1819 he returned from Italy to Berlin, and was made professor in the Academy of Fine Arts. In 1826 he was made director of the Düsseldorf Academy. D. at Düsseldorf, Mar. 19, 1862. In the Berlin National Gallery are his picture *Christ at Emmaus* and a *Portrait Group* of his father and brother with the sculptor Thorwaldsen. At the Staedel Institute at Frankfort is the picture of the *Wise and Foolish Virgins*; at the old Pinakothek at Munich is a *Holy Family*; and at the Cathedral of Anspach is a *Christ*. His last work was an allegorical painting founded upon Dante's *Divina Commedia*. RUSSELL STURGIS.

Schadow, JOHANN GOTTFRIED: sculptor; b. in Berlin, May 20, 1764; studied drawing and sculpture in his native city and at Rome 1785–87, and was appointed professor at the Academy of Art in Berlin in 1788. His life was spent chiefly at Berlin from this time on, but he traveled much, especially in Italy. His style is founded upon classical traditions. His principal works are statues of Frederick the Great, in Stettin; Leopold of Dessau, in Ziethen, and the Count de la Marck, in Berlin; Luther, in Wittenberg; the monument of Marshal Blücher, at Rostock; and a number of busts, some of which are in the Walhalla on the Danube near Ratisbon, etc. He also modeled the quadriga over the Brandenburg gate of Berlin, and a frieze on the outside of the mint in that city. D. in Berlin, Jan. 27, 1850.
Revised by RUSSELL STURGIS.

Schadow, RUDOLPH, called also **Zeno Ridolfo**: sculptor; b. in Rome, July 9, 1786; was the oldest son of Johann G. Schadow. He studied with Thorwaldsen and Canova, and became famous at an early age. He was much employed, and perhaps too constant application caused his early death, at Rome, Jan. 31, 1822. Among his works are the bas-reliefs of the *Daughters of Leucippe*, *Socrates and Theodata*, and that of the tomb of the Marquis of Lansdowne; the statues of St. John the Baptist, Diana, and a Bacchus; a group of the Virgin and Child; and his last work, *Achilles defending the Body of Penthesilea*. RUSSELL STURGIS.

Schaeffer, shā'fer, CHARLES FREDERICK, D. D.: theologian; b. at Germantown, Pa., Sept. 3, 1807; graduated at the University of Pennsylvania; studied theology privately; pastor at Carlisle, Pa., Hagerstown, Md., Lancaster, O., Red Hook, N. Y., and Easton, Pa.; professor of theology, Columbus, O., 1840–45, Gettysburg, Pa., 1857–64, and Philadelphia, Pa., 1864–79. D. in Philadelphia, Pa., Nov. 23, 1879. Among his more important works are the translation of Lechler *On Acts* in the English edition of Lange's *Commentary*, the translation of Kurtz's *Sacred History*, a revised translation of Arndt's *True Christianity*, and a *Commentary on Matthew*. Dr. Schaeffer was a prominent advocate of confessional Lutheranism, and his articles in *The Evangelical Review* of Gettysburg contributed powerfully to the movement that resulted in the establishment of the General Council. H. E. JACOBS.

Schaeffer, CHARLES WILLIAM, D. D., LL. D.: theologian; nephew of Rev. Charles Frederick Schaeffer; b. at Hagerstown, Md., May 5, 1813; graduated at University of Pennsylvania, and Theological Seminary at Gettysburg, Pa.; pastor at Barren Hill, Pa., 1835–40, Harrisburg, Pa., 1840–49, Germantown, Pa., 1849–74; professor in the Lutheran Theological Seminary, Philadelphia, 1864–94, when, on his resignation of the chair of Church History, he was elected professor emeritus. Dr. Schaeffer was for many years president of the Lutheran Ministerium of Pennsylvania, was president of the General Synod and the General Council, and served the University of Pennsylvania as a trustee from 1859 till his death, in Philadelphia, Mar. 15, 1896. Author of *Early History of the Lutheran Church in America* (1857), *Family Prayers*, and one volume of a translation of the *Halle Reports* (Reading, Pa., 1882). H. E. JACOBS.

Schaeffer, DAVID FREDERICK, D. D.: Lutheran pastor and theologian; b. at Carlisle, Pa., July 22, 1787; graduated at the University of Pennsylvania 1807; studied theology privately; pastor at Frederick, Md., 1808, until within a year or two before his death. He conducted a private theological seminary, and directed the studies of a number of most useful pastors. He was one of the most active founders of the Theological Seminary at Gettysburg, and of the General Synod, of which body he was secretary for a number of years from its founding. He edited *The Lutheran Intelligencer*. D. at Frederick, Md., May 5, 1837. H. E. JACOBS.

Schaeffer, NATHAN C.: See the Appendix.

Schaff, PHILIP, S. T. D., LL. D.: b. at Coire, Switzerland, Jan. 1, 1819; studied at Coire, Stuttgart, Tübingen, Halle, and Berlin; took the degree of B. D. and passed the examination for a professorship in Berlin 1841; traveled as tutor of a Prussian nobleman through several European countries; returned to Berlin and lectured in the university on exegesis and church history 1842–44; was called to a professorship in the theological seminary of the German Reformed Church

of the U. S. at Mercersburg, Pa. He removed to New York during the civil war, Dec., 1863; was secretary of the New York Sabbath committee 1864–69, and delivered lectures on church history in theological seminaries at Andover, Hartford, and New York. He was Professor of Sacred Literature in Union Theological Seminary, New York, from 1870 to 1887, when he became Professor of Church History. He received the honorary degree of D. D. from the University of Berlin 1854, the University of St. Andrews 1887, and the University of the City of New York 1892; the degree of LL. D. from Amherst College 1876; was elected member of the Leipzig Historical, the Netherland, and other literary societies in Europe and America. He was one of the founders and honorary secretaries of the American branch of the Evangelical Alliance, and was sent in 1869, 1872, and 1873 as commissioner to Europe to make arrangements for the general conference of the Alliance, which, after a second postponement in consequence of the Franco-German war, was held in New York Oct., 1873. He was also one of the Alliance delegates to the Emperor of Russia in 1871, to intercede with him in behalf of the religious liberty of his subjects in the Baltic provinces. He took part in the founding of the Presbyterian Alliance in London 1875, and was prominent in the first Presbyterian council at Edinburgh 1877, in the second in Philadelphia 1880, in the third at Belfast 1884, and in the fourth in London 1888. He visited Bible lands in 1877. He was president of the American Bible revision committee, which he organized in 1871 at the request of the English committee, and he was sent to England in 1875 to negotiate with the British revisers and university presses about the terms of co-operation and publication of the Anglo-American revision, and attended repeatedly the meetings of the English revisers in Jerusalem Chamber (the last time in 1884). He was also sent as delegate to the fifth centennial of the University of Heidelberg 1886, and to the eighth centennial of the University of Bologna 1888. In 1892 he celebrated the semi-centennial of his professorship. See *Berlin 1842 to New York 1892: Semi-Centennial of Philip Schaff*, privately printed (New York, 1893). He died in New York, Oct. 20, 1893.

Dr. Schaff's books are mostly historical and exegetical. He wrote *History of the Apostolic Church* (New York, 1853; Edinburgh, 1855; Leipzig, 1854, etc.); *History of the Christian Church* (English and German; New York and Leipzig, 1867; rewritten (more than doubled), New York and Edinburgh, 5th ed. 1889–92, 7 vols.); *Creeds of Christendom* (New York and London, 1876, in 3 vols.; 4th ed., rev. and enlarged, 1884). He edited the Anglo-American reproduction and adaptation of Lange's *Critical, Theological, and Homiletical Commentary on the Bible* (1864–80, 25 vols.); an *International Revision Commentary*, with illustrations and maps (New York and Edinburgh, 1879–83, 4 vols.); a *Religious Encyclopædia*, based on Herzog (New York and Edinburgh, 1883–84, 3 vols.; 3d ed., rev., 1891, 4 vols., including *Encyclopædia of Living Divines*); and the *Nicene and Post-Nicene Library of the Fathers* (New York and Oxford, 1888, *seq.*). In addition he wrote a great number of minor books, including *The Principles of Protestantism* (1845); *Critical Edition of the Heidelberg Catechism*, with its history to the tercentenary celebration (1863; rev. ed. 1866); *Bible Revision* (New York, 1873); *Literature and Poetry* (1890). His last work was *Theological Propædeutic: a General Introduction to the Study of Theology, Exegetical, Historical, Systematic, and Practical* (New York, 1893). Several of his works have been republished in Germany, England, and Scotland, and translated into French, Italian, Dutch, Greek, Bulgarian, Arabic, Chinese, Hindustani, and Japanese.

Revised by S. M. Jackson.

Schaffhausen, shăăf-how'zĕn: the northernmost canton of Switzerland; bounded N. by the grand duchy of Baden and S. by the Rhine. Area, 114 sq. miles. It consists mostly of a number of valleys, which slope toward the Rhine and are very fertile. Wheat and other kinds of grain, fruit and wine of superior quality, hemp and flax are extensively cultivated; the rearing of cattle and the manufacture of steel and silk are important. Pop. (1888) 37,783.

Schaffhausen: capital of the canton of Schaffhausen, Switzerland; on the Rhine, 3 miles above the celebrated falls (see map of Switzerland, ref. 2–G). It is an old, curiously built town, with some manufactures of ironware and silk goods. Pop. (1888) 12,402.

Schäffle, shef'fle, Albert Eberhard Friedrich: political economist; b. at Nürtingen, Würtemberg, Feb. 24, 1831; studied theology at Tübingen, where he became Professor of Political Economy in 1861. He was active in politics, sitting in the Würtemberg Landtag 1862–65, and being Minister of Commerce in Austria for a short time in 1871. On the downfall of the ministry in the same year he went back to Stuttgart, and devoted himself to economic studies. His works prove him to belong to the historical school of economists who have broken with the traditions of Adam Smith and the exponents of *laissez faire*. His chief writings are *Die Nationalökonomie* (1861), 3d ed. published under the title *Das gesellschaftliche System der menschlichen Wirthschaft* (1873); *Kapitalismus und Sozialismus* (1870); *Quintessenz des Sozialismus* (1874; Eng. trans. 1889); and *Die Aussichtslosigkeit der Sozialdemokratie* (1885).

Schalk, Franz: See the Appendix.

Schamyl, shăm'il; warrior and prophet of the tribes of the Caucasus; of Tartar origin; b. in Daghestan in 1797. From 1824 to 1831 he took an ardent part in the holy war which Kasi Mollah proclaimed against Russia. A sufi, he claimed to be the mourshid, or elect envoy of God. Twice coming to life when apparently dead, exceedingly astute and thoroughly sincere, he made the Circassians recognize his pretensions. So from 1837, during twenty-two years, he was their sagacious and generally successful leader in their resistance to Russia. In 1859, hemmed in on all sides and cut off from escape, he was made prisoner and carried to Russia. There he remained ten years, being treated with great honor and kindness. In 1870 he went on a pilgrimage to Mecca, and died at Medina in 1871. A marvelously handsome man, daring, eloquent, always master of himself, an economical and judicious administrator, he maintained an absolute supremacy over his lawless followers, who feared him as a wizard and revered him as a saint. E. A. G.

Schandorph, shăn'dŏrf, Sophus Kristian Frederik: poet and novelist; b. at Ringsted, Denmark, May 8, 1834. Originally an idealist, he soon adopted the literary methods of the new school. As a delineator of the life of the Danish peasantry and lower middle class, he is, perhaps, without an equal. To great power of observation he adds a keen humor, which sometimes borders on coarseness. His most ambitious work is a novel dealing with Danish peasant conditions, *Thomas Fris's Historie* (two parts, 1881). Among his other publications may be mentioned *Fra Provinsen, Fortællinger og Skizzer* (From the Provinces, Tales and Sketches, 1877); *Uden midtpunkt* (Without Center, 1878); *Skovfogeds börnene* (The Forester's Children, 1884); *Det gamle Apothek* (The Old Drug-store, 1885); *Fra Isle de France og fra Sorö Amt* (From L'Isle de France and from Sorö District, four tales, 1888); *Stillelivs-Folk* (Quiet Folk, 1889); *Poet og Junker* (Poet and Cavalier, 1892). D. K. D.

Scharn'horst, Gerhard Johann David, von: general; the organizer of the Prussian military service; b. at Bordenau, Hanover, Nov. 12, 1756; entered the Hanoverian army in 1776; became a lieutenant of artillery in 1780, and soon afterward teacher in the school of artillery in Hanover. He served with the allies in the Netherlands 1793–95. Having attracted much attention by his military writings, he was invited to enter the Prussian service, and became in 1801 director of the military academy of Berlin. His lectures here became quite celebrated, but his ideas called forth a strong opposition from the older military men, and in 1803 he was removed to the staff, where he advanced to the rank of general. After the Peace of Tilsit, in 1807, he took charge of the whole administration of military affairs in Prussia until 1810, when he was compelled to retire at the request of Napoleon. He continued to exercise a decided influence, and it was chiefly due to his energy and his ideas that Prussia in 1813 was able to place a large and effective army in the field. He was wounded at Grossgörschen, and died at Prague June 28, 1813, on his way to Vienna to persuade Austria to join the allies against Napoleon. See *Life*, by Lehmann (Leipzig, 1886–87), and von Boyen's *Erinnerungen* (1891). F. M. Colby.

Scharwenka, shaăr-ven'kaă, Philip: composer and teacher; b. at Samter, Posen, Prussia, Feb. 16, 1847. In 1865 his family moved to Berlin, and Philip began study in Kullak's New Academy, and on completing his studies he remained with the academy as a teacher. He is a fine pianist, and has composed largely for his instrument. D. E. H.

Scharwenka, Xaver: composer and teacher; a younger brother of Philip Scharwenka; b. at Samter, Prussia, Jan. 6, 1850; also studied at Kullak's New Academy. He made his first appearance in Berlin as a pianist in 1869, and re-

mained there as a teacher till 1873. In 1877 he produced his first piano concerto. Since then he has composed largely for the piano and for orchestra, and also has written an opera, *Mataswintha*. In 1890 he visited the U. S. on a concert tour, and the next year he settled in New York, where he established a conservatory of music. D. E. H.

Schauffler, showf'fler, William Gottlieb, D. D., LL. D.: missionary; b. at Stuttgart, Germany, Aug. 22, 1798; resided in Russia during his youth; studied theology, and went to Turkey as an independent missionary 1825, but having soon convinced himself that he needed more thorough training, removed to the U. S. in 1827; graduated at Andover Theological Seminary 1830; was ordained Nov. 14, 1831; was missionary to the Jews in Constantinople, Turkey, 1831–55, and after that to the Moslems; he translated the entire Bible into Hebrew-Spanish and into Turkish, the New Testament, the Pentateuch, and Isaiah in the latter language having been printed in Germany under his supervision; and published an *Essay on the Right Use of Property* (1832). He was also author of a work entitled *Meditations on the Last Days of Christ*. D. in New York, Jan. 26, 1883.

Schaumburg-Lippe, showm'boŏrch-lip'pe: a principality and state of the German empire, between Hanover and Westphalia. Area, 131 sq. miles; pop. (1900) 43,132. The southern part is hilly and well wooded; the northern is flat, and here is found Lake Steinhudermeer, occupying an area of 22,000 acres. The actual revenue in 1892–93 was 1,096,516 marks: the public debt in 1891 was 510,000 marks. Capital, Bückeburg: pop. (1895) 5,620.

Schedone, skā-dō'nā, Bartolommeo (called also Schidone): painter; b. at Modena, Italy, in the latter part of the sixteenth century. He was supposed to have been a pupil of the Caracci, but his paintings seem to show a deep study of Correggio and Raphael. He worked in the palace and in the cathedral of his native city. His chief works are a *Madonna di Pietà*, at the Academy of Parma, the *Birth of Christ*, and a *Madonna*, at Loreto. His pictures at Capo di Monte, Naples, were painted for his generous patron, Duke Ranuccio of Parma. He is also well represented in the Louvre. He distinguished himself as a portrait-painter. He died at Parma in 1615 of grief at having lost a large sum of money through gambling. W. J. Stillman.

Scheele, shā'le, Karl Wilhelm: chemist; b. at Stralsund, Pomerania, at that time a Swedish possession, Dec. 19, 1742; studied chemistry in Stockholm and Upsala, and settled in 1777 as apothecary at Köping, near Stockholm, where he died May 21, 1786. By his comprehensive chemical analyses he discovered tartaric acid, manganese, chlorine, baryta, glycerin, the pigment called Scheele's green, and the coloring-matter of Prussian blue. His papers were collected and published in French, English, German, and Latin (*Mémoires de Chimie*, 2 vols., Paris, 1785–88). In his *Chemical Observations and Experiments on Air and Fire* (Leipzig, 1777; translated into English, London, 1780) he described oxygen, unaware of its previous discovery by Priestley.

Scheele, Knut Henning Gezelius, von, D. D.: bishop; b. at Stockholm, Sweden, May 31, 1838; educated at Upsala, where he became Professor of Theology in 1879, whence he was appointed Bishop of Gotland, with residence at Visby, in 1885. He visited the U. S. in 1893 as special representative of the King of Sweden at the tercentenary of the Decree of Upsala, celebrated by the Swedish Augustana Synod. Among the more important of Bishop von Scheele's works is a work on symbolics, published in both Swedish and German, and an outline of the same subject in Zöckler's *Handbuch der Theologischen Wissenschaften*. H. E. J.

Scheele's (sheelz) **Green**, or **Swedish Green**: name given to the arsenite of copper. Scheele prepared it by slowly pouring a hot solution of 11 parts of arsenious oxide in 32 of potash into a hot solution of 32 parts of blue vitriol, with constant stirring. Sharples says the best results are obtained when a solution of 2 parts arsenious oxide and 8 parts cryst. carb. soda is mixed with a solution of 6 parts blue vitriol. The product is a yellowish-green powder, consisting essentially, according to Sharples, of $Cu_3As_2O_6 2H_2O$, or CuO, 51·49; As_2O_3, 41·93; H_2O, 7·93. It may or may not contain basic sulphate and carbonate of copper, according to the proportions and degree of dilution of the materials. *Parrot green*, *pickel green*, and many varieties of *Brunswick*, *Neuwied*, and *mineral green* and *blue*, consist of Scheele's green with more or less hydrate, basic sulphate, or basic carbonate of copper, and sometimes considerable gypsum. Scheele's green is little used in the U. S., being replaced by the more brilliant Schweinfurth Green (*q. v.*).

Revised by Ira Remsen.

Scheffel, Joseph Viktor, von: poet and novelist; b. at Karlsruhe, Germany, Feb. 16, 1826; studied law and German philology at the Universities of Heidelberg, Munich, and Berlin; practiced law for several years; traveled in Italy; and after his return, devoted himself entirely to literary pursuits. In 1854 he published his famous *Trompeter von Säckingen*, an epic poem of great poetic charm, and in 1858 his great historical novel *Ekkehard*, a story of the tenth century. Both of these works were little noticed at first, until the great events of contemporary German history and the subsequent establishment of the empire gave rise to a renaissance of German antiquity. Scheffel's artistic description of German life of the past, his delightful humor, and true patriotic feeling, then led to his being imitated by a host of followers, and for a long time the historical novel was the literary fashion of Germany. He became equally popular as a lyric poet, especially by his *Gaudeamus* (1868), a collection of lyrics of quaint and exquisite humor, many of which became favorite student songs. His *Bergpsalmen* (1870), a later collection of poems, is less popular, though it probably contains his best lyric productions. D. Apr. 9, 1886. Julius Goebel.

Scheffer, Ary: historical and portrait painter; b. at Dordrecht, Holland, Feb. 10, 1797; son of Johann Baptist Scheffer, historical painter (1773–1809); pupil of Guérin in Paris; officer Legion of Honor 1825. He was not in sympathy with either the academic or classic style of painting taught by his master, nor with that of the new school of romanticists led by Delacroix and Géricault, and he formed a style of his own, more sentimental than vigorous and healthy. He was a devoted adherent of the Orleans family, and accompanied the Duc d'Orléans to the siege of Antwerp. After returning to Paris, he painted pictures of military scenes for the Versailles Museum, and when the Revolution of 1848 broke out he assisted the king and his family to escape from Paris, and retired to Holland. He went to England later, and returned to Paris after the *coup d'état* of 1851, but kept aloof from politics. D. at Argenteuil, France, June 15, 1858. One of his most noted pictures, *The Suliote Woman* (1827), is in the Louvre. Other works are in the museums at Versailles, Nantes, Marseilles, Montpellier, and Amsterdam, and in the National Galleries in London and Berlin. William A. Coffin.

Scheldt, skelt (anc. *Scaldis*, Fr. *Escaut*): the most important river of Belgium. It has its rise in a small lake in the department of Aisne, France, and by a circuitous passage enters Belgium near Tournay; thence flows N. N. W. past Tournay, province of Hainault, at Hérinnes becomes the boundary of this province and East Flanders, and at Escamaffles becomes the common boundary between West and East Flanders; thence N. N. E., past Oudenarde to Ghent, where it receives the Lys on the left; thence E. S. E. to Dendermonde and N. N. E. to Antwerp, at which point it becomes a noble stream, with a fine harbor sufficient for the largest ships. Leaving Antwerp, its course is N. W. The island of South Beveland divides it into two arms; the left, or south, known as The Hond or West Scheldt, and the most important, enters the North Sea near Flushing. The right, or north, called the East Scheldt arm, is divided again by the island of North Beveland before it flows into the sea. It has an entire length of 210 miles, and is navigable to Condé, near its source. Among its numerous affluents, the Scarpe, Lys, and Darme, from the left, and the Dender and Rupel, from the right, are the most important. A system of canals connects this stream with the principal cities of Belgium. The entrance to the river is rendered somewhat difficult for large vessels by sandbanks which form at its mouths. These mouths are almost opposite that of the Thames, thus increasing its commercial and naval importance. Revised by M. W. Harrington.

Schelling, shel'ling, Friedrich Wilhelm Joseph, von: philosopher; b. at Leonberg, a village near Stuttgart, Würtemberg, Jan. 27, 1775; d. at the baths of Ragatz, Switzerland, Aug. 20, 1854. His father, distinguished as an Orientalist, was a country clergyman who became prelate at Maulbronn; he directed his son's education. In his sixteenth year young Schelling entered the theological seminary at Tübingen, and studied theology in connection with philosophy and

philology. In his seventeenth year (1792) he wrote a thesis for his degree of master of philosophy, taking as his theme the origin of evil as set forth in Gen. iii. As early as 1793, in his essay on myths, historical sagas, and philosophemes of antiquity, there begins to appear in outline his most important theory, developed in later life. In the spring of 1796 he went to Leipzig, and there remained for two years. He had already published his essay *On the Ego as Principle of Philosophy*, in which he had repudiated the Kantian dualism, and pointed out the common source of the two sides, theoretical and practical, subjective and objective, and set up the theory of a faculty of knowing which could grasp the unconditioned ground of these two sides—a faculty or activity which he called "intellectual intuition." At Leipzig he pursued studies in mathematics and natural science, and paid special attention to medicine. His attitude toward Fichte's system was at first that of an expounder, afterward that of a critic. He put forth his *Ideas on the Philosophy of Nature* (1797) and *Concerning the World-Soul* (1798), indicating his departure from this standpoint. The *Science of Knowledge*, by Fichte, had made the Ego all in all, and nature a mere subordinate affair. Consciousness being regarded as the essential principle, and the will as the highest, ethical science was the sole outcome, and the natural sciences, as well as all partially unconscious activity of man as displayed in art, religion, poetry, and the mythologies, was ignored. Schelling's function was to call attention to this unconscious evolution of Reason—the side of the absolute Ego which Fichte had slighted. Schelling, however, went so far in this new direction as to make Nature a coequal pole of the absolute, with Mind as the other, apparently influenced in this by Spinoza, who had made "thought and extension" the two poles of his "substance." Accordingly, the union of the ideal with the real, of mind with matter, was the ultimate principle with Schelling's system. In æsthetic art this union was to be found. The Beautiful is the highest realization of the Absolute, and that "toward which the whole creation moves." This standpoint was criticised subsequently by Hegel, who restored the supernatural realization of the highest principle in the human soul as above its mere incarnation, which then sinks into a subordinate phase of spiritual life as a mere probationary stage thereof, a step in its progressive development. If the Beautiful be the highest principle, immortal life, a soul divorced from body, becomes a mere abstraction, and with this God, as supernatural, loses consciousness and perfection. Schelling remained almost entirely silent from 1812 to 1834, during the period of the activity of Hegel, whose system was that of Schelling, with the essential modification of substituting religion for art as the highest activity, and indeed preferring conscious thought as found in theology or speculative philosophy to all other forms. He seems to have felt this defect in his system, and after the death of Hegel (1831) to have developed his system from the amended basis. He calls, therefore, his earlier system, which lays so much emphasis on nature-philosophy and art, his negative system, and his later one, in which he endeavored to make freedom the highest ideal, his positive system. From Leipzig he was called to Jena (1799), partly through the interest of Goethe, who was attracted toward his philosophy of nature. At this time he came into contact with and exercised a powerful influence upon the romantic school, becoming intimate with the Schlegels, Novalis, Fries, and others.

If Fichte may be regarded as building his system chiefly on Kant's *Critique of Practical Reason*, Schelling certainly builds upon the *Critique of Judgment* and the *Metaphysical Principles of Natural Science*. Kant's use of the forces of attraction and repulsion for the construction of matter suggested an entire system of philosophy in his fertile mind. Polarity became the principle of matter and of mind as well. In 1800–01 he edited *The Journal of Speculative Physics*, and set forth the doctrines of this fundamental conception, showing how the giant mind of the world develops from its sleep in nature to consciousness in man. In 1802 appeared his dialogue, *Bruno, or on the Natural and Divine Principle of Things*, in which the theory of Giordano Bruno is given in the style of the Platonic *Timæus*. In the same year he associated himself with Hegel for the publication of *The Critical Journal of Philosophy* (Tübingen, 1802–03), the latter furnishing the greater part of the articles for it. In his *Lectures on the Method of Academical Study*, delivered in 1802 and published the next year, he gives the outlines of his entire system in a popular form. The tendency toward mysticism here makes its appearance, and is quite marked in his works written during the next few years. In his *Philosophy and Religion* (1804) he makes finiteness and materiality to be the result of a lapse from the Absolute, to recover from which lapse is the object and goal of human history. Theosophic doctrines appear in his essays *On the Philosophy of Nature* (1806) and *On the Relation of the Plastic Arts to Nature* (1807). The influence of Franz Baader upon Schelling belongs to this period, and is manifested in the noteworthy treatise, *Philosophical Inquiries into the Nature of Human Freedom* (1809), in which he seems to follow Jacob Böhme in his theological distinctions. In this treatise also, which does not strictly accord with his system of transcendental idealism already given, the stress that he lays upon freedom and personality indicates the first appearance of his latest system, which he called his "positive philosophy." He defended his system against the charges of naturalism, Spinozism, and atheism in a controversial work against Jacobi in 1812. In 1808 he had gone to Munich as secretary of the Academy of Arts and Design. When in 1826 the University of Munich was founded, after the removal of that at Landshut, Schelling became professor, and for a time formed the chief attraction of the university. At Erlangen in 1820 he wrote the *Philosophy of Mythology* and the *Philosophy of Revelation*, mythology, according to his view, being an imperfect revelation. In 1834, upon the occasion of the publication of Hubert Becker's translation of Cousin's estimate of French and German philosophy, Schelling wrote a preface for it, and criticised the Hegelian philosophy as being merely negative, and as substituting logical abstractions for the living and real. The dialectic of Hegel he regarded as a fiction of hypostatization, whereby self-movement is ascribed to the Idea. In his lectures on the history of modern philosophy, delivered at Munich, he unfolded this critical view more fully. Ten years after Hegel's death, Schelling became his successor at the University of Berlin, and in his opening lecture (1841) endeavored to unite his earlier and later systems, pronouncing the system of Identity to be the necessary negative phase of his entire philosophy, and needing only to be supplemented by his philosophy of mythology and revelation, which he regarded as the positive phase. The publication (1842) of the substance of his lectures at Berlin, from notes taken by Paulus and Frauenstädt, showed very clearly that the work on freedom already mentioned lay at the basis of his later views. He distinguished in God, after the fashion of Böhme, (1) a blindly necessary or unpremeditating Being—the primordial "abyss" of the divine nature; (2) the three potencies of the essence of God: (*a*) unconscious will, the *causa materialis* of creation; (*b*) conscious will, the *causa efficiens*; (*c*) *causa finalis*, the union of the two—that by which all things are made that are made; (3) the three Persons, who proceed from the three potencies by overcoming the first or unconscious phase by means of the theogonic process. These Persons are the Father, Son, and Spirit—the possibility, the power, and the completed deed of overcoming that "primordial abyss of unconsciousness." In nature only potencies are at work; in man, personalities. Both Schelling and Fichte laid great stress on the distinction between Pauline and Johannean Christianity. Schelling makes three periods of Christianity: (*a*) Petrine, or Catholicism; (*b*) Pauline, or Protestantism; (*c*) Johannean, or the Church of the future.

The two sons of Schelling (Karl F. A. and Hermann) published a complete collection of his writings (Stuttgart and Augsburg, 1856–61) in 14 vols., of which the first division, in 10 vols., contains the works published during his life, arranged in their chronological order, while the second division, in 4 vols., gives what had remained unpublished, and is chiefly the exposition of his later system. Schelling's works have not been, to any great extent, translated into other languages. His introductions to the *Sketch of a System of Nature-Philosophy* and to the *System of Transcendental Idealism* (1799), and the famous *Method of Academical Study*, however, have been translated and published in *The Journal of Speculative Philosophy*. His *Life* was written by Plitt (3 vols., 1867–71). William T. Harris.

Scheltopu'sic, or **Scheltopusik**: a lizard (*Pseudopus pallasii*) inhabiting Sicily and parts of Southern Europe, devoid of external limbs and clothed, except for a space on either side of the body, in a complete armor of small bony plates. It reaches a length of nearly 3 feet, and feeds on insects, birds, and small quadrupeds. F. A. L.

Schem, shem, ALEXANDER JACOB: author; b. at Wiedenbrück, Germany, Mar. 16, 1826; studied at the gymnasium of Paderborn 1839–43; at the university of Bonn 1843–45, and at that of Tübingen 1845–46; edited Westphalian newspapers 1849–51; removed to the U. S. 1851; was Professor of Hebrew and of Modern Languages at Dickinson College, Carlisle, Pa., 1854–60, after which he devoted himself to literature in New York, chiefly in the departments of geography and statistics; edited ecclesiastical almanacs for 1860 and 1868–69; wrote for religious and political newspapers; aided Rev. George R. Crooks in the preparation of his *Latin-English School Lexicon*; was one of the editors of *The Methodist* and of *The Methodist Quarterly Review*; was a contributor to Appletons', McClintock & Strong's, and Johnson's *Cyclopædias*, and prepared a revised American edition of a *Conversations-Lexicon* in the German language (12 vols., 1869, *seq.*). D. at West Hoboken, N. J., May 21, 1881.

Revised by A. OSBORN.

Schemnitz, shem'nits: a large mining-town in Hont county, Northern Hungary; on the Schemnitz; 65 miles N. by W. of Budapest, at an elevation of 1,300 feet above the sea (see map of Austria-Hungary, ref. 5–G). It has a celebrated mining-school with chemical laboratories and a fine collection of minerals. The mines, which yield gold, silver, copper, and iron, extend below the city. Pop. 15,265.

Schenck, skenk, ROBERT CUMMING: diplomat; b. at Franklin, O., Oct. 7, 1809; graduated at Miami University in 1827; studied law and was admitted to the bar, beginning practice at Dayton; member of State Legislature 1841 and 1842, and member of Congress 1843–51; U. S. minister to Brazil, and employed on diplomatic missions to Buenos Ayres, Montevideo, and Paraguay 1851–54. Appointed brigadier-general of volunteers on the outbreak of the civil war in the U. S., he commanded a brigade at the battle of Bull Run July 21, subsequently in Western and Northern Virginia; engaged at the battle of Cross Keys Apr., 1862. At the second battle of Bull Run he was severely wounded and incapacitated until December, when, having meanwhile been promoted to be major-general from Aug. 30, he was placed in command of the Eighth Army-corps and Middle department. He resigned from the army Dec., 1863, and resumed his seat in Congress, having been re-elected, serving at the head of the committee on military affairs and that of ways and means; appointed minister to Great Britain Dec. 22, 1870; resigned 1876, and resumed the practice of law in Washington, D. C., where he died Mar. 23, 1890.

Schenck, WILLIAM EDWARD, D. D.: clergyman; b. at Princeton, N. J., Mar. 29, 1819; was educated at Princeton College and Seminary with one year in the study of law between the two courses; pastor at Manchester, N. J., 1842–45; Hammond Street church, New York, 1845–48; First church, Princeton, N. J., 1848-52; superintendent of church extension in the Presbytery of Philadelphia 1852–54; secretary, 1854–86, and editor, 1862–70, of the Presbyterian board of publication; permanent clerk of the General Assembly (Old School) 1862–70; and vice-president of the American Colonization Society since 1877. Dr. Schenck has published many minor works and several books, including *Children in Heaven*; *Historical Account of the First Presbyterian Church of Princeton, N. J.* (Princeton, 1851); *God our Guide*; *The Fountain for Sin* (1867–68; translated into German); *Church Extension in Cities*; *General Catalogue of Princeton Theological Seminary* (1881); and *Necrological Reports of Princeton Theological Seminary* (1874–84).

C. K. HOYT.

Schenec'tady: city; capital of Schenectady co., N. Y.; on the Mohawk river, the Del. and Hudson and the N. Y. Cent. and Hud. River railways, and the Erie Canal; 17 miles W. of Albany (for location, see map of New York, ref. 4–J). It has connection with the West Shore Railroad at South Schenectady and with the Fitchburg at Scotia, on the opposite side of the river, and local roads connect it with Saratoga and Troy. The city is located in one of the most beautiful portions of the renowned Mohawk valley. The older parts are along the river-bank, the modern are on the heights which surround the valley here. The supply of water is by the Holly system. The city has gas and electric lights and an electric street-railway.

Public Buildings.—Among the notable public buildings are the Ellis Hospital, Children's Home, Home of the Friendless, Free Public Library, the Van Curler opera-house, and a State armory.

Churches and Schools.—Schenectady has 22 churches and 4 missions, the former divided as follows: Methodist Episcopal, 3; Presbyterian, 3; Roman Catholic, 3; Baptist, German, Protestant Episcopal, and Reformed, each 2; and African, Congregational, English Lutheran, German Lutheran, and Jewish, each 1. There is a Y. M. C. A., with a commodious building. The city is the seat of UNION COLLEGE (*q. v.*), the academical department of Union University, and of Union Classical Institute, a preparatory school. The public-school system comprises graded schools, occupying seven modern buildings, having 3,916 pupils, and costing annually about $50,000. There are two parochial schools, a business college, and several private schools.

Finances and Banking.—The city receipts for the year ending Feb. 28, 1901, were $1,011,393.50, and expenditures $834,745.39; the debt was $1,159,114.16, and the property valuation $1,065,430. In 1901 there were two national banks with combined capital of $200,000, a State bank with capital of $100,000, and a savings-bank with deposits of $3,130,000.

Business Interests.—The manufacturing industries are numerous and extensive, and include the main plant of the Edison General Electric Company, the Schenectady Locomotive-works, Westinghouse Agricultural Works, car-works, copper and sheet-iron works, foundries, 3 knitting-mills, mica-insulator works, shawl-factory, women's underwear mill, lace-mill, shirt-factory, planing-mills, boat-yards, and carriage, varnish, and sash and blind factories. There are 3 daily and 4 weekly newspapers.

History.—Schenectady is one of the oldest cities in the State. It was settled by Arent Van Curler in 1661; patented in 1684; burned by the French and Indians, who massacred all but sixty of its inhabitants, in 1690; created a borough in 1765; incorporated as a city in 1798; and had almost its entire business portion burned in 1819. Pop. (1880) 13,655; (1890) 19,902; (1900) 31,682.

CITY EDITOR OF "DAILY GAZETTE."

Schenkel, DANIEL: theologian; b. at Dögerlin, Zurich, Switzerland, Dec. 21, 1813; studied theology in Basel under de Wette and Hagenbach, afterward in Göttingen; was appointed pastor at Schaffhausen in 1841; Professor of Theology at Basel in 1849, and in 1851 at Heidelberg. He became professor emeritus in 1884. He edited *Allgemeine Kirchenzeitung* (1852–59) and *Allgemeine Kirchliche Zeitschrift* (1859–72), and *Bibel-lexicon* (1869–75, 5 vols.); wrote *Das Wesen des Protestantismus aus den Quellen des Reformationszeitalters beleuchtet* (3 vols., 1846–51; 2d ed. 1 vol., 1862), which defended the thesis that Protestantism had for its end rather to found a new community of believers than a new theology or polity. This idea he again developed in his *Das Prinzip des Protestantismus* (1852). Up to this time he was orthodox, but with his *Christliche Dogmatik vom Standpunkte des Gewissens* (2 vols., 1858–59) he came out on the liberal side, and this altered position is yet more plain in his *Das Charakterbild Jesu* (1864; translated into English by W. H. Furness, 1866), which represents Jesus as a mere man without miraculous power. He was the founder of the German Protestant Union. D. at Heidelberg, May 21, 1885.

Schenk'endorf, MAX. von: poet; b. at Tilsit, Germany, Dec. 11, 1783; studied law at the University of Königsberg; practiced his profession until the breaking out of the wars of liberation in 1813, when he entered the Prussian army. Though unable to fight on the battle-field, on account of the lameness of his right arm, he inspired his comrades by his excellent war-songs. Many of these songs, which appeared in the collection of his *Gedichte* (1815), possess the true ring of popular poetry, and, like the war lyrics of Körner and Arndt, they were a powerful help in arousing German patriotism against the tyranny of Napoleon. See A. Hagen, *M. von Schenkendorf* (1863). JULIUS GOEBEL.

Scherer, she-rãr', EDMOND HENRI ADOLPHE: critic; b. in Paris, Apr. 8, 1815; was educated in the Collège Bourbon, Paris; studied theology at Oxford, England, and Strassburg, and was in 1845 appointed Professor of Exegesis at Geneva. His views of the inspiration of the Bible having undergone some modification, he resigned his chair in 1850 and settled in Paris, where he became one of the leaders of the liberal movement within the Protestant Church. For many years he wrote literary and political articles for *Le Temps*. Elected a member of the Legislative Assembly in 1871, he took an active part in politics. D. at Versailles, Mar. 16, 1889. His principal theological works are *De l'État actuel de l'Église Réformée en France* (1844); *La Critique et la Foi* (1850); *Alexandre Vinet, sa vie et ses*

écrits (1853); *Mélanges de critique religieuse* (1860; often reprinted). He also published *Études critiques sur la littérature contemporaine* (7 vols).

Scherer, shā'rer, WILHELM: philologist; b. at Schönborn, Austria, Apr. 26, 1841; studied Germanic philology at Vienna under Franz Pfeiffer, and later at Berlin under Jacob Grimm and Karl Müllenhoff; was Professor of German Language and Literature at Vienna 1868–72, at Strassburg 1872–77, at Berlin 1877–86. D. Aug. 6, 1886. While a student he was made by Müllenhoff coeditor of the famous *Denkmäler deutscher Poesie und Prosa aus dem VIII.–XII. Jahrhunderten*, and by his masterly treatment of the difficult questions of text criticism and philological interpretation in this work he at once attracted the attention of German philologists. In 1868 he published *Zur Geschichte der deutschen Sprache*, in which he made use of the results of comparative philology far more extensively and successfully than had hitherto been done in this field, and opened new fields for linguistic research by the application of advanced methods borrowed from the natural sciences. A number of studies in the history of German literature, *Deutsche Studien* (1870), *Geschichte der d. Dichtung im 11 und 12 Jahrhundert* (1875), *Geistliche Poeten der deutschen Kaiserzeit* (1875), *Die Anfänge des Prosaromans* (1877), *Aus Goethes Frühzeit* (1879), etc., gave evidence of the thorough zeal with which he applied himself also to the investigation of the history of German literature. The results of these studies he embodied in his famous *Geschichte der deutschen Litteratur* (1883), a masterwork which has been translated into English. His essays on Goethe were published under the title *Aufsätze über Goethe* (1886), and his minor writings were collected in the *Kleine Schriften* (1893), with an excellent preface by Konrad Burdach. See W. Dilthey, *W. Scherer* (in *Deutsche Rundschau*, Oct., 1886); Johannes Schmidt, *Gedächtnissrede auf W. Scherer* (1887); E. Schmidt, *Goethe-Jahrbuch* (1888); Julius Goebel, *Modern Language Notes* (1887). J. G.

Scherr, JOHANNES: historian; b. at Hohenrechberg, Würtemberg, Oct. 3, 1817; studied philosophy and history at Tübingen; was appointed Professor of History at the Polytechnic School of Zurich in 1860. He was a very prolific writer, who indulged in strange oddities of diction and style, and as a critic was for a time very influential in German literature. His principal works are *Geschichte der deutschen Litteratur* (2d ed. Leipzig, 1854); *Geschichte der englischen Litteratur* (Leipzig, 1854; 3d ed. 1883); *Schiller und seine Zeit* (Leipzig, 1859, several editions); *Geschichte der deutschen Frauenwelt* (Leipzig, 1860; 4th ed. 2 vols., 1879); *Blücher, seine Zeit und sein Leben* (Leipzig, 3 vols., 1862–63; 4th ed. 1887). D. Nov. 21, 1886.

Revised by J. GOEBEL.

Scherzer, shert'ser, KARL, von: *savant* and traveler; b. in Vienna, Austria, May 1, 1821. In company with Dr. Moritz Wagner he made a scientific journey through North and Central America and the West Indies 1852–55, and on his return published (with Wagner) *Reisen in Nordamerika* (3 vols.), *Die Republik Costarica*, and *Wanderungen durch die Mittelamerikanischen Freistaten*. He was one of the scientists of the Novara expedition round the world 1857–59, and wrote the narrative *Beschreibender Theil der Reise der Oesterreichischen Fregatte Novara* (3 vols., 1861–62, and subsequent editions) and *Statistisch-Kommerzieller Theil der Novara Expedition*. From coca-leaves which he brought home cocaine was first prepared. Scherzer was knighted and was commissioned to edit the commercial statistics of the Austrian empire. In 1869–70 he was chief of an Austrian scientific expedition to Eastern Asia, of which he published a narrative. Besides the works mentioned he is the author of many scientific papers, and a volume of commercial statistics, *Weltindustrien* (1880). He edited (in German) Ximencz's history of Guatemala. H. H. S.

Schiaparelli, skĕe-ăa-păă-rel'lĕe, GIOVANNI VIRGINIO: astronomer; b. at Savigliano, Piedmont, Italy, Mar. 4, 1835; studied in Turin, Berlin, and Pulkowa; became director of the observatory at Milan, 1862, and is best known for his remarkable discovery of the relation between the orbits of comets and meteors. His observations on the surface of the planet Mars are also of much note, as well as his conclusion, not yet fully established, that the planets Venus and Mars, in their rotation around the sun, always present the same face to it, as the moon does to the earth. He is the author of *Astronomical Theory of Shooting Stars* (1867); *The Predecessors of Copernicus in Antiquity*; and of numerous shorter works. S. NEWCOMB.

Schidone, BARTOLOMMEO: See SCHEDONE, BARTOLOMMEO.

Schiedam, *skhĕe*-daam': town of the Netherlands, province of South Holland; on the Schie; 2½ miles W. of Rotterdam (see map of Holland and Belgium, ref. 6–E). It is a neat and well-built place, and has fine buildings, among which the town-hall and exchange are the most remarkable. Its principal industry is gin-manufacturing, for which it has many distilleries and malt-works. Large herds of cattle and swine are fed from the refuse of the distilleries, and an extensive trade is carried on. Pop. (1899) 27,081.

Schiff, MORITZ, M. D.: professor of physiology; b. at Frankfort-on-the-Main, Germany, Jan. 28, 1823; educated in the same city; demonstrator of ornithology in the University of Frankfort till 1852; Professor of Comparative Anatomy in the University of Berne 1852–62; Professor of Zoölogy in the Instituto di Perfezionamento at Florence 1862–70; Professor of Physiology in same institute 1870–76; then took the chair of Physiology in the University of Geneva. His principal works are *Muskel und Nervenphysiologie* (Leipzig, 1853); *Untersuchungen zur Physiologie des Nervensystems* (Frankfort, 1855); *Untersuchungen über Zuckerbildung* (Würzburg, 1859); *Lezioni di Fisiologia sperimentale* (Florence, 1865; 2d ed. 1873); *Leçons sur la Physiologie de la Digestion* (2 vols., Turin, 1867); besides various papers on physiology, translated into French (5 vols., vol. i., 1893).

Schiller, HERMAN, Ph. D.: professor of pedagogy; b. at Wertheim, Baden, Nov. 7, 1839; studied at gymnasium, Wertheim, and at the Universities of Heidelberg and Erlangen; gymnasial professor at Wertheim, 1862–68, Karlsruhe 1868–72; gymnasial director at Constance 1872–76; director of gymnasium and of the seminary, and professor in the university, Giessen, since 1876. Schiller ranks among the foremost leaders of the new educational movements in Germany. His pedagogical writings and the practical application of his theories in his training-school, connected with the Giessen gymnasium, have been largely instrumental in shaping the methods for the professional preparation of teachers for the higher schools of Prussia. In literary activity and in devotion to the solution of problems pertaining to the secondary schools he may be classed with Dr. O. Frick (d. at Halle, 1892); to these two practical schoolmen are due in large measure the new life and scientific spirit of the German gymnasia. His principal works are: 1. Historical, *Geschichte des römischen Kaiserreichs unter der Regierung des Nero* (1872); *Geschichte der röm. Kaiserzeit* (2 vols., 1886–88); *Handbuch der röm. Staats- u. Kriegsalterthümer* (2d ed. 1892); *Lehrbuch der griech. u. röm. Geschichte* (1891). 2. Pedagogical, *Die lyrischen Versmasse des Horaz* (3d ed. 1892); *Handbuch der praktischen Pädagogik* (3d ed. 1894); *Lehrbuch der Geschichte der Pädagogik* (3d ed. 1894); *Die einheitliche Gestaltung u. Vereinfachung des Gymnasialunterrichts* (1890); *Pädagogische Seminarien für das höhere Lehramt* (1890); *Hausarbeit und Schularbeit* (1891); *Vorträge über Schulgesundheitspflege* (1893). Since 1870 Schiller has been a frequent contributor to the leading educational journals. J. E. RUSSELL.

Schiller, JOHANN CHRISTOPH FRIEDRICH, von: poet; b. in the town of Marbach, in Würtemberg, Germany, Nov. 10, 1759. His father was a military surgeon, who was made captain in the army for his services in the Netherlands and Bohemia. His mother, Elizabeth Kodweiss, was a baker's daughter, with some natural taste for music. As a boy, Schiller exhibited signs of a highly imaginative and spiritual nature, and his ambition was to become a clergyman. But Duke Karl of Würtemberg insisted, against the wish of the parents, on having the boy educated in a new academy—the Karl's School—which he had founded according to the most approved plan of military discipline. Theology was not taught in this academy; Schiller, therefore, entering at the age of fourteen, first selected law, but afterward changed to medicine, in which branch he graduated in his twenty-first year. There can be no doubt that the rigid, soulless discipline to which he was subjected for seven years was one cause of the reckless, rebellious spirit which breathes through his earliest works. Even before leaving the academy he had written his play of *The Robbers*, and after his graduation and appointment as military surgeon to a regiment in Stuttgart, he published it at his own expense. The impression it made was immediate and universal: the time was ripe for a revolt in literature against the French classicism which had governed the intellectual tastes of Europe for a century. Baron Dalberg, then di-

rector of the theater at Manheim, announced *The Robbers* for representation on the stage, and Schiller, being refused leave of absence, went to Manheim without it, and witnessed the first successful performance of the play Jan. 13, 1782. On his return to Stuttgart he was arrested and temporarily imprisoned; the duke endeavored to exact a pledge from him that he would write no more poetry, and the probability of sterner measures being taken induced Schiller to take refuge in flight. In September of the same year, under an assumed name, in company with a musician named Streicher, he left Stuttgart, and for nearly a year afterward remained in concealment on an estate belonging to the noble family of Wolzogen, near Meiningen. During this time he completed his plays of *Fiesco* and *Intrigue and Love*. The first of these, rejected by Dalberg, was finally produced at Manheim, and became so popular that the author was offered the post of dramatic poet to the theater there, with a meager salary. He accepted the position, undertook also the editing of a new dramatic periodical, *Thalia*, and remained in Manheim until the spring of 1785, when an invitation from Körner (the father of the famous poet, Theodore Körner) drew him to Leipzig. Soon afterward he followed Körner to Dresden, and was supported in the most generous manner by that faithful friend during two years while writing his tragedy of *Don Carlos*, his historical sketch *The Revolt of the Netherlands*, the romantic fragment *The Ghost-seer*, and a number of lyrical poems. In the summer of 1787 Schiller visited Weimar for the first time, and made the acquaintance of the authors Wieland and Herder. He also met his future wife, Charlotte von Lengefeld, whom he returned to see the following summer, and in the garden of the Lengefeld family at Rudolstadt first met Goethe. The interview has a special interest from the fact that these poets, destined to be such friends and colaborers, disliked each other at first sight. Nevertheless, it was through Goethe's influence that Schiller early in 1789 was offered the place of Professor of History at the University of Jena. He at first hesitated to accept on account of want of preparation, but he was tired of his homeless life, and saw in the appointment the possibility of marriage. His opening lectures were remarkably popular. He married Charlotte von Lengefeld early in 1790, and devoted himself to a life of study and creative activity. But during the following year he was brought to the verge of the grave by an inflammation of the lungs; the report of his death was circulated, and he was already so well known beyond the boundaries of Germany that two Danish noblemen, the Prince of Augustenburg and Count von Schimmelmann, sent him the sum of 1,000 thalers annually for three years, in order that he might rest and recover his strength. His *History of the Thirty Years' War* was published in 1793, and in the autumn of that year he returned to Würtemberg, with his family, and remained until the following spring, his visit being wisely ignored by the duke. Through consultation with the publisher Cotta a literary periodical called *The Hours* was projected, and this led to the most important crisis of his life. Goethe's co-operation was too important to be overlooked; the two poets discovered unexpected points of sympathy, and soon became united in a personal and literary friendship as noble as it is rare in history. Schiller soon freed himself from the influence of Kant, which had for a time interrupted his poetical activity, but which had also been of great influence on his artistic development; stimulated by Goethe, he wrote his finest ballads and lyrics, and was greatly encouraged by the success of his periodical, *The Hours*. His plan for a great drama based on the history of Wallenstein was resumed, and the completion of the work as a trilogy or triple drama in the year 1799 placed him at once in the first rank of authors. His ill health, however, made it more and more difficult for him to discharge the duties of his professorship at Jena; a closer intercourse with Goethe became an intellectual necessity, and in the year 1800, after the grant of a liberal pension by the duke, Karl August, he removed to Weimar. His friendship with Goethe drew upon both the bitter hostility of most of the secondary authors of Germany, and many attempts were made to estrange the two great friends. The splendid rhythm, rhetoric, and artistic completeness of form of Schiller's *Song of the Bell*, *The Diver*, and his classical ballads bore down all narrow criticism, and secured his fame as a poet in the universal judgment of the German people. His *Wallenstein* was a great success upon the stage; not less so his *Maria Stuart*, which appeared in 1800, and the *The Maid of Orleans*, in 1801. In the year 1802 Schiller was ennobled by the emperor, Francis II. His next work, *The Bride of Messina* (1803), was an attempt to unite the stately formalism of the antique Greek chorus with the free romantic element of modern dramatic art. Notwithstanding passages of rare lyrical beauty, the experiment can not be considered successful, although the play is occasionally given on the German boards. *William Tell*, which appeared in 1804, although poetically inferior to *Wallenstein*, was Schiller's greatest dramatic success. He visited Leipzig and Berlin when it was produced, and was received with the greatest popular enthusiasm. There was a chance of his obtaining the post of director of the royal theater in Berlin, but the duke doubled his pension in order to retain him, and Schiller was also unwilling to relinquish his intercourse with Goethe. He began a new play, *Demetrius*, and was well advanced in the work when, in the spring of 1805, his failing vital power reached its limit. A simple cold apparently turned the balance, and on May 9, he died. A dissection showed that under no circumstances could his life have been prolonged for more than six months more. His remains were exhumed in 1826, placed in a granite sarcophagus, and transferred to the vault of the grand ducal family, where they now repose beside those of Goethe. While as a poet Schiller holds one of the most prominent places in German literature, ranking next to Goethe, his influence as a philosopher and critic must not be overlooked. Quite early in his literary career we discover a pronounced talent for philosophy, a talent which he afterward, by the careful study of Kant's system, developed to so great an extent that he ranks among Germany's greatest thinkers. His philosophic studies were, however, not directed to the logical operations of the human mind, but rather to ethics and æsthetics, and a number of essays (*Ueber Anmuth und Würde*, 1793; *Ueber das Erhabene*, 1793; *Briefe über die ästhetische Erziehung des Menschen*, 1795, etc.) give evidence of the profoundness with which Schiller grasped and solved the most difficult problems. In these brilliantly written essays the rigidness of Kant's ethics and the one-sidedness of his æsthetics are overcome, and the innermost thoughts of the great classical period of German literature, which culminate in the advancing of a modern ideal of humanity superior to that of the Greeks, find their powerful philosophic expression. The results of his philosophic studies Schiller with a remarkable skill undertook to turn into poetry in his famous philosophic poems (*Das Glück*, *Der Genius*, *Das Ideal und das Leben*, etc.), the like of which no other literature possesses. The influence of philosophy on Schiller's critical activity is also quite evident. He stands next to Lessing as a critic of German literature. While the former carefully established the subtle formal distinctions between the various branches of poetry, and laid down the laws which govern poetic production accordingly, Schiller discusses chiefly the nature of poetry and its different branches, inquiring besides into the psychological operations of the poet's mind. To him we owe the best critical estimate of Goethe's genius (*Correspondence with Goethe*), and his famous essay on *Naïve and Sentimental Poetry* has influenced literary criticism to the present time.

In Schiller the interest belonging to individual character is associated with his genius, and lends to it the magnetism which accompanies universal popularity. On the hundredth anniversary of his birth, in 1859, a "Schiller fund," amounting to several hundred thousand dollars, was created in Germany, and the annual income is devoted to the assistance of needy authors, some fifteen or twenty of whom are now wholly or partially supported from this source. All the principal cities of Germany have erected statues in his honor. The unselfish devotion of his life to his art is recognized with a fervor which takes no note of his early irregularities; and without ever having made the slightest profession of democracy he is everywhere celebrated in Germany as the poet of the people. The explanation of this fact must be sought for in the sincerity of his nature, no less than in the persecution of which he was temporarily the object. Carlyle finely says of him: "He was a high ministering servant at truth's altar, and bore him worthily in the office he held."

Bibliography.—K. Hoffmeister, *Schillers Leben* (1838–42); E. Boas, *Schillers Jugendjahre* (1856); E. Palleske, *Schillers Leben und Werke* (1858); G. Schwab, *Schillers Leben* (1860); H. Düntzer, *Schillers Leben* (1881); O. Brahm, *Schiller* (1888); J. Minor, *Schiller* (1890); Jacob Grimm, *Rede auf Schiller* (1859); Fr. Vischer, *Rede auf Schiller* (1859); Kuno Fischer, *Schillers Schriften* (1891);

E. L. Bulwer, *Life of Schiller* (1847); Th. Carlyle, *The Life of Frederick Schiller* (1873); Braun, *Schiller im Urtheile seiner Zeitgenossen* (1882); Belling, *Metrik Schillers* (1883); Ueberweg, *Schiller als Historiker und Philosoph* (1884); K. Tomaschek, *Schiller in seinem Verhältniss zur Wissenschaft* (1863); A. Köster, *Schiller als Dramaturg* (1890); Julius Goebel, *Ueber tragische Schuld und Sühne* (1884); Philippi, *Schillers lyrische Gedankendichtung*. See also the important and highly interesting collections of his correspondence with Körner, W. von Humboldt, Goethe, and his wife, Charlotte von Schiller.

Revised by JULIUS GOEBEL.

Schilling, JOHANNES: sculptor; b. at Mittweida, Saxony, June 23, 1828; studied sculpture in Dresden, Berlin, and Rome; settled in 1856 at Dresden, and was appointed professor at the academy in 1868. The first work which attracted attention was *Amor and Psyche*. Among his later works are the Schiller monument in Vienna, the war monument in Hamburg, the monument of the Archduke Maximilian at Trieste, and the grand national monument on the edge of the Niederwald, overlooking the Rhine, which was unveiled by Emperor William I. in 1883.

Schism [viâ O. Fr. from Lat. *schis'ma* = Gr. *σχίσμα*, a split, schism, deriv. of *σχίζειν*, to split]: a division in the Church on points of worship and discipline. A schismatic is one who separates himself, or improperly cuts off others, from the Church. The New Testament word refers to differences rather than divisions. Some of the chief divisions, either voluntary or forced, are the Ebionite (second and third centuries), Novatian (251 A. D.), Miletian (305), Donatian (311), Arian (first under Damasus 355; second under Miletian 361), Nestorian (428), Monophysite (482). The great schism between the East and West (about 880) arose from hierarchical rivalry, the conflict concerning courts of appeal between Pope Nicholas I. and Photius, Patriarch of Constantinople, limits of jurisdiction, doctrines, and rites. Their mutual excommunication dates 1054. The papal schisms concerning the election of popes were 963, 1159, 1164, 1168, 1178, and the great schism, with rival courts at Rome and Avignon, 1378–1429. With discussions and corruptions rose new sects, some fanatical, some reforming, but in their separation from the Church differences of doctrine were emphasized, and generally they were called hereties.

Schist: See CRYSTALLINE SCHISTS and ROCKS.

Schizæa'ceæ: See FERNWORTS.

Schizomyce'tes: See BACTERIOLOGY.

Schizop'oda [Gr. *σχιζόπους*, with cleft feet; *σχίζειν*, cleave, split + *πούς*, *ποδός*, foot]: an order of crustaceans (see MALACOSTRACA), the members of which are small and shrimp-like, but differ from the true shrimps (decapods) in having six pairs of locomotor appendages, and, besides, two pairs of accessory jaws which are pediform. All these feet are two-branched. The present tendency is to dismember the group, distributing its members between the mysids and the euphausia-like forms. The species of *Mysis* are remarkable, from the fact that the auditory organs are in the tail. On the side of the body and abdomen of the euphausians are a series of eye-like organs, which have recently been shown to be phosphorescent. The species, nearly a hundred in number, are almost entirely marine, but one species has been found in the lakes of Sweden as well as in Lakes Michigan and Superior.

J. S. KINGSLEY.

Schlagintweit, shlaach'int-vīt: the name of several travelers and authors; Baron HERMANN von Schlagintweit, b. May 13, 1826, d. at Munich, Jan. 19, 1882; ADOLF, b. Jan. 9, 1829, killed at Kashgar, Turkestan, Aug. 26, 1857; ROBERT, b. Oct. 27, 1833, d. at Giessen, June 6, 1885. They were the sons of an oculist in Munich; were early distinguished by their enthusiastic study of physical science, especially geology. Twice they explored the Alps, and communicated the results of their researches in *Untersuchungen über die physikalische Geographie der Alpen* (1850) and *Neue Untersuchungen* (1854), which attracted general attention. From 1854 to 1858 they undertook, supported by the King of Prussia and the British East India Company, comprehensive explorations of the Himalayas, Tibet, Hindustan, and Deccan, the results of which were communicated in *Results of a Scientific Mission to India and High Asia*, with an atlas of panoramas, views, and maps (1860–64), and *Reisen in Indien und Hochasien* (1869–80), written by Hermann alone. Robert also traveled extensively in North America, and wrote in 1870 *Die Pacific Eisenbahn in Nordamerika*, and in 1871 *Californien, Land und Leute*, and *Die Mormonen* (2d ed. 1878). Hermann in 1864 received the honorary surname of SAKÜNLÜNSKI, because of his ascent of the Kuenlun Mountains.—A fourth brother, EMIL, b. July 7, 1835, studied first law at Berlin, afterward Oriental languages and history, and published *Buddhism in Tibet* (1863); *Die Gottesnrtheile der Indier* (1866); *Die Könige von Tibet* (1866).—A fifth brother, EDUARD, b. Mar. 23, 1831, entered the Bavarian army, and fell in the battle of Kissingen, July 10, 1866. He published *Der Spanisch-marokkanische Krieg* (1863).

Revised by M. W. HARRINGTON.

Schlegel, AUGUST WILHELM, von: critic and poet; b. at Hanover, Germany, Sept. 8, 1767; studied philology under the famous Chr. G. Heyne at Göttingen; was private tutor at Amsterdam; lectured at Jena 1796–98; was appointed professor at Jena in 1798; went to Berlin in 1801, where he lectured on art and literature. He traveled for several years with Madame de Staël; was private secretary of the Crown Prince of Sweden during the wars of liberation. In 1815 he joined Madame de Staël at Paris, and remained with her until her death in 1817. In 1818 he was appointed Professor of Art and Literature at the University of Bonn, where he died May 12, 1845. Schlegel began his literary career as a critic and translator of English, Spanish, and Italian poets. Some of his reviews, as those on Schiller's *Künstler* and Goethe's *Hermann und Dorothea*, may still be considered classic specimens of literary criticism. His translation of Shakspeare, which he began to publish in 1797, and which was continued and finished by L. Tieck and Wolf Baudissin, made the great English poet one of the German classics. In 1798 he founded with his brother Friedrich the *Athenäum*, a periodical which became the chief organ of the romantic school, the new literary movement started by a number of young writers in opposition to the extreme classicism of Goethe and Schiller. Though Schlegel was one of the principal leaders of this new movement, he never participated in the eccentricities of his brother in advocating the return to Catholicism and mediæval feudalism. He was the representative of the sound elements in romanticism, and as such he exerted a great influence upon the development of the mental life in Germany. While his own poetic attempts, though perfect in regard to form, lack the true poetic spirit, his name is to be mentioned among the founders of the study of German antiquities, of Sanskrit and comparative philology. His best work, besides his masterly translations, is his *Vorlesungen über dramatische Kunst und Litteratur* (1809), a book which places Schlegel as a critic very near to Lessing. See Haym, *Die Romantische Schule* (1870); Hettner, *Die Romantische Schule* (1850); Bernays, *Zur Entstehungsgeschichte des Schlegelschen Shakespeare* (1872); I. Minor, *A. W. Schlegels Vorlesungen über schöne Litteratur und Kunst* (1884); D. Fr. Strauss, *Kleine Schriften*.

JULIUS GOEBEL.

Schlegel, FRIEDRICH, von: poet and critic; b. at Hanover, Germany, Mar. 10, 1772; studied philology at Göttingen and Leipzig; lived in Berlin and Jena; lectured in Jena 1801, in Paris 1802; studied Oriental languages, and especially Sanskrit, in Paris; joined, with his wife, the Roman Catholic Church at Cologne in 1808; settled finally in Vienna, where he lived, lecturing and writing, to the end of his life. D. on a lecturing tour at Dresden, Jan. 11, 1829. In his early writings—*Ueber das Studium der griechischen Poesie* (1796); *Die Griechen und Römer* (1796)—Schlegel is still influenced by the critical writings of Schiller, especially by the latter's essay on *Naïve and Sentimental Poetry*. He points to Greek art as the model of artistic perfection, and praises Goethe as the "dawn of true art and beauty." Soon afterward he became the chief theorist and organizer of the romantic school, which aimed at an entire reformation of German literature. For this purpose he founded and edited, with his brother August Wilhelm, the *Athenäum* (1798–1800), in which he advocated most zealously the doctrine of romanticism. As illustrations of his critical principles he wrote the drama *Alarcos* (1802), the indecent novel *Lucinde* (1799), and a great many poems, interesting documents for the study of romanticism, but without poetical value. He exerted far greater influence on the science of linguistics and the history of literature. His book *Ueber die Sprache und Weisheit der Inder* (1808) opened the way for the study of Sanskrit in Germany, and his *Vorlesungen über die Geschichte der alten und neueren Litteratur* (1815) marks the beginning of the science of the history of literature in Germany. Like his brother he directed the attention

of his contemporaries to the beauties of Old Germanic poetry, and by his letters on art in the *Europa*, a periodical which he edited while in Paris, he caused a revival in the plastic arts of Germany. But he is also, especially during the last period of his life, the chief representative of the pernicious elements of romanticism. He advocated the re-establishment not only of the papal hierarchy, but also of mediæval feudalism, and the injurious effects of his and his associates' influence in this direction were only gradually overcome. See R. Haym, *Die romantische Schule* (1870); W. Dilthey, *Schleiermacher* (1870); I. Minor, *Fr. Schlegels prosaische Jugendschriften* (1882). JULIUS GOEBEL.

Schleicher, shlī'cher, AUGUST: comparative philologist; b. at Meiningen, Germany, Feb. 19, 1821; studied theology and comparative philology at Leipzig, Tübingen, and Bonn 1840–46; privat docent in science of language at Bonn 1846–48; newspaper correspondent in Austria 1848–50; appointed Assistant Professor of Comparative Philology at Prague 1850; Professor of Science of Language and Teutonic Philology at Jena from 1857; died at Jena, Dec. 6, 1868. His residence at Prague directed his interest toward the Slavic languages, which, with the related Baltic languages, became from that time central in his scientific work and interest. Though his favorite thesis, that the science of language is to be classed among the natural sciences, has not been maintained, the influence of his views has been powerfully felt in checking arbitrary empiricism and establishing stricter methods of investigation. Chief works: *Die Sprachen Europas* (Bonn, 1850); *Formenlehre der kirchenslav. Sprache* (1853); *Handbuch der litauischen Sprache* (2 vols., Prague, 1856–67); *Die deutsche Sprache* (Stuttgart, 1860); *Compendium der vergl. Grammatik* (Weimar, 1862; 4th ed. 1876); *Laut- und Formenlehre der polabischen Sprache* (St. Petersburg, 1871). BENJ. IDE WHEELER.

Schlei'den, MATTHIAS JAKOB: botanist; b. in Hamburg, Germany, Apr. 5, 1804; first studied law at Heidelberg, then medicine at Göttingen, and finally botany at Jena, where he was appointed professor in 1839. In 1862 he resigned his office, and after a short stay at Dorpat (1863–64) as Professor of Vegetable Chemistry, he settled at Dresden. His principal works are *Grundzüge der wissenschaftlichen Botanik* (2 vols., 1842–43), which attracted much attention and gave rise to many controversies; it was translated into English by Dr. Lankester (1849); *Die Pflanze und ihr Leben*, translated into English by Prof. Henfrey (1848); *Baum und Wald* (1870); *Die Rose* (1873). D. at Frankfort-on-the-Main, June 23, 1881.

Schleiermacher, shlī'er-mā*kh*-er, FRIEDRICH ERNST DANIEL: theologian and philosopher; b. at Breslau, Germany, Nov. 21, 1768; the son of a Reformed clergyman; was brought up in the community of Moravian Brethren, receiving a profound religious impulse from them. From 1783 to 1787 he attended the pædagogium at Niesky and the seminary of the United Brethren at Barby. He completed his theological course at Halle, and after filling the positions of private tutor, assistant preacher, etc., became in 1796 the chaplain of the Charity Hospital at Berlin; in 1802 court chaplain at Stolpe, and in 1804 Professor (*extraordinarius*) of Theology and Philosophy at Halle. In 1809 he preached at the Trinity church in Berlin, and the following year received appointment as Professor (*ordinarius*) of Theology at the new University of Berlin, which position he retained till his death. During the ten years previous to going to Berlin he had studied and criticised the Kantian philosophy, and was greatly attracted by Jacobi's exposition of Spinoza. He subsequently studied and translated Plato, and did much by his lectures to encourage the study of the remains of the early Greek philosophy. His activity knew no limits. He labored to effect a union of the Lutheran and Reformed Churches on the broad basis that demanded unity in the spirit of Protestantism and allowed diversity as to doctrines and modes of worship. His failure in this led to a misunderstanding with Minister von Altenstein, which lasted for some years. D. in Berlin, Feb. 12, 1834.

The fundamental point of view of Schleiermacher's system is this: Religion is not a knowing nor a doing, but a feeling—a feeling of the universal life of the Infinite, and of the dependence of the Ego upon it. Hence, with him, religion begins with the feeling of dependence. Reflection upon this feeling gives rise to descriptions of it, and hence the statement of religious principles and dogmas. All religions are historic and positive. Among these Christianity holds a unique place, inasmuch as in it is found the reconciliation with the Infinite, hence the very essence of religion itself. Upon the same framework of antithetic ideas of the universal and particular (infinite and finite, common and special, God and the Ego) he builds his system of ethics. The organizing activity of reason in the realm of the common or universal, securing identity of common usage, is the first province of ethical action—that of interchange among men. The second is that of organization in the realm of particular individuality, the province of inalienable personality. The third and fourth provinces of ethical action are not those of organization, but of "symbolism," the third being that of symbolism with identity in the realm of thought and language, and the fourth the symbolism with individuality in the realm of feeling. Corresponding to these four provinces are the four institutions: (*a*) State, in which each is for the whole; (*b*) civil society, organized for the benefit of the individual; (*c*) school (college, etc.), for community of culture; (*d*) church, "for individual symbolic activity." The most important of Schleiermacher's writings are: (1) *Discourses on Religion* (Berlin, 1799); (2) *Monologues* (1800); (3) *Confidential Letters on F. Schlegel's Lucinde* (1800); (4–7) *Four Collections of Sermons* (1801–20); (8) *Outlines of a Critique of Previous Systems of Ethics* (1803); (9) *Translation of Plato's Works* (1804–28); (10) *The Christian Faith according to the Principles of the Evangelical Church* (1821–22); (11) *Theological Encyclopædia* (1811). After his death were published (1835) lectures on the history of philosophy, dialectics, psychology, ethics, politics, and pedagogics. The lectures on the life of Jesus, which appeared in 1864, made an epoch when first delivered. According to the authority of Zeller, Schleiermacher is the greatest theologian of the Protestant Church since the period of the Reformation—"a churchman whose liberal ideas will yet prevail in regard to the union of Protestant confessions, the constitution of the Church, and the rights of conscience and individuality in religion"—"a deep-working religious teacher, who formed the heart by the understanding and the understanding by the heart—a philosopher who scattered fruitful seeds, who introduced a new era in the knowledge of Greek philosophy, and who assisted in Germany's political regeneration." He investigated the nature of religion more profoundly than any before him. Physically, he was small of stature, slightly deformed, quick and animated in his movements, his countenance kind and sympathetic. His *Autobiography* (covering only the first twenty-six years of his life) was published in 1851. His *Correspondence with J. C. Gass* appeared the following year in 4 vols. His *Biography* has been written by K. Schwartz, D. Schenkel, W. Dilthey, and others. WILLIAM T. HARRIS.

Schleitz, shlīts: town of Reuss (younger branch), Thuringia, Germany, and residence of the reigning family; 24 miles S. S. W. of Gera, terminus of a branch railroad from Schönberg; elevation, 1,407 feet (see map of German Empire, ref. 5–F). It is well kept, has beautiful streets, tanneries, a foundry, factories of lamps, whips, and lace; also a college and schools for teachers, for deaf mutes, and for wood-carving. Near by is the château of Heinrichsruh. Pop. (1895) 5,094. M. W. H.

Schleswig, shles'vich (i. e. Bay of the Schlei): district and town of the southern part of the Danish peninsula (see map of German Empire, ref. 2–E). The district was a Danish province until 1864, when it was taken by Prussia by conquest and united two years later with Holstein to form the province called Schleswig-Holstein. The town is at the end of a slender arm of the Baltic Sea, which penetrates nearly half-way across the peninsula and is called the Schlei. Schleswig is an ancient town, was known to the Arabian geographers, and by 800 was a place of considerable commercial importance. This continued during the Middle Ages, but eventually the removal of the ducal residence, the rivalry of Lübeck and Kiel, and the silting up of the mouth of the Schlei caused its trade to decline, and it remained only of strategic interest, which, however, was lost as a result of the war of 1864. Southwest from the town are the traces of the Danewerk, a line of intrenchments connecting the Schlei with the Treene, which flows westward and empties into the North Sea. It was thrown up in the ninth century, or earlier, and was intended for the defense of the peninsula. It was used for this purpose for ten centuries, and was repeatedly renewed and strengthened until it was abandoned in 1864 by the Danish army under Gen. de Meza without striking a blow. Pop. of town of Schleswig (1895), 17,255. MARK W. HARRINGTON.

Schleswig-Holstein: province of Prussia; bounded N. by Denmark, S. by the Elbe, which separates it from Hanover, E. by the Baltic, and W. by the North Sea. Area, 7,273 sq. miles. Several islands—Rømö, Sylt, Föhr and others in the North Sea, Alsen and Femern in the Baltic—belong to the province. A slightly elevated ridge stretches through the center of the province, sandy, gravelly, and covered with heath in Schleswig—swampy, marshy, and covered with forests in Holstein. To the E. of this ridge the surface is diversified by hills, and the coast much indented by long, narrow fiords. The soil affords excellent arable land, and forests of oak and beech are numerous. To the W. the surface is perfectly level, and the ground so low that in many places it must be protected against the North Sea by high dikes; but the soil is rich and affords excellent pasturage. The chief occupations are agriculture in the eastern part, and cattle-breeding in the western. Wheat, hops, and fruit are raised in great quantities, and thousands of oxen are annually sold in Hamburg and London. The fisheries in the North Sea are considerable. The province is of great importance to Prussia, partly on account of the harbor of Kiel, the best, if not the only one available for naval purposes, on the coast of Germany, and partly because of the fitness of the inhabitants for maritime occupations. Pop. (1895) 1,286,416. In Schleswig about 150,000 of the inhabitants speak Danish; the Frisian language is spoken in the western districts and on the islands of the North Sea; the rest of the inhabitants speak the Low German dialect. See SCHLESWIG-HOLSTEIN in the Appendix.

Schley, WINFIELD SCOTT: naval officer; b. in Frederick co., Md., Oct. 9, 1839; midshipman Sept. 20, 1856. Was in all the engagements from Mar. 16 to July 9, 1863, which led up to the capture of Port Hudson; Mar. 31, 1884, ordered to command Greely relief ships Thetis, Bear, and Alert, the last having been generously presented for the purpose by the British Government. The Thetis, preceded by the Bear, and followed several days later by the Alert, sailed from New York May 1, and rescued Greely and the remnants of his party at Cape Sabine June 22. Schley was made captain in 1888, commodore in 1898, and rear-admiral in 1899, and served under Sampson in the war with Spain. Author, with Prof. James R. Soley, of *The Rescue of Greely* (New York, 1886).

Schliemann, shlee'măăn, HEINRICH, Ph. D., D. C. L.: archæologist; b. at Neubuckow, Mecklenburg-Schwerin, Germany, Jan. 6, 1822. His enthusiasm for classical antiquity manifested itself at a very early age, and when only ten years of age he wrote a Latin essay on the Trojan war, with the site of which his name was destined to become indissolubly associated. Family misfortunes compelled him to leave the gymnasium, and after a five years' apprenticeship as a grocer's clerk in the village of Fürstenberg he walked to Hamburg, where he embarked as a cabin-boy on a vessel bound for Venezuela (Nov. 28, 1841). The ship was wrecked on the Dutch coast, but Schliemann was saved. He then went to Amsterdam and became an office-boy in a commercial house, where he acquired a knowledge of the principal modern languages. In 1846 his employers sent him as their agent to St. Petersburg. In the following year he founded a firm of his own. In 1850, during a trip to California, he accidentally became a citizen of the U. S., having been present on July 4 of that year, when California was received into the Union. In 1852 he founded a branch establishment at Moscow, and by 1858 had amassed a great fortune. He had acquired a knowledge of Greek in Russia, and after traveling over the European continent and around the world (1864), he settled in Paris, giving himself up entirely to archæological study. He began his excavations in the Troad in Apr., 1870, on the hill of Hissarlik, which he believed to be the site of TROY (*q. v.*). These excavations were continued with intermissions till 1882, and brought to a close by Dr. Dörpfeld in 1892. Schliemann's childlike credulity in the historical reality of the Homeric epic had to a certain extent been vindicated, although many of his inferences regarding details had to be abandoned or modified. These successes were followed up by excavations at Mt. Athos (1878), at Mycenæ (1876–88), Ithaca (1878), Tiryns and Orchomenos (1881 f.). The discoveries at Mycenæ, in particular, were not only of great intrinsic value, but they revolutionized the prevalent ideas of the prehistoric civilization of Hellas, and threw a flood of light upon the rise and development of Greek art. The results of Schliemann's excavations were described in numerous works. His Trojan treasures he presented to Berlin, which honored him with the freedom of the city. He died at Naples, Dec. 26, 1890, and is buried at Athens, near the Ilissos. The best survey of his achievements, together with an admirable biographical sketch, is to be found in Dr. C. Schuchardt's *Schliemann's Excavations, an Archæological and Historical Study* (translated, with an introduction of W. Leaf, by Eugénie Sellers, London, 1891). ALFRED GUDEMAN.

Schlosser, FRIEDRICH CHRISTOPH: historian; b. at Jever, Oldenburg, Nov. 17, 1776; studied theology and philosophy at Göttingen; spent several years as a private tutor in various families and as librarian to the city of Frankfort, and was appointed in 1819 Professor of History at the University of Heidelberg, where he died Sept. 23, 1861. His principal writings are *Geschichte des 18. Jahrhunderts* (1823; often reprinted, and translated into English by Davidson, London, 1843–52); *Weltgeschichte in zusammenhängender Erzählung* (1817–24); *Universalhistorische Uebersicht der Geschichte der alten Welt und ihrer Kultur* (1826–34). Written rather from the ethical than from the scientific point of view, the works of Schlosser have taken a strong hold on the popular mind, and have been especially favored by the middle classes. F. M. COLBY.

Schlözer, AUGUST LUDWIG, von: historical writer; b. at Gaggstedt, Würtemberg, July 5, 1735; studied theology at Wittenberg and Göttingen; lived from 1755 to 1759 at Stockholm as private tutor, and wrote here, in the Swedish language, a history of commerce; went to Russia in 1761 with the Russian court-historiographer, Müller, and was appointed Professor of Political Science in 1764 at Göttingen, where he died Sept. 9, 1809. His principal works are his *Allgemeine nordische Geschichte* (2 vols., 1772) and his translation of Nestor's *Russian Chronicles* (5 vols., 1802–09).

Schlyter, KARL JOHAN: legal writer; b. at Karlskrona, Sweden, Jan. 29, 1795. He became docent in law at the University of Lund 1816, but in 1820 moved to Stockholm, and two years later was chosen, together with H. S. Collin, to bring out a complete critical edition of the ancient laws of Sweden. After visiting the principal libraries of Sweden and Denmark, Schlyter entered upon his work in 1823, which after the death of his colleague in 1833 he performed alone. Some idea of the magnitude of the undertaking may be formed from the statement that about 800 separate MSS. were examined in connection with it, the text of each collection being based upon the oldest codex. The different parts appeared as follows: *Vestgötalagen* (1827); *Östgötalagen* (1830); *Uplandslagen* (1834); *Södermannalagen* (1838); *Vestmannalagen* (1841); *Helsingelagen*, etc. (1844); *Gotlandslagen* (1852); *Visby stadslag* (1853); *Skånelagen* (1859); *Konung Magnus Erikssons landslag* (1862); *idem stadslag* (1863); *Konung Kristoffers landslag* (1869); and finally *Ordbok till samlingen af Sveriges gamlalagar* (1877), not the least valuable portion of the work. D. at Lund, Dec. 26, 1888. D. K. DODGE.

Schmal'kalden, or **Smal'cald**: town; in the province of Hesse-Nassau, Prussia; at the confluence of the Schmalkalde and Stille; 19 miles S. W. of Gotha (see map of German Empire, ref. 5–E). It has salt-works, iron-forges and steel-forges, and manufactures of white lead and paper. The famous league of the German Protestant princes was formed here in 1531. Pop. (1895) 7,888.

Schmauk, shmowk, THEODORE EMANUEL: author; b. at Lancaster, Pa., May 30, 1860; graduated at University of Pennsylvania and the Theological Seminary in Philadelphia; pastor Lebanon, Pa., since 1883; literary editor of *The Lutheran*, Philadelphia, since 1889, and a frequent contributor to *The Sunday-school Times*. His chief work is on *The Negative Criticism* (Lebanon, 1894). H. E. J.

Schmid, shmit, HEINRICH: theologian; b. in Harburg, Bavaria, July 31, 1811; studied at Halle, Berlin, and Erlangen; professor extraordinary at Erlangen 1848; ordinary professor 1854–81. D. in Erlangen, Nov. 17, 1885. His chief distinction was as a successful compiler. He is best known by his *Dogmatik*, a compilation of the definitions of Lutheran dogmaticians of the sixteenth and seventeenth centuries, first published in Erlangen in 1843, sixth edition at Frankfort-on-the-Main in 1876, and translated into English by Hay and Jacobs, first edition, Philadelphia, 1875; second, 1888. He also published *Geschichte der synkretistischen Streitigkeiten* (1846); *Lehrbuch der Dogmengeschichte* (1860; 4th ed. 1887); *Geschichte des Pietismus* (1863); and a *Handbuch der Kirchengeschichte* (2 vols., 1880–81). H. E. JACOBS.

Schmid, JOSEPH: See the Appendix.

Schmid, Leopold: cleric; b. at Zurich, June 9, 1808; studied theology at Tübingen and Munich; became professor in the priest seminary at Limburg 1831, and professor of Theology in 1839 at Giessen. Although a strict adherent of the Roman Catholic Church, his broader and more liberal views, acquired by an extensive study of philosophy, brought him into collision with the ultramontane party. In 1849 his election as Bishop of Mentz was not confirmed by Pope Pius IX., who, however, dared not place his book, *Der Geist des Katholicismus oder Grundlegung der christlichen Irenik* (2 vols., Giessen, 1848–50), in the *Index*. The papal action led him to leave the theological and enter the philosophical faculty at Giessen. His little pamphlet *Ultramontan oder katholisch?* (1867) indicated his renunciation of the Roman Catholic Church. D. at Giessen, Dec. 20, 1869.

Schmidt, shmit, Frederick Augustus: theologian; b. at Leutenberg, Thuringia, Jan. 3, 1837; emigrated to the U. S. in 1841; educated in Concordia College and Seminary, St. Louis, Mo.; pastor Erie co., N. Y., and St. Peter's English church, Baltimore, Md.; entered the service of the Norwegian Synod in 1861; professor at Decorah, Ia., 1862–72; professor in Theological Seminary, St. Louis, Mo., 1872–76, at Madison, Wis., 1876–86, Northfield, Minn., 1886–90, Minneapolis since 1890. Dr. Schmidt was a chief opponent of Dr. Walther in the controversy on the subject of predestination that agitated the Synodical Conference, establishing and editing for this purpose the *Altes und Neues* (1880–85). H. E. Jacobs.

Schmidt, Heinrich Julian: journalist and author; b. at Marienwerder, Prussia, Mar. 17, 1818; studied philology and history at the University of Königsberg; settled in 1847 at Leipzig as editor, afterward in connection with Gustav Freytag as proprietor of the *Grenzboten*, which supported the Prussian interest in Germany; removed in 1861 to Berlin and edited the *Berliner Allgemeine Zeitung* 1861–63; d. in Berlin, Mar. 26, 1886. Author of *Geschichte der Romantik im Zeitalter der Reformation und Revolution* (2 vols., 1850); *Geschichte der deutschen Literatur seit Lessings Tod* (3 vols., 1858); *Geschichte des geistigen Lebens in Deutschland von Leibniz bis auf Lessings Tod* (2 vols., 1860-64); *Bilder aus dem geistigen Leben unserer Zeit* (1870); *Geschichte der deutschen Literatur von Leibniz bis auf unsere Zeit* (1886). He was a much-dreaded critic, hostile to morbid romantic tendencies, and advocated healthy realism in poetry. See G. Freytag's *Erinnerungen aus meinem Leben* (1886). J. G.

Schmidt, Henry Immanuel, S. T. D.: educator; b. at Nazareth, Pa., Dec. 21, 1806, where he was educated, and afterward taught 1826–29; Lutheran pastor, Bergen co., N. J., 1831–33, Boston, Mass., 1836–38, Montgomery co., Pa., 1844; professor at Hartwick Seminary, New York, 1833–36, Pennsylvania College and Theological Seminary, Gettysburg, Pa., 1838–43; principal of Hartwick Seminary 1845–47; Professor of German Language and Literature in Columbia College, New York, 1848–80. D. in New York, Feb. 11, 1889. He published *History of Education* (New York, 1842); *The Lutheran Doctrine of the Lord's Supper* (1852); *Course of Ancient Geography* (1860). H. E. Jacobs.

Schmidt, Johannes: comparative philologist; b. at Prenzlau, Prussia, July 29, 1843; educated at the Marienstifts Gymnasium in Stettin and at the Universities of Bonn and Jena; docent in Comparative Philology at Bonn 1868; assistant professor in Bonn 1873; autumn of same year professor in Graz; since 1876 Professor of Comparative Philology in Berlin; member of the Royal Prussian Academy. Author of *Zur Geschichte des indogerm. Vocalismus* (1871–75); *Die Verwandtschaftsverhältnisse der indogerm. Sprachen* (1872); *Die Pluralbildungen der indogerm. Neutra* (1889); *Die Urheimath der Indogermanen und das europäische Zahlsystem* (1890); also important articles in *Kuhns Zeitschrift für vergleichende Sprachforschung*, of which since 1875 he has been coeditor with E. Kuhn. In scientific acquaintance with the grammatical structure of the Indo-European languages he is unexcelled by any living scholar.

Schmidt, Karl: See the Appendix.

Schmidt-Rimpler, Hermann, M. D.: ophthalmologist; b. in Berlin, Prussia, Dec. 30, 1838; graduated M. D. at the University of Berlin in 1861; was a military surgeon for some years, and after 1871 was brigade-surgeon at the Frederiek William Institute; at that time he was appointed Extraordinary and in 1873 Ordinary Professor of Ophthalmology at the University of Marburg; in 1891 he accepted the same chair at the University of Göttingen. His chief work, *Augenheilkunde und Ophthalmoskopie für Aerzte und Studirende* (Brunswick, 1885), has passed through several editions and has been translated into several European languages. S. T. Armstrong.

Schmucker, Beale Melanchthon, D. D.: clergyman and author; son of Samuel S. Schmucker; b. at Gettysburg, Pa., Aug. 26, 1827; graduated at Pennsylvania College and Theological Seminary, Gettysburg, Pa.; pastor at Martinsburg, Va., 1845–51, Allentown, Pa., 1852–62, Easton 1862–67, Reading 1867–81, Pottstown 1881–88. D. at Pottstown, Oct. 18, 1888. He was especially distinguished as a liturgical scholar and writer, being unexcelled in this department in the U. S. *The Church Book* (1867, 1892) of the General Council and *The Common Service* (1888) of all English-speaking Lutherans owe more to his indefatigable labor and investigations than to any one else. The American edition of the *Hallesche Nachrichten* was edited by him, with Dr. Mann and Dr. Germann, and furnished with exhaustive historical notes. He was secretary of the General Council's committee on foreign missions 1869–88, and secretary of the board of directors of the Theological Seminary, Philadelphia, from its founding in 1864 until his death. H. E. Jacobs.

Schmucker, Samuel Simon, D. D.: theologian; b. at Hagerstown, Md., Feb. 28, 1799; educated at the University of Pennsylvania and Princeton Theological Seminary; pastor at New Market, Va., 1820–26; professor in Theological Seminary, Gettysburg, Pa., 1826–64. D. at Gettysburg, Pa., July 26, 1873. Schmucker represented the American Lutheran type of theology, as he termed it, which was characterized by indifference to the distinctive doctrines of the Lutheran Church. He advocated this tendency in his *Elements of Popular Theology*, first published in 1834; *American Lutheran Church* (1851); *Lutheran Manual* (1855); *Lutheran Symbols, or American Lutheranism Vindicated* (1856); *Church of the Redeemer* (1867), besides in numerous articles in the reviews and church papers. He wrote *The Definite Synodical Platform* (1856), as an American recension of the Augsburg Confession to be adopted by the synods of the General Synod, in which the Lutheran doctrines of original sin and the sacraments were greatly modified. He also labored in the cause of Church union, and was one of the founders in 1846 of the Evangelical Alliance. H. E. J.

Schneider, Johann Gottlob: classical scholar; b. at Collmen, near Wurzen, Saxony, Jan. 18, 1750; began his philological studies at Schulpforta, which he continued at Leipzig, and at Göttingen under Heyne, who recommended him to Brunck at Strassburg to aid the latter in his edition of the Greek poets. Here he added to his classical studies that extensive and thorough acquaintance with anatomy, botany, and zoölogy which gave so great value to his editions of the ancient authors who treat of those subjects. In 1776 he was appointed Professor of Ancient Languages and Eloquence in the University of Frankfort-on-the-Oder. When, in 1811, the university was removed to Breslau, he accompanied it, holding the same office, which he resigned in 1816 on his appointment as chief librarian. Of the many valuable editions published by him may be mentioned: *Scriptores Rei Rusticæ* (4 vols., 1794–95); Vitruvius (3 vols., 1807–08); Aristotle's *Historia de Animalibus* (4 vols., 1812); Works of Theophrastus (5 vols., 1818–21); Ælian, *De naturali animalium*; Nicander's *Alexipharmaca* and *Theriaca*; and Orpheus's *Argonautica*. On his large *Griechisch-Deutsches Wörterbuch* (2 vols., 1797–98; 3d ed., with supplement, 1819–21) Passow based his lexicon. D. at Breslau, Jan. 12, 1822. Revised by A. Gudeman.

Schneider, Karl Ernst Christoph: classical scholar; b. at Wiehe, Prussian Saxony, Nov. 16, 1786; studied theology and philology at the University of Leipzig; in 1816 appointed Professor of Ancient Literature in the University of Breslau; published *De Originibus Tragœdiæ* (1818); edited, with a critical commentary, Plato's *Republic* (3 vols., 1830–33; supplement, 1854); German translation of same (*Platos Staat*), of the *Timæus* (1847), and an edition of Proclus's *Commentarius in Platonis Timæum* (1851); Cæsar's *Commentarii de Bello Gallico* (2 vols., 1840–55), with elaborate commentary; edited a portion of the Plato in Didot's *Bibliotheca Græca* (Paris, 1846–53). D. at Breslau, May 16, 1856. Revised by A. Gudeman.

Schnei'dewin, Friedrich Wilhelm: classical scholar; b. at Helmstedt, Brunswick, June 6, 1810; entered the Uni-

versity of Göttingen 1829; appointed in 1833 teacher in the gymnasium at Brunswick; in 1836 instructor in the University of Göttingen, in 1837 professor extraordinarius, and in 1842 regular professor. His literary activity was very great. He published *Exercitationes Criticæ in Poetas Græcos Minores* (1836); *Delectus Poesis Græcæ* (1838–39); Martial's *Epigrammata*, with critical commentary (2 vols., 1842); Sophocles's *Tragœdiæ* (7 vols., 1849, and frequently re-edited since); Æschylus's *Agamemnon*; Simonides's *Carminum Reliquiæ* (1835); Pindar (2d ed. 1865); Babrius (2d ed. 1865); *Paræmiographi Græci* (2 vols., 1839–51, in conjunction with Leutsch); and founded the *Philologus*, the well-known classical quarterly. D. at Göttingen, Jan. 10, 1856.

Revised by A. GUDEMAN.

Schnetz, JEAN VICTOR: painter; b. at Versailles, France, May 15, 1787; studied painting under David, Regnault, and Gérard, and in Italy; began to exhibit in 1819; was director of the French Academy in Rome 1840–66. D. in Paris, Mar. 17, 1870. His most celebrated pictures are *The Gypsy and Sixtus V.* (1820); *The Sacking of Rome* (1835); *Christ and the Little Children* (1855); *The Capuchin Physician* (1867).

Schnitzer, EDUARD: See EMIN PASHA.

Schnorr von Kar'olsfeld, JULIUS: painter; b. at Leipzig, Germany, Mar. 26, 1794; studied painting under his father, who was a painter himself, in Vienna and Italy; was appointed professor at the Academy of Munich in 1827, and director of the picture gallery at Dresden in 1846. D. at Dresden, May 24, 1872. His principal works are his frescoes in the palace in Munich illustrating the *Nibelungen* and the history of Charlemagne, Barbarossa, and Rudolf of Habsburg, his *Luther at the Diet of Worms*, and *Bibel in Bildern* (a collection of wood-cuts giving the Bible history, 240 plates, with text). His celebrated Nibelungen frescoes are in the Königsbau, a part of the royal palace. His *Luther at the Diet of Worms* has often been reproduced by the engraver's and photographer's arts and spread all over Europe. Revised by RUSSELL STURGIS.

Schodde, GEORGE HENRY, Ph. D.: educator; b. at Allegheny, Pa., Apr. 15, 1854; graduated at Capital University, Columbus, O., 1872; studied theology at Columbus, O., Tübingen, and Leipzig; pastor Canal Winchester and Martha's Ferry, O.; professor in Capital University since 1880. He has published a translation of the *Book of Enoch* from the Ethiopic (Andover, 1882); has been on the editorial staff of *The Lutheran Standard* (Columbus, O.), and is a frequent contributor to *The Bibliotheca Sacra*, *The Independent*, etc.

H. E. J.

Schoelcher, Fr. pron. shō'el'shār', VICTOR: legislator and philanthropist; b. in Paris, July 21, 1804; began early to take an active part in political discussion as a republican; traveled in 1829, 1840, and 1845 in Mexico, the U. S., East and West Indies, Africa, and devoted himself to exposing the conditions of slavery in the works *De l'Esclavage des Noirs et de la Législation coloniale* (1833); *Abolition de l'Esclavage* (1840); *Les Colonies françaises* (1842); *Les Colonies étrangères et Haïti* (1843); *Égypte en 1845* (1846); *L'Histoire de l'Esclavage pendant les deux dernières Années* (2 vols., 1847). He was a member of the Constituent and Legislative Assemblies 1848–51, where he championed the cause of emancipation; during the empire he lived in London, where he published violent attacks against it; also a *Life of Handel* (1857); after the downfall of Napoleon III. he returned to Paris, and represented Martinique in the Legislative Assembly. In 1875 he was chosen senator for life. D. in Paris, Dec. 26, 1893.

Schofield, JOHN MCALLISTER: soldier; b. in Chautauqua co., N. Y., Sept. 29, 1831; graduated at the U. S. Military Academy, and promoted brevet second lieutenant of artillery July 1, 1853; captain May 14, 1861. From 1855 to 1860 he was Assistant Professor of Natural and Experimental Philosophy at West Point, and at the outbreak of the civil war was filling the chair of Physics in Washington University, St. Louis, Mo. Appointed major First Missouri Volunteers Apr. 26, 1861, he served with Gen. Lyon as chief of staff in the operations in Missouri, participating in the battles of Dug Spring and Wilson's Creek. Commissioned brigadier-general of U. S. volunteers and of Missouri militia Nov., 1861, he commanded the State troops and the district of St. Louis, and in Oct., 1862, was placed in command of the Army of the Frontier; promoted to be major-general U. S. volunteers Nov. 29, 1862, he commanded the district and department of Missouri until Jan., 1864, when appointed to command the Army of the Ohio; was in immediate command of the Twenty-third Corps in Sherman's Georgia campaign, participating in the almost constant severe fighting ending with the capture of Atlanta Sept. 2, 1864. In Nov., 1864, he was placed in command of the forces detached from Gen. Sherman's army to strengthen Gen. Thomas at Nashville, being constantly engaged with Hood's army invading Tennessee, and defeated it at the battle of Franklin Nov. 30, 1864; joined Gen. Thomas the next day, and commanded the Twenty-third Corps at the battle of Nashville. For his services at Franklin he was appointed brigadier-general in the regular army. Transferred with his command to North Carolina and placed in command of that department Feb. 9, 1865, he occupied Wilmington Feb. 22, fought the battle of Kinston Mar. 8–10, and joined Gen. Sherman at Goldsboro Mar. 22, 1865. Upon the surrender of Gen. Johnston's army (Apr. 26) he was appointed to execute the terms of the convention; in command of the department of North Carolina until June, 1865. He was on special duty in Europe from 1865 to Aug., 1866; in command of the first military district of Virginia 1866–67; Secretary of War *ad interim* May, 1868–Mar., 1869, when he was promoted to be major-general U. S. army, and assigned to the department of Missouri. In May, 1870, he assumed command of the division of the Pacific; became superintendent of U. S. Military Academy at West Point July, 1876; in command of the military division of the Pacific 1882–83; of division of the Missouri 1883–86; of division of the Atlantic 1886–88: of army 1888. In Feb., 1895, he was appointed lieutenant-general, a rank which expires with him. He was retired for age (64) Sept. 29, 1895. Revised by JAMES MERCUR.

Scholasticism [from Lat. *scholasticismus*, scholasticism, deriv. of *scholasticus* = Gr. σχολαστικός, pertaining to leisure or school, deriv. of σχολή (whence Lat. *schola*), leisure, learning, school]: in a large sense, the science of Christian theology and philosophy as presented in the schools and universities of the Middle Ages, notably those of the thirteenth and subsequent centuries. Strictly speaking, it does not mean a doctrine, nor even a system, but a method, a style, a manner of handling certain truths, which contrasts strongly with their treatment in times previous or posterior to the period in which scholasticism flourished. This method is highly technical, didactic, analytic, implying a severe and exact use of the reasoning faculties. It is strictly syllogistic, and tends to present the doctrines of Christian theology and philosophy in a complete methodical system, in which an even balance and a due proportion shall be everywhere observed. The modern emotional element, the "personal equation," and the individualistic tendency are utterly foreign to the nature of this method, which is constructive, architectonic, unitive in its spirit, and is as tangible an expression of the large unity of the life and ideals of the Middle Ages as their cathedrals, laws, and literatures.

Erroneous Views.—It has been made a reproach to the scholastic period that it examined with excessive subtlety, and was marked by an arid formalism, infinite prolixity of treatment, barbarous technology, etc. The excess of subtlety in the mental investigations of mediæval scholars is not to be laid at the door of their method or their system, whose chief element is the employment of philosophy or trained human reason in the service of religion. It was only in the decay of scholasticism that such refiners of doubt appeared, and even then they awoke the ire of all sensible theologians, to use the words of Melchior Canus. It is not entirely true that all the scholastics are distinguished by cold formalism of style. The style of Abelard and John of Salisbury is easy, familiar, and agreeable. Dante, one of the princes of scholasticism, is the glory of Italian literature, and the preaching of the Middle Ages, the hymns, sequences, and masses, are the products of men formed in the schools, and broken by hard dialectic exercise to exact, clear thought, and a certain power of terse and rugged expression. The scholastic style in St. Thomas and St. Bonaventure has somewhat of the severe charm of the early Gothic, where the lines, proportion, and balance of all alone awake admiration. The masters of mediæval philosophy had a great task—viz., to endow with noble ideals, intelligible, tangible, and familiar, a generation just issued from barbarism, and for this end the categorical exposition of principles and truths was the best means; it was left to future generations and to spontaneous action to present the same in a more charming garb. For them it was enough that they made known to the best of their ability truth, duty, life, nature, man, and God, as they were in themselves and

relatively to one another. It would be unjust to tax them with their shortcomings in history and the natural sciences; those elements of human learning they borrowed from their predecessors, and they were too busy as pioneers of a mighty intellectual movement, as the schoolmasters of the young nations, to devote attention to special and minor departments of the world of knowledge, even if their value were as clear to them as to us. To one of these schoolmen, Vincent of Beauvais, we owe the famous *Speculum*, forerunner of our modern encyclopædias, in which the divisions of human science and their respective claims are justly observed and recognized. Withal, Albert the Great and Roger Bacon recognized fully the bearings of the study of nature, and the great moral poem of Dante is a study in social and political questions of the highest order. The annalists, chronielers, and historians of the time, themselves schoolmen or trained in the schools, show an ever-widening interest in human affairs, much shrewdness, a large extent of observation, and a well-developed political sense. It may also be noted that even in the schools during the latter half of the twelfth and in the thirteenth century the technical and oratorical styles were in a constant struggle for the mastery, a phase of this movement which is well illustrated by the contemporary Alexander of Hales and William of Paris, the former representing the didactic and the latter the larger, more rhetorical manner. A glance at the weighty philosophical problems which constantly attracted the attention of the schoolmen is sufficient to impress a frank, intelligent mind with respect. They were the relations of faith and reason; the nature and means of knowledge; the reality of observations, phenomena, experience; the personality of man; the nature of the universe, immortality, the future life; the rights and duties of the factors of society, the forms and functions of government, etc. And all this, not in a loose, inconsistent, contradictory manner, but with logical coherency, and a consciousness that they were contributing in a systematic way to the creation of a great whole in which faith and reason have each the share that is demanded by the peculiar nature and office of each. The most perfect specimen of this philosophic spirit is St. Thomas Aquinas, and the most admirable of the scholastic works is the *Summa Theologica* of that stupendous genius—"a vast encyclopædia of the moral sciences, in which whatever could be known of God and man and their relations was set down; a monument severely harmonious, magnificent in design, but yet unfinished, like so many other of the great mediæval undertakings." (*Ozanam.*)

Sources of Scholasticism.—Inasmuch as this term implies a rounded and consistent body of doctrines, it sums up all previous knowledge of a higher order, and draws upon all the fountains of human learning then known. In theology the written word of God, the decisions of councils and popes, the writings of the Fathers, Church history, canon law, the liturgy, and popular religious custom and feeling, furnish the materials of the scholastic writings. In philosophy Aristotle, as known to the Middle Ages, with Boethius and the pseudo-Areopagite, form the sources of their logic and metaphysics. The schoolmen accepted without question the teachings of the Church, and proceeded to coordinate them by means chiefly of the Aristotelian method and principles, to illustrate, explain, and defend, to reduce the propositions of theology to formal theses, against which they marshaled all possible objections, which were answered briefly and in order, but not before the theological truth in question had been defined and proved. Thus theology grew under their hands into a perfect science, with the aid of the dialectic method, and all the teachings of the Catholic Church were built up as into a vast edifice, which had its vestibule or preparation in natural theology, its framework in the revealed and defined truths of religion, its roof or completion in their orderly presentation by the schoolmen, and its decoration in the countless services rendered by human reason to the entire process.

The Processes of Scholasticism.—The doctors of the schools wrote usually on two distinct lines. Sometimes they composed independent, original writings, and thus arose their sums of theology, their controverted and so-called quodlibetal questions. Again, they wrote commentaries on some favorite work, like the Bible, the pseudo-Areopagite, Boethius, Peter Lombard, or Aristotle. In either case they usually divided their subject-matter into parts, which were in turn subdivided into questions and articles—the bulk of the doctrine being always given in the latter, and the outlines furnished by the titles or theses placed at the head of each division and subdivision. Each article opened with a series of formal objections, after which the doctrine, theological or philosophical, was stated, and the sufficient grounds for it assigned, whereupon the answers to the objections followed. Clear statement, compressed sentences, close dialectic reasoning, frequent fine distinction, and a sharp insistence upon the point at issue mark these brief treatises of theology, which were as pleasing to the mediæval mind as the dialogue was to that of the Greek. There is in the writings of the best of the schoolmen a magnificent play of reason, which recoils before no difficulty, reminding us often of certain wonderful feats of skill that the contemporary architects successfully attempted. Before them there had been theologians without number, and scarcely a point in theology had been left untouched. But they created the *science* of theology; they impressed the most rational of philosophies into its service; they mapped out all the multiplex relations between God and man, and in all this they preserved a certain free and speculative spirit, with minds turned habitually toward investigation, and, within certain limits, filled with an insatiable curiosity.

History of Scholasticism.—The origins of this method or system are not to be found in a sudden discovery and adaptation of the philosophy of Aristotle; they are as old and deep as those of other great phenomena of the time. The philosophy of Aristotle had been handed down through Boethius, and that of Plato through the pseudo-Areopagite. Ecclesiastical science had found numberless exponents, from Bede and Isidore of Seville down to the meager annalists and collectors of canons in the darkest years of the tenth century. The rational and scientific presentation of theological truths had been happily performed by many writers long previous to the rise of what is known as scholasticism. Usually, however, its history is said to begin with St. Anselm of Canterbury (1033–1109), in whose *Monologium* the outlines of the scholastic dialectic method are distinctly visible. Abelard, William of Champeaux, Roscelin, Peter Lombard, the Blessed Albert the Great, St. Thomas Aquinas, St. Bonaventure, and Duns Scotus mark its progress to the end of the thirteenth century, which was its real apogee, and in which its highest exponents were the Blessed Albert the Great, St. Thomas, and St. Bonaventure. Their theological systems are at once complete and grandiose, and awaken forever the astonishment of dispassionate students, for the keen, searching analysis of details, the regular proportions of the parts, and the successful boldness with which they are fitted together, and resist all antagonizing forces. Other great doctors of this brilliant period were Alanus of Lisle, Alexander of Hales, Henry of Gand, Richard Middleton, Peter of Poitiers, William of Paris, etc. From an early date, however, divergent currents and tendencies, arising from various sources, made themselves visible. Thus the Dominicans and Franciscans represented opposing views in theology and philosophy, and again within each great body there were fresh clefts. The second period of scholasticism covers the fourteenth and fifteenth centuries, and is marked by a tendency on the one hand to free philosophy and the other sciences from their ancillary dependence on theology, and on the other to gather from the latter all possible benefit for the practical, ascetic, spiritual needs of the soul, as opposed to the purely scientific satisfaction of the intellect. Thus the differentiation of the sciences (Roger Bacon, Raymond Lull) and the growth of mystical theology as a specific branch (Master Eckhart, Tauler, Suso, Ruysbroeck, Thomas à Kempis, the "German Theology") divide with theology proper the interest of students in this second age. It was inevitable that the succession of men like St. Thomas and St. Bonaventure should fall upon weaker shoulders, and several other circumstances combined to hasten the decline of the great intellectual movement of the thirteenth century. The Western Schism, the Franciscan controversies, and the political changes drew men's minds more to practical immediate interests, and the cultivation of dogmatic philosophy and theology was neglected for moral and legal questions. It is the age of the moralists and jurists, of the commentators on the law of the Church, and the civil law. Durandus, Occam, Pierre d'Ailly, Gerson, Capreolus, Denys le Chartreux, Gabriel Biel, and Thomas of Strassburg represent this later and weaker stage of scholasticism, previous to the Reformation.

Neo-scholasticism.—As the theology and philosophy of the mediæval schools were not a sudden and foreign importation, but the natural outgrowth of the previous literary movement, so the true Catholic theology and philosophy of

to-day are the legitimate heirs of the best thinkers of the scholastic period, and represent, both in spirit and in method, what was most durable and efficient in the great productions of the schoolmen. The needs of polemic warfare and the external vicissitudes of the schools and universities of the Catholic world brought about deviations, changes, and modifications more or less novel and alien to the old traditions. But during the nineteenth century there has been a steady return to the latter on the part of Catholic theologians and philosophers, culminating in the encyclical letter of Leo XIII., *Pastor Æternus*. This is known as *Neo-scholasticism*—not that it is different from the ancient, but that it takes account of all true and stable modern progress, and combines it with the fundamental and general teachings, and with the spirit, methods, and principles of the old scholasticism, as personified in St. Thomas Aquinas, the "angel of the schools." Its influence is felt daily more and more in all Catholic universities and schools, in textbooks, reviews, and newspapers, and in the great issues of political and social life; and it certainly stands for much in the improvement of the mutual relations between the Church and modern society. There are several academies and reviews, notably at Rome and Louvain, devoted to the work of popularizing this movement, to which Leo XIII. has contributed more, perhaps, than any pope in the last six hundred years, and whose beneficent possibilities are visible in his own personal character, as well as in his religious and politico-social activity.

LITERATURE.—The entire works of the scholastics are not to be had in any complete collection. The most accessible is St. Thomas, whose works can be procured in many cheap and portable editions. Consult in general the histories of philosophy, and in particular Haureau, *Histoire de la Scholastique*; Schneid, *Aristoteles und die Scholastik*; Talamo, *L'Aristotelismo nella Scolastica*; Cousin, *Cours de l'Histoire de la Philosophie*; Stöckl, *Philosophie des Mittelalters*; Denifle, *Die Universitäten des Mittelalters*; Vaughan, *Life of St. Thomas Aquinas*; Ozanam, *Dante et la Philosophie Catholique*; Wetzer and Welte, *Kirchenlexicon*, art. *Scholastik*; Leo XIII. encyclical, *Pastor Æternus* (1879).

J. J. KEANE.

Schöll, MAXIMILIAN SAMSON FRIEDRICH: historical writer; b. at Harskirchen, Hesse-Nassau, May 8, 1766; studied at Strassburg; traveled as tutor with a Livonian family (1788–90) in Italy, France, and Russia; attempted different occupations until in 1814 he received employment in the Prussian diplomatic corps; was employed as secretary at various legations and congresses. D. in Paris, Aug. 6, 1833. His literary activity was very comprehensive; the most remarkable of his works are *Cours d'Histoire* (46 vols., 1830–36); *Archives politiques ou diplomatiques* (3 vols., 1818); *Pièces relatives au Congrès de Vienne* (6 vols., 1816); *Pièces officielles destinées à détromper les Français, etc.* (9 vols., 1814); *Hist. de la Litt. grecque* (8 vols., 1823–25); *Hist. de la Litt. romaine* (4 vols., 1815).

Scholten, skōl'ten, JAN HENDRIK, D. D.: theologian; b. at Vlenter, near Utrecht, Netherlands, Aug. 17, 1811; studied theology and philosophy at the University of Utrecht; appointed Professor of Theology in 1843 at the University of Leyden, and became the founder and leader of a liberal movement in Dutch theology called "the modern theology," which attracted much attention, not only in the Netherlands, but also in Germany and France. It was briefly extreme rationalism. The supernatural was entirely rejected and Christ was considered a mere man. He retired on a pension in 1881, and died at Leyden, Apr. 10, 1885. His principal writings, mostly translated into German and French, are *De leer der hervormde kerk in hare grondbeginselen* (2 vols., 1848–50; 4th ed. 1861); *Geschiedenis der Godsdienst en wijsbegeerte* (1853; 3d ed. 1863); *De vrije wil* (1857); *Het evangelie naar Johannes* (1864); *De oudste getuigenissen aangaande de schriften des Nieuwen Testaments* (1866); *Afscheidsrede bij het neerleggen van het hoogleeraarsambt* (1881, his retiring address, in which he reviews his theological career); *Historisch-critische Bijdragen naar Aanleiding van de nieuwste Hypothese aangaande Jezus en den Paulus der vier Hoofdbrieven* (1882).

Schö'mann, GEORG FRIEDRICH: Greek scholar; b. at Stralsund, Germany, June 28, 1793; professor and librarian at the University of Greifswald from 1823 till his death Mar. 25, 1879. His chief works are *Der attische Process* (2 vols., re-edited by Lipsius, 1887) and the *Griechische Alterthümer* (2 vols.; 3d ed. 1873, translated into English by E. G. Hardy and F. S. Mann, London, 1880, and into French by C. Galuski, 1887), both standard works on the subject; *Die Lehre von den Redetheilen bei den Alten* (1862); and editions of Isaeus; Plutarch's *Agis et Cleomenes*; Cicero, *De natura deorum*; Hesiod's *Theogony*. His minor writings, distinguished no less for their brilliant Latin style than for their intrinsic value, are collected in his *Opuscula* (4 vols., 1871). See Bursian's *Biographisches Jahrbuch*, ii., pp. 7 ff.

ALFRED GUDEMAN.

Schom'berg, FREDERICK HERMANN, Duke of: soldier; b. at Heidelberg, Germany, about 1616; served in the army of the United Provinces, afterward in the French army, where he acquired a great reputation as a strategist and tactician; held important commands in Portugal during the war of liberation, and compelled Spain to recognize the independence of that country under the dynasty of Braganza (1668), for which he was made a grandee and received a handsome pension. He was again in the French service in Catalonia 1675, where he won the grade of marshal; was at Maestricht (1676) and Charleroi (1677); left France on the revocation of the Edict of Nantes 1685; and after rendering his services for a short time to the Elector of Brandenburg was appointed by William, Prince of Orange, his second in command in the expedition to England 1688; was made Duke of Schomberg in the English peerage, Knight of the Garter, and master of the ordnance 1689; received from Parliament a grant of £100,000; took a leading part in the expedition against Ireland, and was killed at the battle of the Boyne, July 12, 1690. His brother and son succeeded to his honors and estates, but the title became extinct in 1719.

F. M. COLBY.

Schom'burgk, Sir ROBERT HERMANN, Ph. D.: traveler; b. at Freiburg-on-the-Unstrut, Prussia, June 5, 1804; resided, engaged in mercantile pursuits, at Leipzig 1823, afterward in Virginia as partner in a tobacco-factory, in which business he experienced pecuniary losses; settled in the island of St. Thomas in the West Indies 1829; devoted himself to botany and natural history; made a scientific examination of Anegada, one of the Virgin islands, 1830, on which he prepared a report which procured him the patronage of the Royal Geographical Society; spent four years in the exploration of British Guiana, where he discovered the great water-lily named by him *Victoria regia*; published a *Description of British Guiana, Geographical and Statistical* (1840), a series of *Views in the Interior of Guiana* (1840), *Researches in Guyana* (1840), and several reports to the Royal Geographical Society, for which he received the gold medal of that body 1839, and which were translated into German by his brother Otto, and published at Berlin with a preface by A. Humboldt (1841); was at the head of the commission for surveying the frontier between British Guiana and Brazil 1841–44; published the *Natural History of the Fishes of Guiana* (2 vols., 1841–43); was knighted 1845; published a *History of Barbadoes* (1847) and *The Discovery of the Empire of Guiana by Sir Walter Raleigh* (1848); was British consul and *chargé d'affaires* in the Dominican Republic 1848–57, and consul-general in Siam 1857–64. D. at Schöneberg, near Berlin, Mar. 11, 1865.—His brother, MORITZ RICHARD, took part in the second exploration of Guiana, of which he published an account in German (3 vols., 1847–48); translated some of the works of Sir Robert into German; went to Australia 1849; and has been since 1865 director of the botanical garden at Adelaide.

Revised by M. W. HARRINGTON.

Schön'bein, CHRISTIAN FRIEDRICH: chemist; b. at Metzingen, Würtemberg, Oct. 18, 1799; studied natural science at Tübingen and Erlangen; was appointed Professor of Chemistry at Basel in 1828; discovered ozone in 1839; invented guncotton in 1845. D. at Baden-Baden, Aug. 29, 1868. His principal works are *Das Verhalten des Eisens zum Sauerstoff* (1837); *Beiträge zur physikalischen Chemie* (1844); *Ueber die Erzeugung des Ozons* (1844); *Ueber die langsame und rasche Verbrennung der Körper in atmosphärischer Luft* (1845). Hagenbach wrote his *Life* (1869).

Revised by IRA REMSEN.

Schön'brunn: an imperial palace situated a few miles from Vienna, on the river Wien, built in 1744 by Maria Theresa. It contains 1,441 rooms, among which are several magnificent state-rooms, and is surrounded with a large park, containing a botanical garden, a menagerie, etc. The palace is generally inhabited by the imperial family during parts of the summer. The Peace of Vienna was signed here Oct. 14, 1809.

Schö'nebeck: town; in the province of Saxony, Prussia: on the Elbe; 9 miles by rail S. of Magdeburg (see map of German Empire, ref. 4–F). It has large salt-works, breweries, and distilleries, and manufactures of powder, chemicals, soap, white lead, and vinegar. Pop. (1895) 14,881.

Schöncfeld, Henry: See the Appendix.

Schön'feld, Edward: astronomer; b. in Hillburghausen, Saxe-Meiningen, Germany, Dec. 22, 1828; became an assistant to Argelander at the University of Bonn, where he took an active part in cataloguing all the stars of the northern hemisphere, down to the ninth magnitude. In 1875 he succeeded Argelander as director of the Bonn Observatory and Professor of Astronomy. In 1869 he received the Watson medal from the National Academy of Sciences in Washington for his work in cataloguing the stars. D. in Bonn, May 1, 1891. S. N.

Schoolcraft, Henry Rowe, LL. D.: ethnologist; b. at Watervliet (now Guilderland), N. Y., Mar. 28, 1793; studied at Union and Middlebury Colleges; devoted himself to a scientific study of the art of glass-making, his father being a manager of extensive glass-works; began the publication at Utica in 1817 of a work on *Vitreology*, which was left incomplete through lack of patronage; made a journey through the mineral regions of Southern Missouri and Arkansas in 1817–18, of which he published an account, *A View of the Lead-mines of Missouri* (New York, 1819); obtained from Secretary Calhoun in 1820 an appointment as geologist to an exploring expedition sent to the upper Mississippi and Lake Superior copper region, and published a *Journal* (1821); was in 1822 appointed Indian agent for the tribes of Lake Superior; was the principal founder of the Michigan Historical Society (1828) and of the Algic Society of Detroit (1831); was at the head of a scientific expedition which in 1832 explored for the first time Lake Itasca and the sources of the Mississippi; negotiated in 1836 a treaty by which the U. S. purchased from the Chippewas a tract of 16,000,000 acres on the upper lakes, after which he became superintendent of Indian affairs for the northern department, and in 1839 chief disbursing agent for the same department; published *Algic Researches* (2 vols., 1839), a collection of Indian tales and legends; removed to New York 1841; issued the prospectus of an *Indian Cyclopædia* (1842), afterward carried into effect in another form; superintended at Washington the publication of a series of reports on all the Indian tribes of the U. S. (6 vols., illustrated. Philadelphia, 1851–57). D. at Washington, D. C., Dec. 10, 1864. Among his numerous publications were a *Narrative of an Expedition to Itasca Lake, the Actual Source of the Mississippi* (1834; reissued in 1853); *Oneota, or Characteristics of the Red Race of America* (New York, 1844); *Notes on the Iroquois* (Albany, 1848); *Personal Memoirs of a Residence of Thirty Years with the Indian Tribes* (Philadelphia, 1851); and *Scenes and Adventures in the Semi-Alpine Regions of the Ozark Mountains* (1853).

School Diseases: See the Appendix.

School Gardens: See the Appendix.

School Hygiene: See the Appendix.

School Laws: See the Appendix.

Schoolmen: those philosophers of the Middle Ages whose labors were directed chiefly to adjusting the relations of the Christian religion to philosophy. See Philosophy (*History of Philosophy*), Nominalists, Realism, and Scholasticism.

Schools: collections of persons brought together and duly organized for the purpose of imparting and receiving instruction. The word school is commonly applied to an organization intended to provide elementary, secondary, or professional instruction, and not to an institution designed to offer exclusively non-professional studies of college or university grade. Thus we have elementary schools, secondary schools, normal schools, trade schools, theological schools, law schools, and medical schools, each group of which is treated below. See also Agricultural College, College, Common Schools, Kindergarten, Manual Training, Military Academies, University, etc.

I. Historical Development of Schools.

The Orient.—In India schools for the instruction of boys have existed from time immemorial. These were held in the open country, under the shade of trees, or, in case of bad weather, under primitive roofs. Exercises were first performed on the sand, then on palm-leaves with a stylus, and finally with ink. Among the Israelites great care was taken to instruct the children, but until the Christian era, so far as is known, such instruction was limited to the family. In the year 64 A. D., however, the high priest Gamala decreed that each town should support a school under pain of excommunication. As given in the Talmud, if the number of children did not exceed 25, the school should be conducted by one teacher; if more than 25 and less than 40, there should be an assistant; if more than 40, there should be two masters. The Talmud describes in detail the duties of the teacher and the obligations of the pupil, showing conclusively that great reliance was placed by the Jews upon the effects of the training effected by the schools. Corporal punishment was tolerated only for children above the age of eleven. "After the age of six receive the child and load him like an ox." "Children should be punished with one hand and caressed with two." In case of disobedience the pupil might be deprived of food and even "struck with a strap of shoe-leather." In China the necessity of the most thorough provision for schools was inculcated by Confucius. The philosophy of the country demanded the most complete knowledge possible of the methods and characteristics of the fathers. To this end the provisions for education were systematic and universal. Huc, the famous missionary and traveler, declares that of all countries it is in China that primary instruction is most widely diffused, and another missionary asserts that "there is not a village so miserable, nor a hamlet so unpretending, as not to be provided with a school." When Japan adopted Chinese civilization, it adopted the Chinese school system, which continued until the opening of the country to European and American influences. In 1872 a law was passed providing for an elementary school for every 600 of the population. This law has been very generally carried out, and the benefits derived from it have been very great. In Egypt intellectual culture reached a very high point, but education was confined almost exclusively to the priestly caste, which guarded jealously all the sources of knowledge. Here, therefore, as in the other contemporaneous nations, schools were only imperfectly developed.

Greece.—The necessity of education in the most comprehensive sense was universally recognized among the Greeks; but schools were private and not subject to governmental supervision. The Athenian lad was put under a pedagogue (a conductor of boys, usually a slave), who took him at an early age to a *palestra* or primary school. Here the boy was taught gymnastics, reading, writing, mythology, and especially music. Homer was universally the boy's reading-book. From the *palestra* the pedagogue took his pupil to the gymnasium or secondary school. Here, as in the *palestra*, special attention was given to music, as a means of inspiring the soul with a love of harmony and order. Grammar and rhetoric were also taught. From the gymnasium the pupils either betook themselves to their several vocations or, in case of special ambitions, continued their studies in the schools of the sophists or under personal private instruction. It was to such pupils that Socrates, Plato, and Aristotle gave instruction. In the *Republic* and the *Laws* of Plato and the *Politics* of Aristotle the Greek ideas of education are set forth. The prevailing thought was the harmonious development of all the powers of the pupil, physical, mental, and moral. In Sparta education was regarded as equally important, but here special stress was placed upon the training of men physically for military duty.

Rome.—With the Romans education manifested two somewhat distinct types. During the republic it inclined to the Spartan, during the empire to the Athenian. Before the second Punic war no provision was made for schools, but education was limited to the care of the family. Under this system a severe family discipline, coupled with the Roman ideals as to the civic and military virtues, succeeded in developing a remarkable race of men. With the introduction of a taste for Greek arts and literature in the third century B. C. the era of severe simplicity gradually gave way to new ideals. Schools of philosophers and rhetoricians came into existence, and the younger children were intrusted, as in Athens, to the care of pedagogues. But even under the empire education was not taken up as an affair of the state; each teacher followed his own method. Varro wrote on grammar, rhetoric, history, and geometry, and his works had much influence for several generations. Of more importance were the *Institutes of Oratory* by Quintilian, who gives a detailed account of the ideal education of an orator from the earliest childhood to manhood.

Middle Ages.—During the period of the invasions the pre-

vailing turbulence made the establishment of schools impossible. Even the Christian Fathers were divided in their opinions as to the influence of a comprehensive education. Tertullian rejected all pagan learning, and St. Augustine, after his conversion, renounced his taste for classical poetry and eloquence. St. Basil, on the other hand, recommended that young Christians become familiar with the orators, poets, and historians of antiquity; and St. Jerome wrote a treatise on the education of girls which has elicited warm commendation. But the ideas of the time were monastic in their nature, and early monasticism was unfavorable to the establishment of schools of any kind. Here and there groups of young Christians, aspiring to the priesthood, gathered around the priest for instruction, but these were scarcely worthy the name of schools. Sidonius Apollinaris, writing in the fifth century, says: "Teachers no longer have pupils, and learning languishes and dies." It was not till the age of Charlemagne that an attempt was made to provide for systematic instruction. This great ruler not only established a kind of itinerant school, which followed the king on his travels, with Alcuin at its head, but he decreed the establishment of schools in various parts of his domain. Nothing gives a more depressing picture of the intellectual feebleness of the time than the description of the methods of instruction contained in Einhard's *Vita Caroli Magni*. (See Guizot, *History of Civilization in France*, lect. xxii.) Thus, notwithstanding the enlightened efforts of Alcuin, who has aptly been called the first minister of education in France, neither the clergy nor the people by their intelligence or their appreciation responded to the efforts that were put forth. No one of Charlemagne's successors took up his thought, and the Council of Aix-la-Chapelle, in 817, decided that no more day-pupils should be admitted to the conventual schools. It was not till the twelfth century that SCHOLASTICISM (*q. v.*), by the introduction of the Aristotelian processes of reasoning, awakened some intellectual activity. But even this was chiefly a mental gymnastic, and gave distorted views of all the affairs and relations of life. The fact that Abelard by the renown of his eloquence could gather about him in Paris thousands of students shows that there was an interest in learning, which, under wise, inspiring, and systematic guidance, might perhaps have accomplished important results. But no such guidance was at hand. It is not till that general awakening called the Renaissance that schools of any considerable importance were established. There were, it is true, ecclesiastical schools for the education of priests, but their methods were crude and their results narrow and distorted. In 1363 choirs and benches were forbidden, because they encouraged pride. The rod was freely used. "Day and night," wrote an abbot to Anselm, "we do not cease to chastise the children, but they grow worse and worse." "In the fifteenth century," says Monteil, in describing the schools, "the rods are twice as long as those in the fourteenth." But it would be erroneous to suppose that the conditions generally prevalent in Europe were universal. On the contrary, after the rise of Mohammedanism in the seventh century, schools were established in all the principal cities in the East as well as in the West. The most celebrated were at Bagdad, Damascus, Cordova, Salamanca, and Toledo. Here grammar, philosophy, chemistry, medicine, and the various branches of mathematics were studied with great success. They gave algebra and trigonometry their modern forms, determined the size of the earth by measuring a degree, made a catalogue of stars, invented the pendulum clock, and discovered alcohol, as well as nitric and sulphuric acids. Their schools were largely attended by the most enterprising and aspiring youth of the other countries of Europe, and their influence was considerable in awakening the thought which led to the Renaissance.

The Revival of Learning.—It is of importance to note that the first general intellectual movement of modern Europe was through the universities. Cambridge, Oxford, Bologna, Salerno, Naples, Paris, Prague, Vienna, and Heidelberg were established before the beginning of the fifteenth century. The moral and intellectual tone of the universities was low, but their influence in behalf of learning soon made itself felt. Students had special halls or colleges in which they lodged and boarded under official superintendence. At first the universities were free associations, but they were soon recognized as elements of power by the Church and the rulers, and soon received special privileges. Before the end of the twelfth century contemporary authorities assert that at the University of Bologna there were 12,000 students and a little later that at Paris there were 20,000. These were grouped into four faculties—those of theology, philosophy, law, and medicine, the classification which is still prevalent in Germany. During this period schools were greatly assisted by the writings of the most enlightened teachers. Besides Abelard (1079–1142), Gerson, chancellor of the University of Paris (1363–1429), Vittorino da Feltre of Padua (1379–1446), and Æneas Silvius, afterward Pope Pius II. (1458–64), contributed greatly to improve the methods and spirit of instruction. In the secondary schools, which were mostly conventual, "the seven liberal arts"—viz., Latin, grammar, dialectics, rhetoric, music, arithmetic, geometry, and astronomy—were regularly, though not very efficiently, taught.

The Reformation.—The great religious upheaval of the sixteenth century was heralded by a number of eminent teachers and patrons of learning. Manuel Chrysoloras collected a vast number of Greek MSS. and introduced them into Italy. Pope Nicholas V. founded the Vatican Library and made Rome the center of learning. Agricola not only transplanted the spirit of letters from Italy to Germany, but gave most valuable advice to those engaged in establishing schools. To the authorities at Antwerp inquiring for a head master, he wrote: "Take neither a theologian nor a rhetorician, but one who knows how to teach, to speak, and to act at the same time. If you know such a man get him at any price." Reuchlin created great enthusiasm for the study of Hebrew, and Erasmus performed a still higher service in behalf of Greek and of polite learning in general. The impulse thus given was carried on by Luther, whose doctrine of justification by faith alone transferred from the Church to the individual the responsibility of saving knowledge. The logical result was a great movement in behalf of the means by which individual knowledge could be increased. Luther not only advocated the establishment of schools everywhere, but he gave important advice in regard to their organization and improvement. His teachings wrought a veritable revolution. He pushed forward the art of giving instruction, and provided for special instruction of the best scholars to fit them for the work of teachers. While he put great stress on the study of theology, and gave a very prominent place to studies in Greek, Latin, and Hebrew, he recommended mathematics and history. He made the support of the schools a charge upon the public treasury, and placed upon the parents the moral obligation to send their children to school. Perhaps the most important of all was the fact that he insisted upon an absolute emancipation from the old spirit of exclusiveness, for it was in this emancipation that the revolution really consisted. The gist of his teachings in this respect was contained in these words: "The monks have imprisoned young men like birds in a cage. It is dangerous to isolate the young. It is necessary, on the contrary, to allow young people to hear, see, and learn all sorts of things, while all the time observing the restraints and the rules of honor." This new spirit became the fundamental idea of education in Germany, and it exerted a vast influence in giving German schools of all grades the pre-eminence they have ever since maintained. These fundamental propositions were given definiteness of form two generations later by the great father of educational organization, Comenius. Michelet calls him "the first evangelist of modern pedagogy—Pestalozzi being the second." His particular service was in giving exactness to different grades of instruction, in defining the most important laws in the art of teaching, in determining how elementary instruction should be conducted, and in applying to all grades of teaching the laws of modern logic. The classification of studies outlined in his different works, of which there were twenty volumes, was essentially the same as that generally adopted at the present day by the best schools of Europe and America. While the work of Comenius was going on in Germany, England, and Sweden, other efforts were put forth in different parts of Europe. In Geneva the ecclesiastical policy of Calvin provided for the establishment of schools and teachers. Melanchthon drew up the "Saxony plan," which was long the basis of organization in many parts of Germany. In Strassburg the school of John Sturm became so famous that it was sought by pupils from all parts of Europe. In all Roman Catholic countries schools were organized in the most thorough manner under the direction of the Jesuits. The foundation of all the Jesuit schools was the study of the classics, but they taught also philosophy, ethics, mathematics, and history. At the beginning

of the eighteenth century the fame of the Jesuits as teachers had become so great that they had been called upon to establish schools in every part of the world. In 1710 they were reported to have 612 colleges, 157 schools for the education of teachers, and twenty-four universities. The system proposed by Loyola in 1588, with the exception of some slight modification made in 1832, has remained unchanged to the present day. Thus far the organization of schools since the Reformation has been largely shaped either by individual teachers or by general religious considerations.

Germany.—From the time of Comenius until the nineteenth century the schools of Germany were multiplied, but there was no very radical change in the plan of organization. In 1715 A. H. Francke founded the first *Pedagogium*, or normal school for the training of teachers, and his organizing and inspiring power was such as to bring together more than 4,000 teachers and pupils in the institutions under his control. Methods were still further improved by Basedow and Rochow, and both Frederick the Great and Maria Theresa gave practical encouragement to the schools by declaring them entitled to the protection and care of the state. Even the eccentric Frederick William I. of Prussia published an edict of compulsory education. But notwithstanding all these efforts, the elementary schools remained in wretched condition throughout the eighteenth century. It was not till after the Napoleonic wars had shattered Prussia (see NAPOLEON I., *Jena Campaign*) that thoroughgoing reform took place. The methods recommended by PESTALOZZI and FROEBEL (*qq. v.*) were then generally applied in the elementary schools, and all grades of instruction were subjected to the most systematic and rigid revision, as well as state control and state superintendence. In a most solemn address to the German people, Frederick William III. recognized the great part that education must play if the nation was to be developed in internal power and splendor. Educational affairs of all grades were intrusted to a department of education, consisting of four of the most eminent professors of Germany, at the head of whom was Wilhelm von Humboldt. Order was soon evolved out of the chaotic conditions that formerly prevailed. After tentative orders in 1811 and 1812, a general statute was promulgated in 1816 constituting the fundamental school law of Prussia. Although this great ordinance was in some of its parts modified by the Prussian Code of 1854, and again by the Falk Laws of 1872, its general characteristics were those which have made the schools of Prussia the most famous in the world during nearly the whole of the nineteenth century. The organization may be briefly described as follows: Schools were classified in four general groups—primary schools, secondary schools, universities, and technical schools. In the fourth class the normal schools were to occupy the place of foremost importance. No teacher was to be employed who had not, after a severe course of pedagogical training, passed a rigid examination, not only in the matter to be taught, but also in the art of giving instruction. Pensions were provided for teachers honorably retired. The hours of instruction for pupils in the lowest grades are twenty-two per week; in the highest, thirty-two. In the elementary and secondary schools the work is strictly prescribed; in the universities there is absolute freedom. By the Falk Law of 1872 the middle school was specially adapted to commercial requirements. In Prussia, which may be regarded as the model, all the schools are under the immediate supervision of thirty-six district boards or committees. The laws compel an attendance of pupils from six to fourteen years of age, and in case of deficiency even a longer time. In Prussia, Saxony, and Bavaria, small fees may be exacted of each pupil, but in the other states elementary instruction is free. In all the German states the laws requiring compulsory attendance are enforced with rigor, and consequently the percentage of illiteracy is everywhere very small. The proportion of pupils who advance to the higher grades is very large. In Berlin, during the decade from 1881 to 1891, of the average of about 160,000 scholars in the public schools, about 9,000 were in the gymnasia, about 5,600 in the realschools of the first class, about 10,000 in the various trade and technical schools, and about 133,000 in the common schools. In Saxony, of 600,000 pupils, more than 11,000 were in schools of gymnasium grade. In all the states of Germany trade schools (see below) and schools of agriculture (see AGRICULTURAL COLLEGE) occupy a prominent place, and are generously supported.

France.—Before the Revolution the schools of France were for the most part under the direct or indirect control of the clergy. Napoleon saw the necessity of thorough and comprehensive reorganization. His method (see *Reforms during the Consulate* under NAPOLEON I.) was not fortunate. The organization of an educational hierarchy with the university at Paris as its head proved to be so unwieldy that the primary and secondary schools never acquired life or efficiency. While the Germans were demonstrating the success of local boards of control acting under a wisely framed general law, the French, on the contrary, were showing the inherent weakness of a system that took all power out of the hands of those who were most interested in success. The war of 1870 proved even to the French themselves the superiority of the German system. The law of 1881 provided for a thorough reorganization. The schools were classed under the terms superior, secondary, and primary, and all were placed under the supervision of a Minister of Instruction. Professors in the universities are paid by the state, as are also in part those of the *lycées*. The *collèges* are supported by departments or municipalities, with occasional endowment of chairs by the Government. The normal schools are mainly supported by the central Government, the primary schools mainly by local taxation; but in case of necessity a "supplementary subsidy" is furnished by the general Government for the better payment of teachers. In all the public schools primary education is gratuitous. Of the 4,520,928 children in school in 1891, 3,453,071 were in public schools, and 1,067,857 in schools under private management, but subject to governmental inspection. The system of technical and trade schools is very elaborate, and extends to nearly every vocation. Since 1881 the system of schools of all grades has been made one of the most thorough in Europe, though the French methods of instruction have not yet become equal to those of Germany.

Great Britain.—The schools of Great Britain have had a peculiar history. Before the Reformation there were few schools except those connected with monasteries and cathedrals. At the beginning of the sixteenth century sixteen grammar schools had been founded, and this number was increased by as many more during the reign of Henry VII., by 63 during the reign of Henry VIII., by 138 in the time of Elizabeth, and by 142 in the reign of the Stuarts. These schools, established under private endowments, were not subject to general governmental control. In the eighteenth century a considerable number of charity schools were founded, largely for the purpose of giving religious instruction. While the charity schools were open to both boys and girls, the grammar schools were open to boys alone. The wretched condition of the English schools in the eighteenth century is amply revealed by the writings of Joseph Lancaster and Andrew Bell. In 1808 the Royal Lancastrian Society and in 1811 the British and Foreign School Society were organized, but they accomplished little except to demonstrate the need of governmental assistance. In 1816 a select committee on the condition of schools was appointed, with Henry Brougham at its head; but its achievements were mostly limited to the dissemination of knowledge. It was not till 1832 that Parliament made its first appropriation of £20,000 for the erection of school-buildings. In 1835 and 1838 committees of inquiry were appointed, and in 1839 a committee of the privy council on education was established. The first fruits of this committee were the establishment of model schools and the appointment of inspectors of all aided schools. The system thus entered upon was rapidly developed, and in 1858, when the annual grants amounted to £830,000, a member of the privy council was raised virtually to the position of minister of education. The result was a revised code in 1862, which swept away many of the worst features and made the distribution of funds depend on the efficiency and standing of individual schools. In 1867 the royal commissioners reported that of 3,000 endowed schools, 782 had been designated in the articles of endowment as grammar schools and the others as charity schools. This law was violently opposed as too radical, but it was followed by the much more radical Education Acts of 1870 and 1871, with which the name of the Right Hon. William E. Forster is inseparably connected.

These memorable acts, which may be regarded as the corner-stone of the present English system of elementary education, may be summarized under the following heads: (1) That either by voluntary organization and effort, or by the compulsory establishment of school boards, the supply of elementary schools should be made sufficient for all the school districts in the kingdom. (2) That every such ele-

mentary school should be taught by properly qualified teachers, should conform to the general school laws, and should be subject to official inspection. (3) That in all public elementary schools whatever religious instruction is given shall be either at the beginning or at the end of school hours, so that the secular instruction may be uninterrupted. (4) That a time-table setting forth the hours at which instruction is to be given in each subject shall be displayed in every schoolroom. (5) That in schools managed by public school boards no catechism or other denominational creed shall be taught. (6) That the governmental inspectors are to inspect and report on all the schools receiving governmental aid.

Some of the most eminent of English men of letters have occupied the position of inspector, and their reports are of great educational value.

In the period of the Reformation John Knox advocated for Scotland a school for every parish, a college in every notable town, and the establishment of three universities. The outcome of the movement then begun was a school law in 1696 which, with those soon following it, was the basis of the system of parish schools that prevailed in Scotland until the law of 1870–71 was applied to Scotland in 1872. The parish schools were generally taught by scholarly men, and were among the most efficient schools in the kingdom, taking the pupils from the most elementary studies through those neeessary for admission to the university. In 1872 the parish schools became board schools, and subject to inspection as such.

In the other states of Europe the methods of Germany, France, and Great Britain have generally prevailed, with more or less important modifications.

The United States.—Edueation in the U. S. had its beginnings in New England. Harvard College was founded in 1636, and in 1647 a school law was enacted by Massachusetts which provided for the systematie establishment of primary and secondary schools. This earliest example of providing for education at public expense was soon imitated in other colonies. The Huguenots, the Dutch, the Cavaliers, as well as the Puritans, eaeh in their own way, made provisions for the education of their children. The first public school was established in New Amsterdam in 1633, the second in 1652. During the colonial period schools were everywhere developed by the individual colonies, and accordingly, when the Federal Constitution came to be adopted in 1789, the care of educational affairs was retained by the individual State governments. Massachusetts, in its constitution of 1780, proclaimed it as the "duty of magistrates and legislators to cherish the interests of public schools, grammar schools, colleges, and universities," and the example thus set, even before the adoption of the Federal Constitution, was very generally imitated by other States. When in 1787 the ordinance for the organization of the Northwest was adopted it contained the injunction, "Religion, morality, and knowledge being neeessary to good government and the happiness of mankind, schools and the means of education shall forever be encouraged." Though the general Government under the Constitution is not charged with the eare of education, Congress has uniformly been actuated by the spirit embodied in this declaration. In 1787 provision was made for giving each State the sixteenth section (1 sq. mile) of every township for common-school purposes, and two townships (72 sq. miles) for the purposes of a university. By an act in 1841 sixteen of the newer States received each 500,000 acres of land for education; and in 1848 the thirty-sixth seetion was added to the sixteenth for common schools. In 1849, 1850, and 1860 large tracts of the public domains, known as swamp-lands, amounting to 62,428,413 acres, were given to Alabama, Arkansas, California, Florida, Illinois, Indiana, Iowa, Louisiana, Miehigan, Minnesota, Mississippi, Missouri, Ohio, and Wisconsin. In 1862 Congress gave to each State 30,000 acres for each of its members of Congress for the purpose of promoting industrial education, and supplementary aets were passed in 1889 and 1890. The amount of land given by Congress for educational purposes has amounted to about 150,000,000 aeres.

While Congress has thus encouraged education with a lavish hand, the details of edueational organization and method have been provided for by the individual States. Each has its own method, though there is general similarity. In New York a board of regents was established in 1784 to have general superintendence of the educational interests of the State, but until the adoption of the eonstitution of 1894 the efficiency of the board was crippled in various ways. In most of the States there is a superintendent of public instruction, whose duties are more or less comprehensive, as defined by constitutional or legislative provisions. In all the States a tax is levied for the support of the elementary schools. In some of the States a portion of the fund so received goes to the free high schools, but in all cases it is distributed in proportion either to the number of pupils in attendance, or to the number securing promotion.

The following table furnishes the most important statistics of public, private, and parochial schools in 1890:

SCHOOL STATISTICS IN THE UNITED STATES AND TERRITORIES, AS SHOWN BY THE CENSUS OF 1890.

STATES AND TERRITORIES GEOGRAPHICALLY GROUPED.	Number of pupils in public schools.	Number of pupils in private schools.	Number of pupils in parochial schools.	Per cent. of enrollment to population in 1890.	Per cent. of enrollment to population in 1880.
The United States	12,728,439	750,942	737,182	20·22	19·84
North Atlantic Division	3,078,829	195,683	272,890	17·57	20·33
Maine	140,650	6,521	4,015	21·13	23·24
New Hampshire	59,947	4,134	5,919	15·89	18·64
Vermont	66,720	4,168	3,071	19·74	22·04
Massachusetts	373,087	28,183	38,240	16·59	17·76
Rhode Island	52,974	3,959	6,995	15·27	15·37
Connecticut	127,303	8,746	15,380	16·95	19·04
New York	1,049,952	76,242	109,522	17·38	20·22
New Jersey	234,964	15,831	27,827	16·20	18·14
Pennsylvania	973,232	47,899	61,921	18·36	22·19
South Atlantic Division	1,758,384	151,547	27,534	19·77	16·31
Delaware	31,434	1,126	1,711	18·66	18·02
Maryland	185,058	12,591	14,288	17·68	16·04
District of Columbia	36,906	5,503	3,252	16·02	14·88
Virginia	343,970	17,318	2,240	20·67	14·59
West Virginia	194,356	3,518	1,519	25·34	23·25
North Carolina	326,895	39,117	1,539	20·14	18·32
South Carolina	203,980	18,796	658	17·67	13·74
Georgia	344,062	49,209	934	18·64	15·38
Florida	91,723	4,369	1,393	23·30	16·07
North Central Division	5,022,284	180,258	383,587	22·35	23·55
Ohio	798,093	39,264	60,552	21·71	23·53
Indiana	509,355	17,911	26,307	23·14	25·89
Illinois	781,004	29,555	81,638	20·34	22·87
Michigan	430,665	11,057	37,328	20·39	22·14
Wisconsin	354,675	7,904	65,043	20·85	22·77
Minnesota	284,368	7,513	33,266	21·65	23·89
Iowa	494,957	20,188	23,099	25·80	26·20
Missouri	623,071	27,740	33,622	23·15	22·41
North Dakota	35,694	599	1,803	19·45	10·15
South Dakota	67,492	1,432	2,179	20·12	10·15
Nebraska	241,446	5,518	9,567	22·69	22·30
Kansas	401,464	11,577	9,183	27·98	24·71
South Central Division	2,349,616	172,649	36,667	21·34	15·41
Kentucky	408,208	27,301	13,258	21·93	17·74
Tennessee	456,242	47,342	2,391	25·78	28·90
Alabama	306,350	20,295	1,150	20·92	14·86
Mississippi	351,919	21,927	2,237	27·19	20·95
Louisiana	125,159	18,040	10,339	11·12	8·62
Texas	477,320	25,404	5,120	21·31	11·07
Oklahoma	579	1,203	.....	10·85	.....
Arkansas	223,839	11,137	2,172	19·77	13·49
Western Division	519,326	50,805	16,504	17·01	16·92
Montana	16,980	1,119	384	12·85	11·92
Wyoming	7,134	140	191	11·62	13·98
Colorado	66,173	4,735	2,493	15·89	14·54
New Mexico	18,249	4,413	571	11·86	3·98
Arizona	7,861	469	518	13·13	10·42
Utah	36,730	10,214	666	17·49	17·92
Nevada	7,524	131	325	16·14	14·32
Idaho	14,331	1,104	.....	16·96	17·89
Alaska	903	730	.....	.....	.....
Washington	55,705	3,457	914	15·87	19·68
Oregon	63,987	4,073	616	20·19	21·42
California	223,749	20,220	9,826	18·36	18·67

The most noteworthy feature of the above table is the fact that in all the older States the percentage of attendance in 1890 was considerably less than it had been in 1880. While in the older States of the East and North this tendeney seems generally manifest, in the South, on the other hand, there has been a marked improvement.

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aux États-Unis; Arnold, *Higher Schools and Universities in Germany*; Painter, *History of Education*; Boone, *Education in the United States*; Klem, *European Schools*; Quick, *Educational Reformers*; Barnard, *Superior Instruction in Different Countries*; Grant, *History of the Burgh Schools of Scotland*; Arnold, *Reports on Elementary Schools*; Arnold, *Middle-class Education and the State*, to which is added *Schools and Universities in France*; Hoyt, *Education in Europe and America*. C. K. Adams.

II. Primary Schools.

This term is here applied to those schools which are planned to furnish the elementary education necessary for citizenship and for the ordinary duties of life. Such schools are now almost universally supported by the state. In point of time, they occupy the children from about the sixth to the fourteenth year, or during the first eight years of a course of study, the kindergarten not being included. Where schools are graded this period is frequently divided in the U. S. into primary, intermediate, and grammar departments. The obligation of the state to provide instruction for all its children is a modern conception. In ante-Christian society education was largely a state concern, but it was confined exclusively to the more wealthy classes. From the time of Christ practically to the beginning of the nineteenth century, all elementary education was controlled by the Church. Occasionally the state intervened when a ruler more enlightened than his fellows took some step in advance. But the great achievements in this field have all been accomplished in the nineteenth century.

In Great Britain.—Until well into the nineteenth century primary or elementary education in England was practically left entirely to the care of the clergy of the Established Church. Parliament in 1832 for the first time voted money to aid in the building of schools. In 1846 money was first given for increasing the salaries of teachers; in 1853 grants began to be made according to the number of pupils in attendance; while in 1862 these grants were made to depend on the successful passing of examinations. The Elementary Education Act of 1870 as subsequently amended regulates elementary education in England and Wales, while the act of 1872 extended the system to Scotland. The central authority is a committee of council on education, the acting chief being the vice-president, who is a member of the cabinet. The local administrative unit is the district, to form which boroughs and parishes are grouped together. Each district has a school board, which may compel parents to send their children to school. Under this law, sufficient school accommodations must be provided in every district for all children between the ages of five and fourteen. The obligatory subjects of instruction are reading, writing, arithmetic, drawing for boys, and needlework for girls. Optional subjects are singing, geography, sciences, algebra, modern languages, cookery, and some others. Religious instruction is given. There are seven grades, and each pupil should pass one grade each year. After passing the fourth grade, the children may, if twelve years of age, leave school. This education became practically free only in 1891. The system of paying for results, or, in other words, giving grants in proportion to the number of examinations passed, still prevails, and with all its faults seems to have a strong hold. The schools are local or denominational institutions. The state aids them, but does not manage them. The managers of any schools may cut loose from the governmental connection at any time, the state's rights to supervision being based solely on its contributions to financial resources. The business of inspectors is solely to ascertain and report on the efficiency of the schools. Probably in no country is there so large local independence and power to adapt the school to the needs of the country as in Great Britain.

The schools of Scotland have long been famous. Here from 1695 to 1872 elementary education was regulated by the act of James VI., which ordained that every parish should have a school supported by revenues derived from the land, the teachers being appointed by the heritors and the presbytery of the Established Church. By the Elementary Education Act of 1872 the Scotch education department was instituted, and each borough and parish, or group of parishes, was required to have a school board to administer both elementary and secondary education and to enforce the attendance of children from five to fourteen years of age. In Ireland, since 1845, elementary education has been under the superintendence of the commissioners of national education in Ireland. Of these national schools there were in 1893 8,459, having on their rolls 832,545 of the 939,694 children of school age.

In Germany.—The school laws of Prussia are, with slight modifications, the standard in all the German states. Thorough organization of the school system dates from the prostration of Prussia after her crushing defeat by Napoleon. The reform in education undertaken under the leadership of von Humboldt began first with the university, then extended to the secondary schools, and presently primary schools felt the same impulse. Since 1816 Prussian common schools have been usually considered the best in the world. The attendance on the schools is compulsory. The law of 1888 provided for making instruction free. About 18 per cent. of the cost of the schools is borne by the state and the rest by the community. The minister of ecclesiastical, educational, and medical affairs, a member of the cabinet, is the head of all the educational institutions of the kingdom. The course of study is prescribed in general outlines by the central Government, and the appointment of teachers must be approved by the Government. The course of study in the elementary schools includes religion, reading, writing, arithmetic, geography, singing, drawing, natural history, and history of man. Needlework and household economy is taught to the girls. Instruction in natural history, natural science, and history of man is entirely oral. Physical exercises are prescribed, and every school is provided with suitable apparatus. Industrial education for girls consists of knitting, crocheting, embroidering, sewing, darning, cutting, fitting, and patching, and is found in every school. The study of arithmetic is less extensive than in the U. S. Vocal music is continued through the entire course. The school hours are usually six a day. Schoolrooms are apt to be small and overcrowded. The school year consists of forty-five weeks, with six or seven weeks of vacation. Legal holidays are more frequent than in the U. S. Lessons usually last from forty to fifty minutes. Examinations are comparatively rare, are usually oral, and are conducted in the presence of parents and friends. In Germany, students who are to take a secondary course, as a rule leave the common schools and enter the secondary schools at the age of nine or ten.

In France.—The educational reorganization of France dates from the Franco-German war. School management is completely centralized. This was done originally by Napoleon in constituting the University of France. Since 1850 the central school organization has not been officially called university, though in common usage it still is. Previous to 1870 only one important effort had been made looking toward the education of the people. This was the passage in 1833 of Guizot's laws which imposed upon the commune the obligation of establishing primary schools. The law was not well executed. Jules Simon declared that it was the German schoolmaster that conquered at Sedan. As in Prussia after Jena, so in France in 1871 it began to be felt that the school was to be the instrument of national regeneration. The law of 1878 created a fund of 23,000,000 francs for the purpose of establishing necessary schoolhouses. The law of June 16, 1881, made instruction obligatory, that of Mar. 28, 1882, made it gratuitous, and that of Oct. 30, 1886, reorganized education, and declared that within a certain period all public schools should be under the charge of laymen. In 1857 France devoted to primary instruction the sum of 16,523,969 francs; in 1891, 173,372,524 francs; and in no modern country has the advancement in educational lines been so great and so rapid. The course of study for primary schools prescribed by the law of Mar., 1882, comprises moral and civic instruction, reading, writing, the elements of arithmetic and the metric system, history and geography, especially of France, object-lessons and the first notions of science, elements of design, of singing, manual work, needlework in the school for girls, gymnastic exercises, and in the school for boys military training. In the superior primary schools this course is much extended.

In the United States.—The school organization of the U. S. shows a general adherence to a certain type, with infinite variety in details. The great local differences work more to the disadvantage of the pupil than they would in Europe, since the people of the U. S. are proverbially migratory, and change of schools, with consequent loss of time, is very common. The success of primary schools is determined by (*a*) the intensity of public interest, (*b*) the thoroughness and comprehensiveness of organization and supervision, and (*c*) the aptitude and training of teachers. There is a general disposition on the part of the people to appro-

priate money freely for the support of the common schools. The instruction is everywhere gratuitous, the teachers are laymen or women, and progress is making in the direction of compulsory attendance; more or less satisfactory laws of this character already exist in over half the States and Territories, the most common age for required attendance being from eight to fourteen. Fairly successful efforts have been put forth, especially in the West, to introduce science teaching in the elementary schools. Opportunities for professional training for teachers are still sadly inadequate. Supervisory and administrative offices are political in their nature, making frequent change inevitable in most localities. There are also, as a rule, too few supervisory officers. Many experienced observers are of the opinion that the children in the schools of the U. S. are in attainments behind those of the same age in the leading countries of Europe. A comparison of the school work in Great Britain, France, and Germany, as given above, with the system in the U. S. will show where lie the differences. As the general government has no control over the schools, the U. S. Bureau of Education being charged solely with the function of collecting and disseminating information, the school system of each State must be studied by itself. The differences that appear in such a study are very great.

C. H. THURBER.

III. SECONDARY SCHOOLS.

Scope.—In the U. S., what is known as secondary instruction technically means the ninth to the twelfth years of the course of study, inclusive, or from about the fourteenth to the eighteenth years of life. The classification into primary, secondary, and higher education has been distinctly recognized only in the nineteenth century, but as early as 500 B. C. the Greeks had divisions in the education of their youth which corresponded fairly well to the three classes of modern times. As a term of general application, then, secondary education covers the intermediate of the three periods in the complete educational plan. In the countries of the Old World its range has been fixed with tolerable definiteness, but in the U. S. the limits both of higher and of primary education are constantly shifting, thus making the secondary sphere rather indeterminate. The U. S. Bureau of Education has selected from the forty or more studies taught in different secondary schools in the U. S. the following as typical secondary-school studies: Latin, Greek, French, German, algebra, geometry, trigonometry, physics, chemistry, history (other than U. S.), rhetoric, English literature, and geology.

In Germany.—With the exception of Great Britain, and to a less extent France, all the European countries have modeled their course largely after the German pattern. The typical German institution of secondary education is the gymnasium. This name came into use as early as the sixteenth century, and in 1812 a ministerial decree ordered that all learned school institutions, such as the lyceum, pedagogium, collegium, Latin schools, etc., should henceforth be called by that name. It has properly six classes, counted upward from the sixth, the lowest, and called sexta, quinta, quarta, tertia, secunda, and prima. In each of the three lower classes the course is one year; in each of the three upper it is two years, making the entire course nine years. There are two terms, or semesters, and generally two corresponding sections in each class, one section comprising the scholars who enter at Easter, and the other those who enter at Michaelmas. The class-system, as opposed to the system of instruction in each subject by specialists (*Fachlehrer*), prevails generally. The course is thorough, and the attainments of the students at graduation correspond in a general way to the attainments of American students at the beginning of the junior year in the best colleges. In 1892 a new programme was adopted for these schools, which is here given:

PROGRAMME OF GERMAN GYMNASIUM.

SUBJECTS.	VI.	V.	IV.	IIIB.	IIIA.	IIB.	IIA.	IB.	IA.	Total.
1. Religious instruction	3	2	2	2	2	2	2	2	2	19
2. German	4	3	3	2	2	3	3	3	3	26
3. Latin	8	8	7	7	7	7	6	6	6	62
4. Greek	..	..	..	6	6	6	6	6	6	36
5. French	..	..	4	3	3	3	2	2	2	19
6. English	..	..	..	..	..	..	2	2	2	6
7. History	2	2	2	2	2	2	3	3	3	26
8. Geography			2	1	1	1				
9. Mathematics	4	4	4	3	3	4	4	4	4	34
10. Natural history	2	2	2	2	..	..	..	..	..	8
11. Physics	..	..	..	..	2	2	2	2	2	10
Totals	23	21	26	28	28	30	30	30	30	246

Attention is called to the provision for religious instruction in Germany, and to the great number of periods—thirty in the upper classes—required of students. Side by side with the gymnasium exist the realgymnasium and realschool, the former having Latin and no Greek, and the latter neither Greek nor Latin. These three institutions correspond in plan and purpose fairly well to the classical, Latin-scientific, and English courses which are found in the U. S. side by side in the same high school. The way to any high position in the army, in the Government service, and in all professional lines in Prussia is through some one of the higher schools. The right to one year voluntary military service, instead of the three years required of the uneducated, is one which belongs to every German youth who completes six years of the course in any one of the three higher schools. Graduates of the gymnasium are admitted to the universities, and to the study of any of the learned professions, as well as to the practice of teaching in all its branches. Graduates of the realgymnasium are excluded from the learned professions, and may study only with the philosophical faculty of the university, and may become teachers only in mathematics and modern languages, and are then eligible for positions only in realschools. The realschools qualify for admission to the technical high schools. Teachers in the gymnasium must be graduates of a gymnasium, who have attended a university three years, passed a severe Government examination, and taught then on trial for two years. There is an ascending salary-scale for length of service. At the age of sixty-five, teachers are entitled to a pension.

In France.—In France the system of education has been entirely reorganized since the disasters of 1870–71. Secondary education is cared for by the *lycées* and communal colleges. Of these the representative establishments are the *lycées.* Pupils enter at eight years of age, and are expected to spend a year in each class, completing their course at eighteen. The discipline is rigid and rather mechanical. Both communal colleges and *lycées* have boarding-departments. The scope of the instruction given is not materially different from the German standard.

In Great Britain.—In Great Britain there is no secondary education at the expense of the state, and for the great mass of children who go through the elementary schools there is no further opportunity, except in the numerous grammar schools and academies, both endowed and private, which are found there, but over which the Government has no direct control. The great public schools of England correspond to the best and most expensive private endowed schools in the U. S. All are boarding-schools, with their own traditions and customs. Nine of these schools have been distinguished by special commission as particularly the public schools, although there are forty or more. Two of these nine are day schools. The others, which are incontestably public schools, are, with the dates of their foundation—Winchester, 1387; Eton, 1440; Shrewsbury, 1551; Westminster, 1560; Rugby, 1567; Harrow, 1571; Charterhouse, 1609. These schools are for the most part well endowed. Eton, for example, has an annual income of some £30,000.

In the United States.—The earliest representative of the secondary schools in the U. S. was the academy, which flourished in New England and New York. At the close of the eighteenth century New York had nineteen of these schools and Massachusetts about an equal number. They were to be found in almost every State, and were the characteristic educational agency of the period. Their course, not planned solely with reference to preparing for college, was frequently followed by a college education, but more often not. Of these schools the Boston Latin School, founded in 1635, was the earliest. Other notable ones are the Hopkins Grammar Schools at Hartford and New Haven, Conn., 1657; Germantown Academy, Germantown, Pa., 1760; Dummer School, Byfield, Mass., 1763; Phillips Academy, Andover, Mass., 1778; Phillips, Exeter, N. H., 1781; and Flatbush Academy, New York, 1787. There soon developed two distinct types of secondary schools—public high schools and the private endowed schools or academies. The public high schools seem to have succeeded in large measure to the work of the old New England academies, which sought not so much to train for college as to give the best possible education for life to those who came within their influence. The academies which sprang up in connection with the early colleges as preparatory departments to the same have, in the Eastern States at least, nearly disappeared and been succeeded by the private endowed schools, which aim mainly to fit their

pupils for the different colleges, though they are managed in entire independence of these colleges. In Massachusetts, as early as 1797, the academies were virtually incorporated into the system of public schools by receiving endowments of land from the State. In 1834, by an act of the New York Legislature, the regents of the university were required to apply the surplus income of the literature fund beyond the sum of $12,000 to the education of common-school teachers by distributing it to such academies as should undertake their instruction. Philadelphia organized a high school in 1837, the first of the kind in the U. S. outside of Massachusetts. Baltimore followed in 1839, Cincinnati in 1850, Chicago in 1856. The New York Free Academy was organized in 1849. Courses of study in the different high schools vary, as the schools themselves are subject to local influences. Private endowed schools also have different courses shaped mainly by the influence of the college to which the majority of their graduates are sent. Most public high schools receive and educate both sexes in the same class-rooms and under the same teachers. In a very few of the larger cities there are separate high schools for girls and boys. The following statistics on secondary education in the U. S. as to students and teachers in public high schools and private academies are taken from the report of the commissioner of education for 1890–91:

PUPILS, ETC.	Public high schools.	Private academies.	Total.
Students	211,000	99,000	310,000
Preparing for college	25,058	20,907	45,965
Sex—male	85,000	51,000	136,000
female	126,000	48,000	174,000
Teachers *	8,270	6,231	14,501
Male	3,745	3,041	6,786
Female	4,525	3,190	7,715

* Incomplete; there are probably at least 20,000 teachers in secondary schools in the U. S.

The constitutions of at least twenty-two States specify high schools as the object of legislative and general interest. The newer States universally recognize the high schools as part of the State system of education. In the East, Massachusetts has gone so far as to compel the offering of high-school advantages to all her children. As high schools can not be established within easy reach of every one, the State pays for carrying children from sparsely settled districts to the nearest village or city high school. The public high schools are relatively best and strongest in the Western States; the private and endowed academies in the Eastern States. The question of introducing military drill and tactics in public schools is beginning to be agitated. In most high schools participation in military drill is yet optional.

Provisions for the preparation of secondary teachers are meager as compared with such provisions in the foremost European countries. The best secondary teachers are college graduates, who, however, rarely have been able to obtain any special professional training. Colleges and universities are beginning to establish chairs in pedagogy to supply this professional training in some measure. A unique contrivance to meet a special want is the summer school for teachers, a feature in many leading universities. These schools are attended largely by secondary teachers, who find opportunity not only for studying their own specialties, but also in most cases for taking work in psychology and pedagogy.

No account of secondary schools would be complete without mention of the work of the committee on secondary-school studies appointed by the National Educational Association July 9, 1892. This committee consisted of ten prominent educators. It appointed nine sub-committees or conferences, each numbering ten, on the various subjects comprising the secondary curriculum. These sub-committees met in Dec., 1892, and prepared elaborate reports, which were transmitted to the central committee as material for their work. The report of the main committee, with the reports of the conferences as an appendix, was published by the U. S. Bureau of Education in Jan., 1894, and has since been the center of educational discussion in the U. S. The committee prepared four model programmes for secondary schools, which are inserted below. No school is known to be actually following any one of these; but since the report appeared a number of schools have modified their programmes to conform closely to these model programmes, and it is certain they will form for some years to come the standard toward which a large number of schools will more and more closely approach.

C. H. THURBER.

MODEL SECONDARY PROGRAMMES.

YEAR.	CLASSICAL. Three foreign languages (one modern).	LATIN-SCIENTIFIC. Two foreign langnages (one modern).	MODERN LANGUAGES. Two foreign languages (both modern).	ENGLISH. One foreign langnage (ancient or modern).
I.	Latin ..... 5 p. English ..... 4 p. Algebra ..... 4 p. History ..... 4 p. Physical geography ..... 3 p. 20 p.	Latin ..... 5 p. English ..... 4 p. Algebra ..... 4 p. History ..... 4 p. Physical geography ..... 3 p. 20 p.	French (or German) begnn. 5 p. English ..... 4 p. Algebra ..... 4 p. History ..... 4 p. Physical geography ..... 3 p. 20 p.	Latin, or German, or French 5 p. English ..... 4 p. Algebra ..... 4 p. History ..... 4 p. Physical geography ..... 3 p. 20 p.
II.	Latin ..... 5 p. English ..... 2 p. German * (or French) begnn 4 p. Geometry ..... 3 p. Physics ..... 3 p. History ..... 3 p. 20 p.	Latin ..... 5 p. English ..... 2 p. German (or French) begun. 4 p. Geometry ..... 3 p. Physics ..... 3 p. Botany or zoölogy ..... 3 p. 20 p.	French (or German) ..... 4 p. English ..... 2 p. German (or French) begun. 5 p. Geometry ..... 3 p. Physics ..... 3 p. Botany or zoölogy ..... 3 p. 20 p.	Latin, or Ger., or French 5 or 4 p. English ..... 3 or 4 p. Geometry ..... 3 p. Physics ..... 3 p. History ..... 3 p. Botany or zoölogy ..... 3 p. 20 p.
III.	Latin ..... 4 p. Greek * ..... 5 p. English ..... 3 p. German (or French) ..... 4 p. Mathematics {algebra 2, geometry 2} 4 p. 20 p.	Latin ..... 4 p. English ..... 3 p. German (or French) ..... 4 p. Mathematics {algebra 2, geometry 2} 4 p. Astron. ½ yr., meteorol. ½ yr. 3 p. History ..... 2 p. 20 p.	French (or German) ..... 4 p. English ..... 3 p. German (or French) ..... 4 p. Mathematics {algebra 2, geometry 2} 4 p. Astron. ½ yr., meteorol. ½ yr. 3 p. History ..... 2 p. 20 p.	Latin, or German, or French 4 p. English {as in others 3, additional 2} .... 5 p. Mathematics {algebra 2, geometry 2} 4 p. Astron. ½ yr., meteorol. ½ yr. 3 p. History {as in Latin-scien. 2, additional 2} 4 p. 20 p.
IV.	Latin ..... 4 p. Greek ..... 5 p. English ..... 2 p. German (or French) ..... 3 p. Chemistry ..... 3 p. Trig. and higher algebra or History ..... 3 p. 20 p.	Latin ..... 4 p. English {as in classical 2, additional 2} . 4 p. German (or French) ..... 3 p. Chemistry ..... 3 p. Trig. and higher algebra or History ..... 3 p. Geol. or physiography ½ yr. and Anat., physiol., hyg. ½ yr. 3 p. 20 p.	French (or German) ..... 3 p. English {as in classical 2, additional 2} . 4 p. German (or French) ..... 4 p. Chemistry ..... 3 p. Trig. and higher algebra 3 or History ..... 3 p. Geol. or physiography ½ yr. and Anat., physiol., hyg. ½ yr. 3 p. 20 p.	Latin, or German, or French 4 p. English {as in classical 2, additional 2} . 4 p. Chemistry ..... 3 p. Trig. and higher algebra .... 3 p. History ..... 3 p. Geol. or physiography ½ yr. and Anat., physiol., hyg. ½ yr. 3 p. 20 p.

* In any school in which Greek can be better taught than a modern language, or in which local public opinion or the history of the school makes it desirable to teach Greek in an ample way, Greek may be substituted for German or French in the second year of the classical programme.

IV. Normal Schools.

A normal school is an institution for the training of teachers, and is usually supported by the state. As a general rule such schools confine their labors to the preparation of teachers for the elementary schools. There are in France two notable exceptions, the Superior Normal School at Fontenay-aux-Roses for women, and that at St.-Cloud for men. These schools devote themselves to the preparation of instructors for the lower normal schools. Nothing of this kind exists in the U. S. or Germany, though the State Normal School at Albany, N. Y., gives a higher grade of professional instruction than that found in other schools. It is designed for those who have completed college or ordinary normal-school courses. By the common practice of the world, therefore, the scope of the normal school is confined to the training of elementary teachers. Beyond the indefinite purpose of training teachers for the elementary schools the function of the normal school has not been accurately defined in the U. S., the work of each school being adjusted to real or seeming local needs and conditions. In the early stages of their development in the U. S. it was held to be the chief purpose of these schools to furnish a limited amount of accurate academic instruction to candidates for the teachers' certificate. In some schools this is still the sole idea. Later it was held to be their chief function to furnish only professional instruction in methods of teaching and school management, the burden of academic instruction to be borne by the secondary or high schools. Nor has it always been clear that normal schools have any inherent right to exist. There may be an abundance of incidental grounds of expediency for their existence, such as the absence of sufficient academic instruction in high schools, or the scarcity of college-bred teachers, or the great cost of their services, without there being any peculiar function for the normal school to perform. Were there college-bred teachers enough to supply the needs of the schools and at prices within the range of the financial abilities of the community, would there be any need of normal schools? Would there be any need of them could the academic and high schools furnish enough teachers well trained in academic branches? If these questions are not to be answered in the negative and there is any real inherent function for the normal school, it must be different from these two types of culture.

The university and college rightly pride themselves upon the breadth and depth of the knowledge they impart and upon the rigorous scientific character of the methods they pursue. But rigorous scientific method for adults is the logical unfolding of relatively perfect systems of completed knowledge, or is a difficult excursion into new realms of truth hitherto unexplored. The young, however, are mostly incapable of pursuing either of these processes successfully. The logical unfolding of a department of acquired and systematized knowledge is not a proper guide for imparting it to children, since this course does not coincide with the psychological laws of learning in the young. The laws of apperception demand that new knowledge shall be imparted in view of the interpreting experience that the child has already acquired. University knowledge is therefore of small account until it has been analyzed and readjusted in accordance with the psychological principles governing the child's mental assimilation. On the other hand, students in academic and high schools acquire in an elementary, non-reflective manner the knowledge imparted. They are so much engrossed in absorbing that they are unconscious of the manner of assimilation, nor do they pursue the higher studies long enough to see their interpreting value for the more elementary branches. It is evident that to a still greater degree there must here be a lack of psychological insight as to the proper way to select, arrange, and impart instruction, since there is a lack both of the knowledge that the university gives and the broad liberalizing outlook that it imparts.

The function of the normal school, therefore, is to pass the white light of knowledge, whether acquired in the high school alone or in that and the college combined, through the prism of that psychology which reveals the elementary processes of learning. The machinery of the best normal schools is all adjusted to this end. Academic knowledge is imparted, not in the rigid scientific method of the university, or in the half-unconscious manner of the academy, but rather according to methods that reflect the psychological conditions under which it can be reimparted to children so as to arouse their greatest interest and promote their most rapid understanding. The purpose of the practice or training school, in which normal-school students do practice teaching, is a practical device for securing still greater objectivity to the psychological adjustment of the matter of education to the mind of the child. The strictly professional aspect of normal schools pertains to theoretical instruction on psychology and the general theory of the educative processes. There are, therefore, in most normal schools these three factors: (1) Academic knowledge from the teacher's standpoint; (2) professional instruction in psychology and theory of teaching; (3) training-schools where candidates for teaching may impart knowledge to children in accordance with the educational doctrines they have learned.

Rise and Growth.—Normal schools had their beginning in the eighteenth century in France and Germany, but their development as important factors in public education is confined to the nineteenth century.

In Germany the beginnings of normal-school instruction were instituted by August Hermann Franke in connection with his orphan school at Halle in 1697. In 1704 he founded his *Seminarium Præceptorium*, or teachers' seminary, which a little later grew into the *Pedagogium*, or normal school, and is still in active operation. A state normal school was founded at Stettin in 1735, one in Potsdam in 1748, and one at Breslau in 1765. After this time the establishment and maintenance of normal schools were greatly stimulated by the demand for popular education incident to the period of the French Revolution and the educational reforms brought about through such men as Pestalozzi. The cause was especially promoted by the effort to free Germany from the rule of Napoleon through the development of the intelligence of the people. The Revolution of 1848 was followed by a reaction in which the normal schools suffered greatly, not so much in diminution of numbers as from the control of the clergy. The three noted Prussian regulations of 1854 crushed all effort to develop independence of character, reducing instruction mostly to memoriter exercises and the inculcation of religious dogma. At the close of the Franco-German war these regulations were repealed, and the number of scholars increased until practically the whole demand for elementary teachers could be supplied from them. Prussia alone has 116 of these schools, 106 being for men and 10 for women. Austria-Hungary has 70 and Switzerland 37 normal schools. Great Britain sustains 44 training-colleges for teachers, the Government paying 58 per cent. of the cost, which amounts to $867,438. Nearly all civilized nations now support normal schools in some form or other.

After the establishment of the "seminary for lay teachers" by La Salle in 1684, the first permanent normal school in France was founded by local authorities at Strassburg in 1810. Between 1830 and 1832, when the state took charge of the matter, fifteen were founded. The course was usually two years in length, most of the schools being supplied with training-departments. The fundamental law of 1879 organized the normal schools upon their present basis. In 1889 there were 82 schools for the training of male, and 89 for the training of female teachers. All were released from the control of the clergy. Most of them are now installed in new and enlarged buildings, and are well equipped with the needed material and teaching facilities. The students in 1889 numbered 4,754 male and 3,647 female, and as a rule resided in the schools. Nearly all French normal schools now have practice schools connected with them.

The first normal school in the U. S. was established at Lexington, Mass., in 1839. During the same year a similar school was established at Barre (now at Westfield) and in 1840 at Bridgewater, both in the same State. During the period from 1840 to 1860 twelve others were founded, located for the most part in the Eastern and Middle States. Normal schools began at this time to multiply rapidly, forty of them having been established from 1860 to 1870, seven of which were in New York, and most of the remainder in the States of the northern Mississippi valley. In 1890 there were 135 public normal schools in the U. S.

Organization of German and U. S. Normal Schools.—In order to understand the points of difference between German and U. S. schools for the training of teachers the following facts must be borne in mind: (1) Of the 116 Prussian normal schools but 10 are for women, thus indicating that but little more than 8½ per cent. of the elementary teachers in that country are women. Normal schools in the U. S. are coeducational, but the number of women attending them is 18,000 and the number of men only 9,000. In Germany

most persons who prepare for teaching follow that business for life, so that the number of new teachers that must be supplied each year is comparatively small, but little over 5 per cent., the average length of service for Prussian teachers during the last 50 years being 16·9 years, while in the U. S. about 30 per cent. must be renewed each year. This fact greatly enhances the cost and labor of preparing teachers in the latter country. To supply trained teachers for all schools it would take—e. g. in the single State of Illinois alone—142 normal schools, each having 100 students (the usual number in a German normal school), a three years' course of study, and graduating 33 students annually. Illinois has in reality two State normal schools, each graduating from 25 to 50 persons every year—that is, instead of furnishing the 4,000 or 5,000 new teachers needed, the normal schools of that State furnish less than 100 annually. (2) The attendance in German normal schools is unbroken save by accident, so that each year there are nearly as many graduating as entering students; but in the U. S. the attendance is so irregular that rarely more than a fourth or a third as many students graduate as enter. This irregularity of attendance causes discontinuity in study, and explains the fragmentary nature of the instruction in the average normal school. (3) As a rule, the preparation enjoyed by students of German normal schools is of uniform amount and excellence, being special instruction in public or private schools for three years after the close of the Volks-school course at the age of fourteen, and concluded by a public examination before school commissioners. The preparation for entrance to normal schools in the U. S. varies much, ranging from that given in the poorest country school to that furnished by the best city high schools. Under such conditions the German method of training teachers can be much more effective in every way than can that in the U. S., with its broken attendance and great variety in preparation. (4) The supply of learned and skillful teachers in Germany being practically unlimited, and the direction of the normal schools being in the hands of state officials and educational experts, it naturally follows that these schools are supplied with thoroughly efficient corps of instructors; whereas in the U. S., in which no such body of trained teachers exists, and where the administration of the normal schools is intrusted to State boards who concern themselves with business rather than with educational affairs, it is not surprising to find a teaching corps in the normal school which varies as much in preparation and fitness to teach as the student body itself does in scholarship and ability.

The normal schools of the U. S. and Germany are practically agreed as to the need of training-schools in which the students may have an opportunity to observe and practice teaching under criticism and direction. The training department usually covers the field of elementary instruction, sometimes including on the one hand the kindergarten and on the other the high school. In Germany it is common to have one class to represent the ordinary country school. In general the student teacher prepares more trial lessons and teaches less in the practice school than is customary in the U. S. Thus there is in Prussia one trial lesson a week for each student during the second and third years, whereas class-teaching in the training-school is reserved for the last year. In the normal schools of the U. S. it is usual to give the actual conduct of a class in the early part of the second year, but it is less common to have repeated trial lessons under searching criticism, followed by thorough discussion on the part of teachers and students.

The following table exhibits the amount and distribution of professional and academic work that is accomplished in the German normal schools, and will furnish a basis for further comparisons:

SUBJECTS.	HOURS PER WEEK EACH YEAR.			Per cent. of whole.
	First.	Second.	Third.	
I. Pedagogics.				
1. History of education	2	..	..	
2. Pedagogics (psychology and logic)	..	2	..	5·6
3. Methods	..	..	2	
4. Teachers' meetings (for pupil-teachers)	..	..	1	
5. Model lessons by teachers	..	1	2	
6. Trial lessons by the pupils	..	1	1	
7. Preparation for teaching in training-school	..	..	1	12·8
8. Teaching in training-school	..	..	4·6	
9. Observation (con)	..	..	1·2	

WORK IN GERMAN NORMAL SCHOOLS—CONTINUED.

SUBJECTS.	HOURS PER WEEK EACH YEAR.			Per cent. of whole.
	First.	Second.	Third.	
II. Religion.				
1. Biblical history	3	2	..	
2. Catechism	..	2	..	7·7
3. Hymns	1	..	..	
4. Exegesis and church history	..	..	2	
III. German.				
1. Grammar	1	1	1	
2. Essay and oration	1	1	..	
3. Cursory reading	1	1	..	
4. Careful reading (detailed study of selections, declamations, and systematic study of classical works)	2	2	..	11·4
5. History of literature	..	..	1	
IV. General History	2	2	2	5·6
V. Mathematics.				
1. Arithmetic and algebra	3	3	1	10·5
2. Geometry	2	2		
VI. Natural Science.				
1. Natural history	2	2		
2. Physics	2	..	2	9·5
3. Chemistry	..	2		
VII. Geography	2	2	1	4·7
VIII. Drawing	2	2	1	4·7
IX. Writing	2	1	..	2·7
X. Gymnastics	2	2	2	5·6
XI. Music.				
1. Piano	1	1	..	
2. Organ	1	1	1	
3. Harmony	1	1	1	
4. Violin	1	1	1	
5. Elementary singing	1	..	..	19·2
6. Figurative descant and choral singing	2	2	2	
7. History of music	..	..	1	
8. Mixed choir singing	..	..	1	
Total required	37	37	32·1	100·0
XII. French (optional)	3	3	2	....

It can be seen from the foregoing table that no subject is pursued for less than one year, while many subjects, such as history, geography, drawing, gymnastics, and certain branches of music, are studied throughout the entire three years. Many other subjects are pursued continuously for two years. It is curious to notice that the number of hours per week assigned to any given subject does not exceed two, except for arithmetic and algebra, biblical history, and teaching in the training-school. On the other hand, the normal schools of the U. S. usually pursue whatever subjects they have in hand for four or five recitation periods of forty-five or fifty minutes each per week.

There has been a decided movement in many States of the U. S. for the abolition of all academic instruction in normal schools, the argument being that the State should not have to pay for this, since the academies and high schools profess to impart academic knowledge. It is declared that the high schools should teach the *what* and normal schools the *how*. This movement has resulted in securing perhaps a higher grade of academic instruction, but it has nowhere driven it out of institutions for the training of teachers.

The conditions of admission to normal schools in the U. S. do not greatly vary in the different States, and may be summarized as follows: (1) The candidate must be not less than sixteen years of age; (2) must possess sound health and a good moral character; (3) must be able to pass a satisfactory examination in reading, spelling, writing, arithmetic, and the elements of English grammar, or be a graduate of an accredited high school; (4) must sign a declaration of intention to teach for a certain specified time, usually two or three years, in the common schools of the State. In city normal schools it is often customary to require graduation from the high school as a condition of admission. That the actual instruction in normal schools is not, or at least need not be, so elementary as might be inferred from a study of the curriculum that follows, becomes evident when the age of the average normal student is considered. Answers from twenty-four representative State normal schools show that the average age at graduation is twenty-two years. Since, however, their courses do not exceed three years in length, it is clear that the average entrance age

is between eighteen and nineteen years. This is the age for beginning superior instruction. The schools just mentioned report that 37 per cent. of their students are graduates of high schools, or have had an equivalent preparation.

The State Normal School at Normal, Ill., founded in 1857, may perhaps be regarded as a typical normal school. Its educational ideals and methods of work were a direct inheritance from the old Bridgewater, Mass., normal school, since the leaders in the early conduct of the Western school came direct from the Bridgewater normal. The faculty consists of twenty-one persons, twelve men and nine women. The president, John W. Cook, A. M., LL. D., is a graduate of the school. Of the professors, ten are college or university graduates, and two have taken degrees at German universities; of the whole number, ten are graduates of the school itself. The scholarship represented in this faculty is considerably above the average for normal schools in the U. S. One of the weaknesses of these institutions comes to light when it is stated that these twenty-one persons must do all the teaching for 646 normal and 186 high school students, besides spending considerable time with the 389 pupils of the model or training school. This makes an average of over forty students to one instructor; in good colleges and universities there are usually only from ten to twelve students for each teacher.

The training-department of this school consists in reality of three groups of pupils—a grammar school with 185, an intermediate school with 83, and a primary school with 121 pupils, each of these schools being in charge of an assistant training-teacher. There is, besides, a model high school, in which pupils may prepare for college or study ancient and modern languages, but in which students do not teach to any considerable extent. The academic year is divided into three nearly equal terms, and each normal-school student who completes the course is required to teach under inspection at least four terms in the training-school, giving during the senior year trial lessons in the presence of instructors and of students in the senior class. In many normal schools there is a different organization of the pupil teaching. Some so arrange the matter that a student may do his practice-teaching for a short period at a time, being in charge, it may be, of all the pupils in a given department for a few weeks.

The curriculum of study is not very different from that of most normal schools in the U. S. having a three years' course. It is as follows, the numerals 1, 2 and 3 indicating the three terms of the year respectively:

STUDIES.	First year.	Second year.	Third year.
Elements of pedagogy	1	.....	.....
Pedagogy	2, 3	.....	.....
Elementary psychology	.....	1	.....
Practice-teaching	.....	2, 3	2, 3
Adv. psychology and Rosencranz	.....	.....	1, 2, 3
Illustrative teaching	.....	.....	1, 2, 3
School laws of Illinois (3 weeks)	.....	.....	3
Reading and orthoëpy	1, 2	.....	.....
Spelling	1, 2, 3	.....	.....
Grammar	1, 3	.....	.....
Rhetoric	.....	2	.....
Criticism	.....	3	.....
English literature	.....	.....	1
Shakspeare and themes	.....	.....	2
Arithmetic	1, 2	.....	.....
Algebra	3	1	.....
Geometry	.....	2, 3	.....
Bookkeeping (8 weeks)	.....	.....	3
Drawing	1, 2, 3	1, 2, 3	.....
Penmanship	2	.....	.....
Geography	1, 2	.....	.....
U. S. history	3	.....	.....
Civil government	.....	1	.....
Ancient history	.....	2	.....
Physical geography	.....	3	.....
Mediæval history	.....	.....	1
Zoölogy	.....	1	.....
Physiology	.....	2	.....
Botany	.....	3	.....
Physics	.....	.....	1, 2
Chemistry	.....	.....	3
Vocal music	3	.....	.....

In addition to this table a number of optional studies, like Latin, Greek, German, astronomy, advanced mathematics, economics, and science, are offered, but the required work so nearly fills the programme that there is little time for extras. The regular number of periods per week for each study is four and a half and five, elements of pedagogy, drawing, penmanship, and vocal music alone having but two each. This is in sharp contrast with the programme of the German normal schools given above. On the other hand, it will be seen that the amount of time given to many important studies is sadly inadequate for anything more than the most superficial knowledge. Thus chemistry, botany, physiology, zoölogy, to say nothing of other branches, receive but one term each. Lack of teaching force prevents any specialization on the sciences. It is difficult to see how much more time can be given to the individual subjects unless their number is reduced, or unless the amount of attention given to the common branches is considerably abridged.

The sharpest contrast between the schools of Germany and the U. S. is in uniformity of excellence. The German system of training teachers insures for every school in the land a high minimum of excellence, since every teacher must demonstrate by examination that he has adequate academic knowledge, and has subjected himself to at least three years of professional preparation. In the U. S. this is by no means the case, for only a small per cent. of the teachers have any professional training whatever, while their academic knowledge is gauged by constantly varying standards. The results obtained in Germany from the universal training of teachers should therefore be an ever-present stimulant for educators in the U. S. to extend and perfect their normal schools. CHARLES DE GARMO.

V. THEOLOGICAL SCHOOLS.

Their Rise.—As forms of worship developed, divine oracles required interpretation, or holy men attracted disciples, schools of theology grew up in all civilized nations of antiquity. Thus Egypt had her priestly colleges at Heliopolis, Memphis, Thebes, and Sais; Assyria her prophetic schools at Arbela and Nineveh; Babylonia her seats of sacred learning at Uruk, Kutha, Babylon, and Borsippa. The prophetic unions of Rama and Gibea can scarcely be called schools, but the disciples of Isaiah were students, and the canonizing of religious writings made the *beth hammidrash*, or "house of instruction," a necessity. The Magi imparted particular instruction in the rites and tenets of Mazdaism. The cult of Eleusis called for training, and the Orphic revelation for special study; young men were drawn to Pythagoras and Socrates, Plato, Aristotle, and Zeno largely by their religious interest; the best theology of Greece was expounded in the academy, the lyceum, and the stoa; and Plotinus, Porphyry, and Proclus made the school of Alexandria a theological seminary.

Like John the Baptist, Jesus gathered about himself disciples whom he taught the way of life and the manner of the kingdom. From his personality, his teaching, and his death the mightiest impulses to theological study, as well as to religious life, have gone forth; but he founded no school of theology. Paul recognized the need of apostles, prophets, and teachers, and chose for his companions young men fit to continue his work; but he established no seminary. The charismatic organization of the Church supplied her for some time with an order of apostolic teachers. As tradition grew in importance, the cult developed, and the ministry of the word was added to the episcopal function, the house of the bishop became a home of Christian training. But it was the maiden efforts of Hellenistic philosophy in the service of the Christian faith that resulted, in the second century, in the first regular schools of Christian theology. Such were the schools of Valentinus in Rome, Carpocrates in Alexandria, Saturninus in Antioch, and Bardesanes in Edessa. A maturer fruit of the same tendency was the school of the catechists at Alexandria, founded by Pantænus in 190 and brought to its highest efficiency by Clemens and Origen, where candidates for the ministry as well as catechumens received instruction. In 231 Origen opened a school in Cæsarea. Of greater importance was the school of Antioch established by Lucian about 300, where Chrysostom and Theodore of Mopsuestia taught. From 363 to 489 the school of the Persians at Edessa was the great center of Christian learning, and there was a flourishing school at Nisibis in the sixth century. The clergy of the Occident, as a rule, studied in the schools of the rhetoricians, so highly praised by Augustine. Besides the ordinary catechetical instruction, ministerial candidates often enjoyed special episcopal training. After Constantine's conversion the school of the Patriarchium at Rome attracted many students. The closing of the University of Athens in 529 really signalized the inability of the pagan schools to furnish any longer the culture needed for theological study. In the same year Benedict of Nursia opened his monastery on Monte Cassino, and in 535 Cassiodorus introduced *trivium*, *quadrivium*, and theology in a cloister school at Vivaria.

Monastic schools had already been established by Cassian

at Marseilles, by Martin at Marmontier, and by Honoratus on the Leryns, about 400. The schools of Armagh, Aran, and Clonard in Ireland, Whitherne, Lantwit, and Llan Elwy in England, may have been founded in the fifth century, and the school of theology at Constantinople owed its origin in the seventh to an independent movement; but it was the Benedictine order and discipline that gave lasting fame to the foundations of Columban at Luxeuil, St.-Gall, and Bobbio, and efficiency to the great schools of Bangor, Iona, Lindisfarne, Canterbury, and York. The *regula* of Chrodegang of Metz (754), made binding on the entire Church in Aachen in 814, provided for an episcopal school at each cathedral. Both episcopal and monastic schools received enthusiastic support by Charlemagne. His palace school, where Alcuin and Erigena taught, set an example followed not only by Tours and Fulda, Corvey and Ferrières, but also by the cathedral schools of Orleans and Rheims. The tenth century marks the ascendency of Liège, the eleventh that of Le Bec. In this Norman cloister Lanfranc and Anselm laid the foundations of scholasticism, and their influence was quickly felt in Chartres and Rouen, in Glastonbury and Oxford. The mendicant friars brought the heritage of Le Bec to the new centers of learning.

University Schools.—From the thirteenth century theological schools began to be connected with the universities. The *studium generale* rarely had its origin in an episcopal school, never in a monastery. Of the forty-six universities founded before 1400, twenty-eight had at the outset no theological faculty, having generally grown out of city schools, medical schools, or law schools. Among the other eighteen many were new creations and some sprang from private schools like that of Abelard. But the Franciscans and the Dominicans, besides founding their own colleges, gradually secured generous representation on the theological faculties. Probably no other school of theology ever enjoyed the prestige of the Collège de Sorbonne. The theological course at Paris (twelfth century) was open only to masters of arts and covered ten years, five for the baccalaureate and five for the licentiate. The student began with a biblical course familiarizing him with the literal, tropical, allegorical, and anagogic interpretations. This was followed by dogmatics based on Lombard's sentences. Instruction was given by lectures, repetitions in the colleges, and disputations. Substantially the same rules prevailed in all mediæval universities. In advance of Cambridge (twelfth century), and next to Paris in importance, was Oxford (twelfth century). Toulouse was founded in 1229, Coimbra in 1291, Salamanca in 1355, and Valladolid in 1418. Bologna had no theological faculty until 1362; but Rome (1303), Pisa (1343), Florence (1349), and Padua (1363) taught theology at the beginning. Prague (1347) was the first German university. Then followed Vienna (1365), Erfurt (1379), Heidelberg (1385), Cologne (1388), Leipzig (1409), Rostock (1419), Freiburg (1457), Tübingen (1477), and Mayence (1477). Geneva had a university in 1368 and Basel in 1460, Upsala in 1477 and Copenhagen in 1479. Famous Louvain (1431) reflected the wisdom of the *fratres devoti*.

Modern Catholic Schools.—The Renaissance inaugurated a new era. Classical antiquity returned, the Semitic world drew nearer, the physical universe expanded and attracted minds emancipated by nominalism, and the religious life demanded greater earnestness and freedom. The intellectual forces of the modern world began to operate. But the renascent influence has been felt in varying degrees in different parts of Christendom. While the Romance and Teutonic nations claimed the heritage of Byzantium, the Slavs, so long under her tutelage, had not yet reached their majority. But the Orthodox Church, by nurturing national life and letters, has proved a faithful tutor in Russia, Servia, and Bulgaria, not less than in Roumania and Greece, and these nations are making rapid progress. The religious academies of St. Petersburg, Moscow, Kiev, and Kasan may not be consciously affected by Occidental thought, but they are flourishing institutions, and especially devote praiseworthy attention to non-Christian religions and to missionary history. The universities of Bucharest (1869) and Czernowitz (1876), as well as that of Athens (1837), have theological faculties.

The Roman Catholic Church owes it largely to a new order of theological schools that her influence, still so marked in the Romanee nations, has survived the Renaissance. By the establishment of colleges, at the universities or independently, embodying Sturm's humanistic and their own religious principles, Loyola and his successors sought to meet the demands of the age for spiritual earnestness, classical learning, and biblical erudition. Few schools have attained the efficiency of the Collegium Romanum (1550). The *studia superiora* comprised four years of philosophy, three years of positive or biblical theology and dogmatics based on Thomas Aquinas, and three years of casuistry. Other famous colleges were the Germanicum (1552), the Anglicanum (1580), the Claromontanum at Paris (1562), and those of Pont à Mousson (1572) and Dijon (1581). Clerical seminaries were also established at Rome (1565), at Milan (1572), and elsewhere by Borromeo, and subsequently in every Roman Catholic country. Had the searching criticisms of the Port Royalists been heeded, the Society of Jesus might have been saved from spiritual decay and loss of power. When, in 1773, Clement XIV. dissolved the order, it had 669 colleges and 176 seminaries, and controlled 80 theological faculties; but its moral influence was so shattered that not even the restoration of 1814 could rehabilitate it. Its system of education still survives, but scarcely to the profit of the Church. To this day Italy depends upon her 217 seminaries, no Italian university having a theological faculty. Spain is equally dependent, and though Coimbra teaches theology Portugal has many seminaries. France is better provided, with her Roman Catholic faculties at Paris, Lille, Lyon, and Toulouse. At Vienna, Salzburg, Budapest, Cracow, Innsbruck, Agram, and Gratz Roman Catholic theology is taught, and Prague has both a Czech and a German faculty, but there are forty-three seminaries besides in Austria. Freiburg (1457), Munich (1826), Münster (1773), Würzburg (1582), Bonn (1818), Breslau (1702), and Tübingen have Roman Catholic faculties. Besides Louvain, Belgium has sixteen seminaries. Since 1854 Ireland has had a Roman Catholic university at Dublin. England has twenty-seven Roman Catholic seminaries.

German Protestant Schools.—In the independent Teutonic churches the Renaissance bore richer fruits. The influence of Luther was strongly felt in the universities already leavened with humanism, and there the study of Lutheran theology remained in touch with other departments of learning. Luther's suggestions were nobly carried out by Melanchthon. Under his presidency Wittenberg (1502) became a great center, and other universities modeled their instruction after it, as Marburg (1529), Tübingen (1536), Leipzig (1539), Königsberg (1544), Greifswald (1545), Rostock (1563), Heidelberg (1551), and Jena (1558). The change involved an extension of the biblical course, interpretation of the Hebrew and Greek texts of the Scriptures, and greater attention to Augustine. The theological faculty became an arbiter in doctrinal matters. In the period of orthodoxism occasioned by this arrangement, Giessen was founded in 1607 and Kiel in 1665. Metaphysics had crowded Bible study and personal piety into the background, when Spener and Francke made their plea for faithful exegesis and living experience, and embodied their ideas in the University of Halle (1694) and the *seminarium ministerii ecclesiastici* (1714). The indifference of pietism to theology as a science undermined orthodoxy and paved the way for rationalism. In the opposition against supernaturalism Göttingen (1737) became a leader. Kant's *Critique* made this conflict meaningless by a higher synthesis, but the new theological development started with Schleiermacher's and Hegel's teaching at Berlin (1810). To their influence the still dominant tendencies emanating from Baur in Tübingen, Reuss in Strassburg, and Ritschl in Bonn are largely traceable. Scientific methods prevail in the biblical departments and find increasing application in Church history, dogmatics, and practical theology. The professors in the seventeen evangelical faculties are free to present their own views and to modify them as research demands. Their lectures are the prominent feature. Disputations are seldom held. Seminars and theses try the student's strength. A triennium leads to the doctorate in philosophy, three additional years suffice for the licentiate. The doctorate in theology is conferred either *rite* or *honoris causa*, the recipient recognizing the honor by dedicating a work to the faculty. The annual average of doctors of divinity made in all Germany is forty.

Other European Schools.—The Universities of Upsala and Lund (1668), Christiania (1813), Copenhagen, Helsingfors (1827), and Dorpat (1632) supply the clerical needs of Sweden, Norway, Denmark, Finland, and Lutheran Russia. Preachers' seminaries have also been established by the Moravians at Gnadenfeld and Nisky, the Baptists at Hamburg and Stockholm, the Methodists at Frankfort and Upsala, and the Congregationalists at Christinehamn. In

scholarship inferior to the state schools, these seminaries emphasize more strongly personal piety.

Zwingli was a humanist, Beza brought the new learning to Lausanne (1536), and Calvin had studied with Sturm in Strassburg before founding at Geneva his college (1536) and theological academy (1559). Calvin's new theology and scholarly exegesis made the academy a center of French Protestantism. Like Lausanne it has maintained itself through the centuries, while Neuchâtel and Freiburg are of modern growth. A reaction against theocratic ideas has called forth theological schools unsupported by the state in Geneva, Lausanne, and Neuchâtel. Similarly Basel, Berne (1528), and Zurich (1832) have theological faculties, and each city also a free seminary. French Protestant seminaries were established at Nîmes (1561), Saumur (1598), Montauban (1598), and Sedan (1580); but the expatriation of the Huguenots left only Montauban, which has been connected with the Academy of Toulouse. In 1877 the seminary of Strassburg (1802) was removed to Paris and incorporated in the university. All these schools are open to bachelors of arts who may graduate as bachelors of divinity after three years and as licentiates after four, upon presenting six discourses and two theses. L'École des Hautes Études (1868) also has a section for theology with excellent equipment for the study of comparative religion. In Holland Leyden (1575) became the representative of Arminianism, while Groningen (1614) and Utrecht (1634) expounded Calvinism. Rationalism in the eighteenth century destroyed these landmarks, and Gröningen, Utrecht, and Amsterdam (1877) are now making valuable contributions to theological science. The Scotch universities of St. Andrews (1411), Aberdeen (1494), and Glasgow (1451) have remained more faithful to Calvinism, while Edinburgh (1583) is at present liberal. Each has four divinity professors. Masters of arts may gain the bachelor's degree in three years. Six discourses and a thesis are required. At St. Andrews bachelors of divinity may obtain the doctorate after eighteen years upon presenting a thesis; elsewhere it is conferred *honoris causa tantum*. The Free Church has three divinity halls at Edinburgh, Aberdeen, and Glasgow, and the United Presbyterians one hall at Edinburgh. Four years' attendance is required, but the course is identical with that at the universities.

Of the English universities Cambridge was first affected by the Renaissance, and under the influence of Puritanism, Platonism, and rationalism, has steadily advanced, while conservative Oxford was aroused from long lethargy by the Tractarian movement. At present both offer excellent opportunities for theological study. Masters of arts may become bachelors of divinity in three years and doctors after four additional years. Durham (1852) admits bachelors of arts and others to theological study. Besides these, the Church of England has 23 theological schools, the Methodists have 10, the Congregationalists 11, the Baptists 9, the Presbyterians 3, the Unitarians 1, and the Jews 1. Two are undenominational.

Schools in North America.—Canada long depended upon the mother country, but in the nineteenth century the Episcopalians have established 2 theological schools at Toronto, the Presbyterians 3 at Montreal, Toronto, and Quebec, the Methodists 2 at Montreal and Toronto, the Baptists 1 at Toronto, and the Congregationalists 1 at Montreal.

The English, Dutch, Swedish, and French colonists in America in the seventeenth century were at first served by ministers educated at Cambridge or Utrecht, Upsala or Montauban. New England began to supply her own needs by establishing Harvard (1638) with a professorship of divinity. William and Mary (1693) probably did similar service for Virginia. In 1740 a professor of divinity was appointed at Yale (1701); but the Dutch Reformed Church founded the first theological school, at New Brunswick, N. J. (1784). The example was followed by the Roman Catholics at Baltimore (1791), the United Presbyterians at Xenia, O. (1794), the Moravians at Bethlehem, Pa. (1807), the Congregationalists at Andover (1807), the Presbyterians at Princeton (1811), the Lutherans at Hartwick (1815), the Unitarians at Cambridge (1817), and the Baptists at Hamilton (1819). Before 1860 50 seminaries had been established. After the civil war the emancipated race and the settled West caused schools to multiply. The commissioners report 143 theological schools; 25 of these have scarcely any existence, 25 are for freedmen, 18 are Roman Catholic seminaries, and 1 is a Jewish school. The remaining 74 belong to 10 Protestant denominations, the most prominent being Baptist: Colgate (1819), Newton (1825), Rochester (1851), Louisville (1858), Chicago (1867), Crozer (1868); Congregationalist: Andover (1808), Bangor (1816), Yale (1822), Hartford (1834), Oberlin (1835), Chicago (1858), Pacific (1869); Episcopalian: New York (1820), Virginia (1823), Berkeley (1854), Philadelphia (1862), Cambridge (1867); Lutheran: Gettysburg (1826), Concordia (1839), Augustana (1860), Philadelphia (1864); Methodist: Boston (1847), Garrett (1857), Drew (1867), Vanderbilt (1873); Presbyterian: Princeton (1812), Auburn (1820), Union, Va. (1824), Columbia, S. C. (1828), Lane (1832), Union (1836), Chicago (1859); Dutch Reformed: New Brunswick (1784); German Reformed: Lancaster (1825) and Heidelberg (1851): Unitarian: Harvard (1817) and Meadville (1846); Universalist: Tufts (1869). Sixteen States have no theological school. No State university teaches theology; of the ten leading ecclesiastical universities Harvard, Yale, Princeton, Colgate, and Northwestern have theological faculties; of the privately endowed, Boston, Vanderbilt, and Chicago. These and many independent schools admit only bachelors of arts to the regular course, and confer the baccalaureate of divinity after a triennium. The anomaly exists that over 300 institutions, not universities and without a theological faculty, can create doctors of divinity, while only a few theological schools have the right even of nomination. No American theologian has formed a school of thought, but the conservatism of Princeton, the "new theology" of Andover, and the more advanced position of Harvard have exerted a wide influence. The revival of Semitic learning, the introduction of scientific methods, the decline of sectarian teaching, the missionary zeal, the close contact with Church life, the high moral tone and the warm piety characterizing the North American schools give promise of rich and independent work in theology.

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NATHANIEL SCHMIDT.

VI. MEDICAL SCHOOLS.

I. *In the United States.*—In the earlier history of North America physicians generally received their medical training from preceptors, in whose offices they served an apprenticeship of seven years in the practical branches, receiving at the same time instruction as students and studying such cases of disease as developed in the daily practice of their preceptors. In rare instances these studies were supplemented by a trip to Edinburgh, London, or Paris, and less frequently to Holland or Italy. In some country districts the physician was also the clergyman. Frequently he was engaged in tilling the soil.

Dr. Thomas Cadwallader, of Philadelphia, who had studied anatomy under Cheselden, gave anatomical demonstrations

to the physicians of Philadelphia prior to 1751, and Dr. Hunter, of Newport, R. I., gave anatomical demonstrations in 1754–56. Dr. William Shippen, Jr., of Philadelphia, gave a course in anatomy to twelve students in 1762. These were all private enterprises. The first regularly organized school of medicine was the College of Philadelphia, which was founded by Dr. William Shippen, Jr., and Dr. John Morgan at the suggestion of Dr. John Fothergill, of London, in 1765. Dr. Morgan was appointed to the chair of Medicine in May, 1765, and Dr. Shippen to the chair of Surgery in September of the same year. The first course of lectures was given in Nov., 1765, and continued annually thereafter. The College of Philadelphia subsequently became the University of Pennsylvania.

The requirements for the degree of bachelor of medicine were: (1) A satisfactory knowledge of Latin, mathematics, natural and experimental philosophy; (2) one course of lectures in anatomy, materia medica, chemistry, theory and practice of physic and clinical lectures, and one year's attendance on the practice of the Pennsylvania Hospital and a public examination; (3) apprenticeship to a reputable physician.

The requirements for the degree of M. D. were: The candidate, being twenty-four years of age, and a bachelor of medicine of three years' standing, must present and defend an original thesis. The degree of M. B. was first conferred in 1768, and of M. D. in 1771.

The second medical school in North America was founded in New York in 1767 in connection with King's (now Columbia) College by Dr. Samuel Bard and Dr. Peter Middleton. The degree of M. B. was first conferred in 1769, and of M. D. in 1770. It was broken up by the Revolutionary war, but was reorganized in 1792 and merged with the College of Physicians and Surgeons in 1807. The third medical school was founded in connection with Harvard College in 1783, the fourth in connection with Dartmouth College in 1798, the fifth was the Maryland College of Medicine in Baltimore (now the University of Maryland), founded in 1807, and the sixth at Yale College in 1813.

From this date the growth of medical colleges was rapid, until almost every large city possessed one or more. Many, like those at Castleton, Vt., Berkshire, Mass., and Fairfield, N. Y., were established in small country towns independently of any institutions of learning or hospital facilities, and gave purely theoretical instruction by lectures, the effect being to lower the standard of medical education. In some schools a single course of lectures was exacted prior to graduation; in others two courses of four months each; in the vast majority two courses of not more than six months each; and in comparatively few colleges three courses of lectures. Since 1890 a movement to lengthen the number of courses to three, and in some cases to four, has gained strength, to the great advantage of medical education.

Requirements for Admission to Medical Colleges.—Prior to 1892 no uniform requirements for admission to medical colleges existed in the U. S. In 1892 the Association of American Medical Colleges established the following standard: (1) Ability to write an English composition of not less than 200 words. (2) To translate simple Latin prose. (3) A knowledge of algebra or higher arithmetic. (4) Elementary physics.

The regents in the State of New York require that all applicants for admission to medical schools must file a certificate showing:

(A) That they hold a degree of bachelor or master of arts, of bachelor or master of science, or of bachelor or doctor of philosophy; or, (B) That during or prior to the student's first year of medical study he has passed an examination conducted under the regents of the University of the State of New York, or by the faculty of a medical school or college in accordance with the standard and rules of the said regents, in arithmetic, grammar, geography, orthography, American history, English composition, and the elements of natural philosophy; or, (C) That he possesses one or more of the following equivalents:

(*a*) A certificate of having successfully completed a full year's course of study in any college or university under the supervision of the regents of the university, or registered by them as maintaining a satisfactory standard. (*b*) A certificate of having satisfactorily completed a three years' course in any institution subject to the visitation of the regents, or registered by them as maintaining a satisfactory academic standard. (*c*) A certificate of having passed the examination preliminary to the study of medicine, required by the present medical act of Canada. (*d*) A certificate of having passed the matriculation examinations of any university in Great Britain or Ireland. (*e*) A regent's diploma. (*f*) Regents' pass-cards for any twenty counts not including reading and writing.

Many medical colleges in the South and West do not exact even these modest requirements.

A few medical schools require more, e. g. the University of Michigan, which requires an elementary knowledge of English, mathematics, including arithmetic, algebra and plain geometry, physics, botany, zoölogy, physiology, history, and Latin prose.

The requirements of Harvard Medical School are: English, Latin, physics, chemistry, and any one of the following: French, German, algebra, plane geometry, or botany.

The Johns Hopkins Medical School, at Baltimore, Md., requires: (1) An ability to pass the matriculation examination to enter any undergraduate course at the Johns Hopkins University; (2) a reading knowledge of French and German; (3) a knowledge of minor courses in physics (at least five class-room exercises and three hours' laboratory work each week for one year constituting a minor course), chemistry (five class-room exercises and five hours' laboratory work each week for one year), and biology (five class-room exercises and five hours' laboratory work each week for one year), or the degree of A. B. in the chemical-biological course of the university.

Courses of Study.—The best medical courses are graded and cover a period of four years. In the most advanced schools the first two years are spent in the study of anatomy, embryology, physiology, histology, bacteriology, pathology, physiological chemistry, and pharmacology; the third year is devoted to the study of medicine, surgery, gynæcology, and obstetrics, and the fourth year to clinical work and special branches of medical practice. In the first two years laboratory work occupies a prominent place, and recitations and seminary conferences are held rather than formal didactic lectures.

Many schools have three courses of lectures which practically cover identical subjects, but this method of instruction is no longer popular, and laboratory work and graded recitations are fast taking the place of didactic lectures.

Medical educators differ as to the advisability of requiring a degree in arts or sciences preliminary to the study of medicine, and many are of the opinion that the majority of young men can not afford to sacrifice the time needed to secure a degree before commencing a course of medical study proper, extending over a period of at least four years. They prefer the arrangement of studies existing at Cambridge, England, whereby the last two years of study for the degree of B. A. constitute the first two years of medical study leading up to the degree of M. D. at the end of three years thereafter, thus practically giving a medical course of five years.

Requirements for Degree of M. D.—The requirements for this degree vary materially. In some schools in the U. S. the degree is conferred after three years of medical study and an attendance upon two courses of lectures. The majority of the medical schools since 1892 have required three courses of lectures. The leading schools require four courses of lectures and practical work in laboratories.

Number of Schools.—In 1891 there were 95 regular, 9 eclectic, 14 homœopathic, 2 physio-medical colleges, and 9 post-graduate schools of medicine, with 18,160 students and 4,931 graduates receiving the degree of M. D.

II. *Canada.*—There are 12 medical schools in Canada. The requirements for admission are English, arithmetic, algebra, geometry, Latin, and Greek, French, German, or natural philosophy.

Courses of study extend over four years. During the first and second years, anatomy, physiology, histology, chemical physics, general chemistry, materia medica and therapeutics, toxicology, and botany. During the third and fourth years, theory and practice of medicine, including medical pathology; principles and practice of surgery, including surgical pathology; clinical medicine, clinical surgery, midwifery, diseases of women and children, medical jurisprudence, and sanitary science.

In Quebec the requirements for admission to the medical schools are nearly equal to the medium requirements for admission to the schools of Great Britain.

III. *Great Britain.—Requirements for Admission.—Minimum.*—English, Latin, mathematics, including algebra and geometry, elementary mechanics, and one of the following optional subjects: Greek, French, German, Italian, or

any modern language, logic, botany, zoölogy, elementary chemistry.

Medium.—Latin, Greek, French, German, Sanskrit or Arabic, English language, history and geography, mathematics, mechanics, science—one of the following: chemistry, heat and light, magnetism and electricity, botany.

Maximum.—Latin, translation of selected and non-selected authors, grammar, and short passages to be translated into Latin; Roman history; Greek grammar and translation from a selected author; English language, composition, literature, and history; French or German, grammar, and translation into English; mathematics—arithmetic, algebra to the theory of indices, and logarithms; geometry, plane and solid, with the elements of co-ordinate geometry; trigonometry. This is equivalent to the examination for the B. A. degree in Oxford, Cambridge, and London.

The courses of study occupy at least five years. After finishing the regular courses the students spend several years in the London hospitals.

IV. *Germany.*—The applicant for admission must present a certificate of having successfully passed the final examination of the gymnasial course. Eight semesters must be devoted to medical study. The first four are devoted exclusively to physics, chemistry, zoölogy, botany, mineralogy, anatomy, and physiology. The purely medical studies begin with the fifth semester, and must be pursued for two years.

V. *France.*—The applicant for admission must possess the "diplôme de bachelier ès lettres" and the "diplôme de bachelier ès sciences restreint," which are equivalent to B. A. of London University, with considerable knowledge of chemistry, zoölogy, botany, geology, and astronomy added.

Courses of Study.—These must be pursued at one of the six medical faculties of France, viz., Paris, Montpellier, Nancy, Lille, Lyons, and Bordeaux, and must cover four years.

First year: Physics, chemistry, anatomy and dissection, natural history, physiology, and histology; second year, anatomy and dissection, histology, general pathology, surgical pathology and clinic physiology, medical pathology; third year, dissection, surgical pathology and clinic, medical pathology and clinic, operations and apparatus, gynæcology; fourth year, dissection, surgical pathology and surgery, medical jurisprudence, pathological anatomy, materia medica and therapeutics, hygiene, and gynæcology.

VI. *Italy.—Requirements for Admission.*—Latin, mathematics, including algebra, geometry, plane trigonometry and conic sections, mechanics, elementary physics, chemistry, and natural history.

Courses of Study.—Medical studies are to be pursued at any one of the twenty universities of Italy. The course is six years. There are no rules as to sequence of studies, but the following order is generally observed: First year, zoölogy, botany, inorganic chemistry; second year, physics, organic chemistry, comparative anatomy; third year, anatomy, physiology; fourth year, general pathology and pathological anatomy; fifth year, special pathology and surgery and clinic, topographical anatomy, operative surgery; sixth year, medical and surgical clinic, hygiene and medical jurisprudence, ophthalmology, obstetrics.

VII. *Sweden.*—The applicant for admission must present the *Maturitäts* certificate from the gymnasium. The courses of study must be pursued at Upsala or Lund, or the Medical Academy of Stockholm. The period of study is ten years. The first three years are spent in preliminary studies. Three years are then spent in the study of anatomy, physiology, physiological chemistry, general pathology, pathological anatomy, and pharmacology. Two years are spent in the study of practical medicine, practical surgery, ophthalmology, obstetrics, and forensic medicine. In addition there are eight months in a medical and surgical clinic, four months in an obstetrical clinic, and two months in a psychiatric clinic.

Number of Schools.—The following is a summary of the medical schools of Europe: Belgium, 4; Denmark, 1; Germany, 20; France, 6; Great Britain, Scotland, and Ireland, 32; Italy, 20; Netherlands, 4; Austria-Hungary, 6; Norway and Sweden, 4; Portugal, 1; Russia, 7; Switzerland, 5; Spain, 7—total, 117.

HENRY M. HURD.

VII. LAW SCHOOLS.

In Continental Europe.—With the revival of interest in the Roman law, students flocked to the mediæval universities, notably to Bologna and Paris; and in countries where the system of law is essentially Roman the tradition of obtaining one's legal education at a university is still maintained. Indeed, upon the continent of Europe a university law school is the only avenue to the legal profession. In Germany, for example, the course for one aiming at a legal career is plainly defined. He must first complete the curriculum of a gymnasium; he must then study law for three years at a university and pass an examination at the end of the course; after this theoretical study he must, if he means to be a judge or an advocate, give three years to the "service of practical preparation." Then, upon passing a second state examination, he may expect an appointment as an inferior judge when a vacancy occurs, or, if he prefers to practice, he may be admitted to the body of advocates. One wishing to be a law-professor dispenses with the three years of practical work, and seeks first, by passing a special examination, the position of privat docent. His subsequent promotion to assistant professor and professor will depend wholly upon his ability and success as a private lecturer, for the ranks of the law-professors are recruited, not from judges and successful practitioners, but exclusively from those who have won their spurs as younger teachers. What is true of Germany is, in the main, true of the other continental countries.

In England.—The history of legal education in England has been widely different. The English law was not Romanized and English lawyers were not bred at Oxford or Cambridge. Since the fourteenth century legal education has been in the hands of the four Inns of Court, Lincoln's Inn, Gray's Inn, the Inner Temple, and the Middle Temple. These, with the ten dependent Chancery Inns, have been called by Fortescue and Coke a legal university. In the days of these writers the term was not inapt. The membership of the Inns of Court was made up of students, barristers, readers, and benchers. A student after eight years was admitted to the degree of barrister. From the barristers of longest standing were chosen annually two readers, each of whom was to give a dozen readings or lectures to the members of the Inn, and to preside at mootings. The readers after performing these duties became benchers or governors of the Inn. The two courses of readings were delivered in vacation, and each reading with the discussion that followed between the reader and some of the barristers occupied the morning hours. In term-time the members of the Inns would naturally be engaged in the forenoon in court. Both in term-time and vacation much time was given after dinner and after supper to boltings, i. e. conversational arguments upon cases put to the students by a bencher and two barristers sitting as judges in private, and to mootings, which were public arguments by barristers before the benchers. This continued discussion of points of law could not fail to develop legal acumen and the art of ready speaking. But the readings and the discussions came in time to be regarded as too great a burden. They were at first shortened and finally, in the latter half of the seventeenth century, given up altogether. Membership in an Inn of Court for three years became the sole requisite for a call to the bar. A legal education being no longer obtainable in the Inns of Court, students of law trusted to private reading, supplemented at first by experience in attorneys' offices; but after Lord Mansfield's time the chambers of special pleaders, conveyancers, or equity draughtsmen were resorted to instead of attorneys' offices. Since the middle of the nineteenth century attempts have been made to convert the Inns of Court into a genuine law school, but thus far with very little success. Annual courses of lectures on five subjects have been introduced, upon four of which students must pass examinations before being called to the bar. The attendance at these lectures is not large. At Oxford and Cambridge there are courses both in Roman and English law, but the attendance is small. Another generation may see the establishment of a true law school, but private study and the attendance at the chambers of a barrister are still the normal mode of learning law in England.

In the United States.—This same method was naturally adopted so far as practicable by the English colonists in North America; but the English distinction between the upper and the lower branches of the legal profession was not followed, the law work of the barrister and the business of the attorney being united in the same person. For this reason the office of a lawyer in the U. S., regarded as a place for legal training, was distinctly inferior to the chambers of the English barrister. It is doubtless to a sense of the inadequacy of a law office to give a satisfactory legal education that is due the early origin and later widespread success of the

American law school. It is claimed that the earliest law-school in the U. S. was at the College of William and Mary in Virginia. Chancellor Wythe was certainly appointed Professor of Law in that college in 1779; but it may be doubted if a law school, in the proper sense of the term, existed there at that time. Be this as it may, the famous school at Litchfield, Conn., may justly be regarded as the parent of law schools in the U. S. This school was established by the Hon. Tapping Reeve in 1782. The Hon. James Gould was associated with him in 1798, and after Judge Reeve's retirement in 1820 remained in charge of the school until its discontinuance in 1833. This school was eminently successful in attracting a high class of students from all parts of the U. S., the average attendance being about twenty-five a year. The course, with two months' vacation, occupied fourteen months. The instruction was by lectures, thrown into the form of legal treatises, specimens of which may still be seen in *Reeve's Domestic Relations* and *Gould's Pleading*.

Mention should be made of sporadic and ephemeral courses of lectures delivered by Judge James Wilson at the College of Philadelphia in 1791 and 1792, by James Kent, Esq., afterward Chancellor Kent, at Columbia College, New York, in 1797, and by Prof. Stearns at Harvard College from 1815 to 1817. But it is still true that the Litchfield school was for many years without a rival, the Harvard Law School, the oldest of all existing law schools, not being established until 1817. The first dozen years of this new school were full of discouragement. Most of those who desired a law-school education still resorted to Litchfield, or, during the years 1823–29, to another successful private school at Northampton, Mass., conducted by Judge Samuel Howe and John Hooker Ashmun. The prosperity of the Harvard school dates from its reorganization in 1829 when Judge Story and Mr. Ashmun were appointed professors. In 1833, when the Litchfield school was given up, there were law schools at Harvard, University of Maryland, Yale, University of Virginia, Cincinnati College, and at Transylvania University, Kentucky, with less than 150 students in all. There were two new schools in the next decade, at Dickinson College, Pennsylvania, and at the University of Indiana. Five more were established between the years 1846 and 1850. In 1860 the number of law schools had risen to twenty-two, with a total attendance in that year of about 1,000 students. The following table gives the law schools existing in the U. S., with the date of their foundation, the length of the course, and the number of students in the academic year 1893–94:

NAME OF LAW SCHOOLS.	Date of establishment.	Length of course, years.	Number of students in 1893–94.
Harvard	1817	3	353
University of Maryland	1822	3	146
Yale	1824	2*	188
University of Virginia	1826	2	139
Cincinnati	1833	2	158
Dickinson	1836	2	56
University of Indiana	1842	2	66
University of Louisville	1846	2	47
University of North Carolina	1846	2	66
Tulane	1847	2	75
Cumberland	1847	1	74
Washington and Lee	1849	1	62
University of Pennsylvania	1850	3	228
Albany	1851	1	43
De Pauw	1855	2	37
University of Mississippi	1855	2	20
Columbia	1858	3	270
University of the City of New York	1858	2	251
University of Georgia	1859	1	21
Northwestern	1859	3*	139
University of Michigan	1859	2	607
M'Kendree	1860	2	27
Columbian	1865	2	328
University of Kentucky	1865	2	6
University of South Carolina	1866	2	24
St. Louis	1867	2	116
University of Iowa	1868	3*	200
University of Wisconsin	1868	2	169
Howard	1869	2	48
University of Notre Dame	1869	2	43
Georgetown	1870	2	267
Richmond	1870	1	28
Boston	1872	3	256
University of Missouri	1872	2	77
University of Alabama	1873	2	18
Illinois Wesleyan	1874	2	55
Mercer	1875	1	14
Vanderbilt	1875	2	30
Hastings	1878	3	140
University of Kansas	1878	2	82
University of West Virginia	1878	2	47

* Prior to 1895–96 the course was two years.

LAW SCHOOLS IN THE UNITED STATES—CONTINUED.

NAME OF LAW SCHOOLS.	Date of establishment.	Length of course, years.	Number of students in 1893–94.
National University	1879	2	96
Northern Indiana Normal School	1879	2	123
Central Tennessee	1879	2	10
Chaddock	1880	2	8
Allen	1882	2	...
Iowa College of Law	1883	2	63
University of Texas	1883	2	103
National Normal	1884	2	22
Willamette	1884	2	5
University of Oregon	1885	2	72
Emory	1886	1	1
Buffalo	1887	2	50
Cornell	1887	3*	228
University of Minnesota	1888	2	310
Shaw	1888	3	10
University of Tennessee	1888	2	19
Lake Forest	1889	2	479
Arkansas Industrial	1890	2	31
Sioux City	1890	2	14
Atlanta	1891	2	17
University of Nebraska	1891	2	53
Metropolis	1891	3	162
New York	1891	2	467
Ohio State University	1891	3	72
Detroit College of Law	1891	2	65
University of Colorado	1892	2	28
Denver	1892	2	67
Kent	1892	2	163
Western Reserve	1892	3	34
Leland Stanford Junior	1893	3	65
University of the South	1893	1	11
Centre College	1894	2	...
Wake Forest	1894	2	...
American Temperance University	1894	.	...
Total, 75 schools	...	..	7,804

* Prior to 1895–96 the course was two years.

Fifty-three law schools have been organized since the civil war—seventeen in the period 1890–95. There were 3,906 students in law schools in 1888–89, and 7,804 in 1893–94. This shows the rapidly growing conviction that a legal education is best acquired in a law school. It is noticeable also that at only eight of the seventy-five schools is the course limited to a single year. In eleven the course extends over three years. It is highly probable that in a few years a majority of the schools will have the three years' course. Furthermore, all but seven of the seventy-five schools are university schools. The significant feature of legal education in the U. S., it will be seen, is the wide departure from English traditions in favor of study with a practicing lawyer and the close approximation to the continental principle of university legal training. This result has been reached not by imitation of continental methods, but by an independent development. There are still important differences. Upon the continent of Europe the student's attendance at the university law school is compulsory, while in the U. S. it is optional. In continental countries a collegiate education is a prerequisite to admission to the law school. In the U. S. the great majority of law students have no academic degree, and the standard of admission requirements is lamentably low, although gradually rising. The Harvard Law School, indeed, after the academic year 1895–96 will, with rare exceptions, give the degree of LL. B. only to college graduates.

Methods of Instruction.—There is, as yet, no consensus of opinion as to the best mode of teaching law in a law school. In the European universities the professors teach almost wholly by lectures, but the *seminar* courses, in which the students and the professor discuss the original authorities, are growing in favor. In American law schools, also, in early days the instruction was generally given in the form of lectures, but since the multiplication of legal treatises the lecture method has been largely superseded by the recitation method. The student reads a certain number of pages of a given text-book, upon which he is catechised in the classroom by the professor, who also expounds and criticises the treatise. In 1870 the inductive and genetic method, which is almost universally adopted in the teaching of other sciences, was for the first time used in the teaching of law. To Prof. Langdell, dean of the Harvard Law School, belongs the honor of this innovation. The chief merit of this new system lies in its development of the habit of intellectual self-reliance. The text-books used contain, not a treatise or commentary upon the original sources, but the original sources themselves, being collections of cases upon various branches of the law, properly classified and so arranged as to show the historical development of legal prin-

ciples. These cases are subjected in the class-room to a thorough analysis and comparison by the students, who are made to feel, so far as possible, that they and the instructor are fellow students engaged in the common pursuit of scientific truth. In a word, the students apply to the questions successively arising in the orderly development of a branch of law the same method which is employed by a successful barrister in solving the heterogeneous questions arising in active professional life. The inductive method, or, as it is frequently, but unfortunately, called, the case method, of teaching law has been adopted by all of Dean Langdell's colleagues at the Harvard Law School. It is also the exclusive or prevailing mode of instruction at the law schools of Columbia College, Northwestern University, Western Reserve University, and at the Metropolis Law School, and has also been adopted in one or more courses at the following law schools: Cornell, Leland Stanford Junior, University of Colorado, Columbian, University of Iowa, University of Michigan, University of Minnesota, St. Louis, University of the City of New York, University of Pennsylvania, University of the South, University of Tennessee.

JAMES BARR AMES.

VIII. TECHNICAL SCHOOLS.

Under this head must be included polytechnic institutes, institutes of technology, schools of technology, schools of applied science, mining schools, all schools, in fact, in which the sciences are taught with a view to their practical application to the promotion of the material interests of man. There will necessarily be included also technical departments of colleges and universities, some of which have distinct and separate organization as to faculties of instruction, and often a distinctive name, although controlled by the same corporate body as other departments, while others are little more than technical or professional courses of study, in which instruction is given by the college or university professors.

It is difficult to point out the exact beginnings of technical education, when considered in a general sense as education specially planned to prepare young men for the occupations in which they are likely to be engaged during their active lives. Perhaps the earliest authentic records of such a system of training are those of the ancient Persians. The curriculum, like many in more modern times, was tripartite. It included riding, shooting with the bow, and speaking the truth. The first two accomplishments may rightly be considered as technical in their character, being evidently closely related to the probable future occupation of the young men being educated. That speaking the truth was then considered of sufficient importance to form an essential element of this training is extremely interesting, especially as it appears to have furnished about all there was of the moral-intellectual side of the educational discipline. The purely intellectual found its earliest pronounced development among the Greeks, and technical education had little recognition at their hands. It is true that Aristotle evolved and taught an elaborate system of natural philosophy, but when it is remembered that it was founded on two principles, namely, the principle of generation and the principle of corruption, it is easy to admit that the growth of science was enormously retarded during the nearly 2,000 years over which the influence of Aristotle was dominant. Archimedes, another Greek, living a century later, was the founder of applied science, the great forerunner of the noble army of engineers which has brought the forces of nature into subjection for the benefit of man. He was the first to possess some knowledge of the fundamental principles of mechanics. Out of a clear insight into the doctrine of equilibrium he created the science of statics, one of the two pillars on which the best part of engineering rests. He possessed two accomplishments, even now necessary and all but sufficient to the production of a successful engineer. He had the skill and instincts of a mechanic, and he was a profound mathematician.

In spite of the life and work of Archimedes, the influence of Aristotle remained paramount for many centuries, and throughout all Europe; but a new era began with the appearance of Galileo, who was especially fitted for the task which seems to have awaited his coming. Possessed of many accomplishments, music, painting, eloquence, with charming manners, he was at the same time bold and courageous. At the age of nineteen he began his career as an experimental philosopher by making a discovery which the world will never forget, and which was the beginning of a series resulting in a few years in the establishment on an experimental basis of the fundamental principles of dynamics. These had been beyond the grasp of Archimedes, but the work of the Italian furnished the other pillar upon which, through a system of rational mechanics, the science and art of engineering might now rest. For the first time it came to be recognized that whenever possible every dictum of the science of philosophy should be subjected to the inexorable tests of trial and experiment before acceptance, and the reign of authority was ended, although not without a struggle.

It would seem that the times were ripe for this development, for contemporaneous with Galileo were two Englishmen, Dr. William Gilbert and Lord Bacon, who bore a prominent part in the work. The work of Gilbert, although relatively very narrow and restricted, was on the same high plane of originality as that of the Italian, and furnished one of the earliest and very best examples of the purely experimental method of discovering truth. That of Bacon, while generally over-estimated, was valuable as a formulated expression of the principles of the new philosophy, and a masterly analysis of the methods of inductive reasoning. The labor of these men resulted in the destruction of the method of antiquity. They were followed by Kepler, Newton, and a host of others, who, by creating science, made applied science possible.

Much time elapsed, however, before experimental science was admitted to the sacred precincts of the college curriculum. Brilliant scholars had made beautiful discoveries concerning the interrelation of natural phenomena, the exposition of which at once charmed the cultivated and delighted the ignorant. Practical applications of these discoveries were made from time to time, by means of which the comforts of life were enormously multiplied and wretchedness and anxiety enormously lessened; but all of these originated in more or less irregular and sporadic examples of scientific activity. Science had, it is true, found its way into many institutions of learning before the beginning of the nineteenth century, but the methods of instruction in vogue were those then, and until recently, in use in teaching mathematics, language, philosophy, and history. Such experimental studies and research as were carried on were mostly the private work of the professors; students continued to learn from books only, as they were accustomed to do in other subjects, and independent thinking was not encouraged. As early as the beginning of the nineteenth century, however, the importance of a systematic study of the applications of scientific discovery to the practical affairs of everyday life was felt by more than one man, and the possibility of an organized effort to encourage experimental research and the pursuit of applied science was recognized. The establishment of the Royal Institution in London by Count Rumford was an epoch in the history of science. He unquestionably had in his mind a technical school or college of the modern type. He founded the institution that it might serve for "the general diffusion of the knowledge of all new and useful improvements, and teaching the application of scientific discoveries to the improvement of arts and manufactures, and to the increase of domestic comfort and convenience." It originally contained a workshop for blacksmiths, with a forge and bellows, all sorts of models of machinery, and at one time a score of young mechanics were boarded and lodged in the house. But, fortunately indeed for the world at large, it was not destined to continue as an example of what its founder evidently intended it to be, and what has been so abundantly realized in other more recent institutions. One of the first men to begin the work of the Royal Institution was Davy, and he quickly inaugurated for it a career on a distinctly higher plane. By a rapid evolution it became the most famous laboratory of research in the world, and even its founder would be compelled to admit that by its devotion to pure science and seeming neglect of the practical it has been infinitely more useful to those whom it was originally planned to benefit than if it had been held closely to the lines at first laid down. The splendid and continuous series of epoch-making discoveries by Thomas Young, Davy, Faraday, Tyndall, and Rayleigh constitute an everlasting monument to the founder of the institution.

Indeed it may be safely affirmed that during the first half of the nineteenth century the time was not yet ripe for the establishment of the technical school as it now exists. A science must come to be more or less of an exact science, and it must have accumulated a tolerably well-di-

gested and compact body of facts and principles before its application to practical problems can be undertaken with assurance of success. The splendid researches carried out by a generation of scholars now passed away were essential to successful development of the school of technology, and in a still greater degree were the methods of scientific investigation necessary to that development. Observation and experiment came to the front, and for the first time in the history of education began to be esteemed at something like their full value. It came to be understood that the path to success was not alone through the study of books, but that the study of things was more important. What is known as the "laboratory method" of instruction began to be adopted in the most progressive institutions of learning, and soon proved itself to be vitalizing and powerful. All other departments of learning were forced to become the imitators of science in the use of this method, and the "new education" resulted. Many feared the effect upon the courses of study tending to produce what was long erroneously called a "liberal education," but it was soon found that if the simple "culture effect" be considered alone, the new education asks no odds of the old, while in the production of sound thinking and a virile intellectuality it is far and away ahead.

All of this was a necessary forerunner to the perfectly organized school of technology, but as a matter of fact the development of the latter was in a large measure contemporaneous with the evolution of the new education as outlined above. A class of professional schools has existed, indeed, almost as long as education itself, namely, those organized and maintained for the training of clergyman, lawyers, and physicians. Military schools have also long been in existence, and out of these latter came the beginnings of technical instruction.

In Europe this beginning is to be found in the creation of the celebrated École Polytechnique in France, in the third year of the Convention (1794). It was primarily for the training of young men in mathematics and drawing, to fit them for the Engineer and Artillery Corps of the French army. It owes much of its excellence to the labors of Carnot, who strove to give it a secure and proper foundation. The number admitted to its classes was limited, and only the best of the candidates were selected. Some of the most celebrated military and civil engineers of France have received their training there, and it has numbered among the members of its faculty such famous men as Lagrange, Laplace, Berthollet, Poisson, etc. It continues to adhere with considerable conservatism to the principal methods of its early history, and, in spite of innumerable competitors that have sprung up since its foundation, its rank is among the highest.

The famous School of Mines at Freiberg, earlier in its establishment by many years, has enjoyed a long and illustrious career, and is an excellent type of a technical school differing very decidedly from the École Polytechnique. In its early development, amid the rich mining resources and industries of Saxony, it illustrates the general principle that nearly every one of the first technical schools owes its origin to the demands of the leading industry in its immediate vicinity, by which also the character of its instruction was largely determined. Influenced largely by this principle, schools of technology became very numerous throughout continental Europe during the first half of the nineteenth century. Most of them have kept pace with the extraordinary development of science and scientific methods which has taken place during the last half of the century; their facilities for instruction have increased, and their courses of study have become largely professional. The polytechnic school has begun to assume its proper place in European schemes of education as something quite distinct from the earlier trade schools, from which, however, it was in many instances evolved. Besides France and Germany, Austria, Sweden, Switzerland, and Russia have maintained technical schools of high repute. Indeed, the U. S. is indebted to Russia more than to any other nation for some of the most important and valuable features of the modern school of technology. It was at two famous Russian schools, the Imperial Technical School, at Moscow, and the Institute of Technology, at St. Petersburg, that the experiment was first made of combining in the engineering courses the study of text-books, lectures, and other exercises long known to form a necessary part of scholastic training, with practical exercises in workshops in which the student was made familiar with machines, their construction and use, and the nature of the materials upon which they worked. Many of the older and more conservative schools in Europe have been reluctant to follow the example of the Russians, but the numerous and great advantages of the method have been recognized in England and in a still greater degree in the U. S., where nearly every school of technology has adopted the Russian plan in a greater or less degree.

Great Britain, although contributing more largely, perhaps, than any other nation to those scientific discoveries upon which all technology is based, was slow to realize the necessity for technical education. It was not until it became evident that France, Germany, and other nations of continental Europe were likely, through their encouragement of technical schools and colleges, to deprive the United Kingdom of the prestige of first place in engineering and manufacturing skill, that the British began to develop this side of their educational system. Much interest was suddenly created, royal commissions were appointed, the work of foreign countries was examined and reported upon, and organized efforts resulted in the rapid advancement of the interests of technology. One organization, extensive in scope and comprehensive in plan, deserves more extended notice, even in a brief treatment of the subject. It is the City and Guilds of London Institute for the Advancement of Technical Education. The Prince of Wales is the president of the institute, and among its vice-presidents are the lord mayor of London, the president of the Royal Society, the president of the Institute of Civil Engineers, and many other of the most eminent men of Great Britain. The operations of the institute include the management of three London colleges and the system of technological examinations. The three colleges are the City and Guilds Central Technical College, which is "a college for higher technical instruction in mechanics and mathematics, civil, mechanical, and electrical engineering, and chemistry," the City and Guilds Technical College at Finsbury, and the London Technical Art School. The scheme of technological examinations is very elaborate and ambitious. Examinations are conducted once every year at various centers in the United Kingdom, upon a wide variety of technical subjects, more than sixty in number. Prizes and honors are awarded, and in some cases grants of funds are made. The object is to encourage local development of technical education, and the results are commensurate with the magnitude of the undertaking.

In the U. S. the earliest foundation for technical education was that of the Rensselaer Polytechnic Institute at Troy, N. Y. It was established in 1824 by Stephen van Rensselaer as a School of Theoretical and Applied Science. In the early years of the republic it was the necessary custom to employ learned and skilled foreigners in various public works, and most of the engineers at first engaged on the construction of canals and roads came from France. Many young men were sent there from the U. S. to be educated, and the Rensselaer School evidently owed its origin to a desire on the part of its founder to create an institution capable of supplying this demand. Its work has been mostly confined to the education of civil engineers, in which it has had a long and successful career.

About the middle of the century the importance of the sciences of chemistry, physics, geology, etc., had become so evident that several of the more important colleges established special departments for scientific work. The old education still held sway, and was at most only willing to admit the new as a sort of annex, but carefully avoiding responsibility in most cases by providing quite a distinct organization for the scientific school. The Sheffield Scientific School of Yale University was the earliest of these, having been founded in 1847. It was followed by the Lawrence Scientific School of Harvard University in 1848, and the Chandler Scientific School of Dartmouth College in 1852. The first two were for a long time schools of science rather than its applications, although they have latterly taken more of the character of schools of technology with thorough courses in several branches of engineering. The school at Dartmouth College has confined its work largely to civil engineering. All have done work of a high order.

Technical education in the U. S. received its greatest impetus, however, during the later years of the civil war and those first following its close. This must be attributed to two causes: First, the passage of the Morrill Act by which large land grants were made to the several States for the purpose of enabling them to establish institutions for giving instruction in agriculture and mechanics; second, the very

extensive endowment of schools of technology during these years by private munificence. At this time the great mineral resources of the country began to receive the attention they deserved; the civil war had demonstrated the great value of technical knowledge and skill, and by the rapid rise in the value of real estate near cities and towns, and also by reason of the enormous expenditure of the Government for supplies during the period of the war, many men found themselves masters of larger fortunes than they had ever hoped to possess. Some of them were wise enough to return a good share of their accumulations to the people through educational endowments.

From these two sources came a number of technical colleges, which easily divide themselves into two great classes. In the first are found principally those schools owing their existence to the national land grant and a few others, including some of the early schools already mentioned, all of which are departments or schools or colleges belonging to a university or college organization. Probably half of the institutions growing out of the land grant fund have special courses in the various branches of engineering and other technical subjects. Among those best known for the strength of the technical courses may be mentioned Cornell University, at Ithaca, N. Y.; Purdue University, at Lafayette, Ind.; the Universities of Wisconsin, of California, the Ohio State University, at Columbus, and the Illinois Industrial University. To these should be added, as among the more important technical schools attached to colleges or universities not founded or supported by the land grant fund, the Sheffield, Lawrence, and Chandler Scientific Schools mentioned above, the Thayer School of Civil Engineering, also connected with Dartmouth College, the School of Engineering of the Washington University at St. Louis, organized in 1870, and the School of Mines connected with Columbia College, New York.

In the second class are found schools of technology on an independent and separate foundation, and mostly the outcome of private endowment. The earliest of these was the Rensselaer Polytechnic Institute, already referred to. The next in order of time and one of the foremost in the country is the Massachusetts Institute of Technology, at Boston. It had its origin in a report prepared by Prof. William B. Rogers, entitled *Objects and Plan for an Institute of Technology, including a Society of Arts, a Museum of Arts, and a School of Industrial Science.* It was chartered in 1861, and opened to students in 1865. The school of Industrial science has grown to be the foremost feature of the institute, although the other features are still retained. The next in the order of the date of incorporation is the Worcester Polytechnic Institute, at Worcester, Mass. It was incorporated in 1865, and its first building opened to students in 1867. It was the first school of technology in the country to add a workshop to its equipment for the instruction of mechanical engineers and systematically to provide workshop practice as a part of the course of study. In this class should also be included Lehigh University, at South Bethlehem, Pa., incorporated in 1866. Although bearing the name university, and providing courses of study in general literature as well as in technical subjects, the location of the school in the heart of a region rich in mineral resources has given it such a bent in the direction of applied science that it may not unjustly be regarded as a school of technology. In 1871 the Stevens Institute of Technology was established through the munificent liberality of Edwin A. Stevens, himself a noted engineer. The Case School of Applied Science was opened in Cleveland, O., in 1891, and the Rose Polytechnic Institute, at Terre Haute, Ind., in 1883. All of the schools named as belonging to the last class owe their origin to private endowment. The Massachusetts Institute of Technology receives a share of the congressional aid to land grant colleges.

The courses of study in the schools of technology in the U. S. extend through four years in nearly every instance. Students are not usually admitted under sixteen years of age, and the requirements for admission are not, in general, lower than those of other institutions of college rank, and in some instances they are higher. Modern languages are usually required for admission instead of Latin and Greek. The courses of study generally include, besides mathematics and the more purely technical subjects and sciences, language, history, and political economy, differing in this respect from many of the European technical schools. They differ widely as to the range of their technical courses, a few confining themselves almost exclusively to civil engineering, or in some cases to mining engineering, while the greater number include civil, mechanical, and electrical engineering and chemistry, to which in a few instances are added mining engineering, sanitary engineering, architecture, and general scientific courses. The instruction is largely of a practical character, extensive use being made of laboratories, workshops, etc. Considerable difference exists in the character and amount of workshop practice as a part of the course in mechanical engineering. In some schools this is largely restricted to hand and bench work, little or no attention being given to construction. In others, the use of machine tools and experience in the actual construction of machines, and the assembling of their parts, is regarded as of paramount importance to the engineer. In all schools of technology worthy of the name the methods of instruction are such as tend to create independence of thinking and personal responsibility in judgment. With properly managed courses of study they are not deficient in the production of that intellectual discipline and culture which constitute a liberal education. While not organized for original research, their methods naturally lead to it, and in the U. S. they have probably during the period of their existence contributed more to the advancement of science than have educational institutions non-technical in character. They represent one of the most important achievements of an age whose chief glory is found in the increase and diffusion of science and its applications.

T. C. Mendenhall.

IX. Trade Schools.

The inception and growth of the trade-school idea is, strictly speaking, confined to the nineteenth century. As an institution the trade school is purely a logical outgrowth of the changes in industrial methods which have taken place since the invention of the steam-engine. In the days of the guilds, when all production was in the hands of the master workman and his corps of journeymen, the youth seeking a trade found his natural place in the household of his master, where during the long years of his indenture he was initiated into all the secrets of the craft. With the introduction of machinery, however, a great change began in industrial methods. The economic advantage of quantity production, coupled with the division of labor, appeared, and the master, no longer simply the master craftsman, has gradually developed into the directive head of an industrial establishment. No longer working with his own hands, he uses his brain to direct more effectively the hands of many. Under these conditions the natural relation between the apprentice and his master has ceased, and without any provision for systematic training the apprentice, except in rare instances, is left to pick up the practice of his trade by observation and to such opportunities as chance and the good nature of his fellow workmen afford. Under such conditions a large amount of time is inevitably wasted and the training obtained liable to be one-sided and lacking in thoroughness.

Object of the Trade School.—The trade school represents an attempt to provide a modern substitute for the apprenticeship system better suited to these changed conditions. Before discussing the institutions engaged in such instruction it will be necessary to make clear certain distinctions in purpose and methods existing among the present schools. The trade school proper, with which this article is immediately concerned, is an institution designed to prepare handicraftsmen for practical work at a trade. Such a school may or may not include instruction other than manual, but its primary object is manual dexterity. Such schools are represented by the *Fachschulen* of Germany and Austria and the trade schools of the U. S. A technical school is an institution in which, in addition to practical instruction in the methods of a craft, the scientific principles upon which it is founded are thoroughly explained and their bearing upon the operations of the trade clearly demonstrated. Such schools may prepare superior craftsmen, fitted to become foremen or superintendents, or they may produce designers. The Pennsylvania School of Industrial Art and the weaving-school at Crefeld, Germany, are typical examples of such schools.

Schools in Continental Europe.—On the continent of Europe a large amount of study and experiment has been given to the problem of industrial training, and trade and technical schools have there reached a high point of organization and efficiency. This is particularly true of Germany, Austria, Belgium, and France. In Germany and Austria the system of trade schools is very thorough and much special-

ized. General industrial schools, in which a number of trades are taught, are found throughout the two empires, while special trade schools, in which one particular branch is dealt with, are distributed according to local needs. Thus there are special trade schools for silk-weaving, linen-weaving, watch-making, wood-working, mason-work, machine-work, brewing, etc. Courses in these schools are generally from three to five years in length, and embrace, besides practical trade-training, instruction in mechanical and free-hand drawing, geography, business forms, mathematics, book-keeping, and science. From the nature and extent of the instruction many of these schools should more properly be classified as technical schools, and even when the object is merely to combine the elements of a general education with the training of a handicraftsman the large amount of time required prevents their benefits being very generally reaped by the artisan class. The actual effect of these schools is in consequence rather to prepare a limited number of graduates fitted for superior workmen and foremen than to supply a means of training the great mass of artisans.

The aim of the Belgian schools approaches more nearly to that of a true trade school than those of the schools just described. Trade proficiency rather than an all around education is the end sought. Mental instruction is indeed generally provided, but its character is limited to such branches as have a direct bearing upon the trade. Besides a number of institutions supported by guilds and trade-unions, as well as several parochial schools in which practical trade-training is furnished, two very comprehensive trade schools exist at Tournay and Ghent. In these schools the pupil upon entering selects a special trade, which he pursues for a course of three years. Instruction is given in these schools in drawing, mathematics, science, and industrial economy.

In no country is the character of trade and technical instruction more differentiated than in France. In each of the French schools the grade of product aimed at, whether it be artisan, foreman, superintendent, or engineer, is accurately defined. Of the first mentioned class are the manual apprenticeship schools, into which boys are admitted at twelve or thirteen years of age. These schools are municipal institutions receiving state aid. They are in fact elementary trade schools which devote the greater part of a three years' course to practical manual work. The aim is not to turn out full-fledged workmen, but rather to shorten the period of apprenticeship. Mental instruction to the extent of three or four hours a day is given throughout the course. There are schools of this character in Paris for the mechanical trades, for bookmaking, and for furniture-making. Other schools exist at Havre, St.-Étienne, Rheims, Nantes, and St.-Chamond. Besides these municipal schools there exists a system of national apprenticeship schools, which are divided into primary and secondary grades. The primary schools are similar in character to the municipal schools, but afford somewhat more advanced instruction. In the three secondary schools at Châlons, Angers, and Aix, the instruction in both theoretical and practical branches is very thorough, and is such as to fit the graduates to become superintendents and masters of industrial establishments. The course is three years in length, and pupils must be between fifteen and seventeen years at entrance.

Great Britain.—In Great Britain trade schools (with one or two possible exceptions) do not exist. There are a large number of technical schools representing a great variety of aims and methods in which workshop instruction plays a part, but the principle almost universally obtains that a trade can only be properly acquired in a regular shop.

The United States.—Practical trade-school work in the U. S. began with the foundation of the New York trade schools in 1881. At first the work of these schools was confined entirely to evening classes. From the beginning the aim has been to train beginners for practical work at the trades. It is not designed, however, to reach the expertness of the finished mechanic, but rather to give a thorough grounding in the science and practice of the trade, leaving speed and experience to be acquired in after-practice at the trade. These schools have been pre-eminently successful. Starting with thirty-three pupils in 1881, the attendance has steadily grown, until in 1893 it reached 556. Manual instruction is supplemented in all classes by instruction upon the nature of materials and the scientific principles involved in the trade. Schools of like nature have been established by the Philadelphia Master Builders' Exchange and by the Pratt Institute of Brooklyn. In all of these institutions the principle obtains of confining the instruction given in the schools to an essentially practical preparation for the trade and to pupils of sufficient age to learn rapidly, leaving the general education to be gained in the common schools previous to entering.

This system has received the endorsement of the National Association of Master Builders, who at their meeting of 1888 at Cincinnati passed resolutions recommending that a lad who wished to enter the building trades should go at first to a trade school to learn the science and practice of his trade. When the trade-school course is finished and he has proved by an examination held by a committee of master mechanics that he has profited by it, he is to enter a workshop as a "junior." When old enough and able to do a full day's work he is to apply for a second examination, which if passed entitles him to be considered a journeyman.

This system seems well suited in its essentials to the needs and genius of the people of the U. S. and destined to develop throughout the country. One great obstacle to progress, however, is the attitude of the labor-unions, who oppose the entrance of trade-school graduates into the trade upon the same ground that they seek to limit the number of apprentices. In order to secure a full and free development of the trade-school movement in the U. S., a recognition of the trade-school graduate by the organization of the journeymen as well as by organizations of masters is necessary, and his establishment with a definite place and a definite economic value in the industrial world. C. R. Richards.

Schools of Fine Arts: See the Appendix.

School Statistics: See the Appendix.

Schooner: a vessel with two or more masts and fore-and-aft rigged; or, if the foremast have a square topsail, the vessel is called a topsail schooner. When sailing by the wind, schooners have an advantage over square-rigged vessels, and they are easily handled by a small crew.

Schoonmaker, Augustus: lawyer; b. in Rochester, Ulster co., N. Y., Mar. 2, 1828; was educated in the public schools of his native town; 1848–50 taught in the district schools of the county; in 1851 began the study of law, and was admitted to practice in 1853. He was elected county judge in 1863; re-elected in 1867; in 1875 was elected to the State Senate, where he drafted a bill to provide for uniformity of text-books in the common schools, which embodied the principle of the one which finally became a law of the State. In 1877 he was elected attorney-general of the State, and during his term of office (1877–79) had to deal with the questions relating to the release of William M. Tweed, the complications of the Erie Railway, the new apportionment under the census of 1875, and the constitutionality of that portion of the New York city charter creating a board of estimate and apportionment. In 1883 he was appointed one of the civil-service commissioners of New York. In 1887 he became an interstate commerce commissioner. D. in Kingston, N. Y., Apr. 10, 1894.

Schopenhauer, shō'pen-how-er, Arthur: philosopher; b. in Dantzic, Prussia, Feb. 22, 1788. His father was a banker; his mother, Johanna, a writer of novels and books of travels. He entered the University of Göttingen in 1809; studied philosophy under Schulze the skeptic, and gave especial attention to Kant and Plato; in 1811 heard the lectures of Fichte at Berlin; wrote his famous essay, *On the Fourfold Root of the Principle of Sufficient Reason*, for his degree at Jena in 1813; adopted Goethe's theory of colors, and wrote in 1816 an essay *On Seeing and Color*. His principal work, *The World as Will and Representation*, was composed in Dresden and published in 1819. After a visit to Italy he settled at Berlin University as docent, and remained there in this capacity until 1831, with the exception of some intervals spent in Italy. Want of success as a lecturer caused his withdrawal from Berlin in 1831 to Frankfort-on-the-Main, where he spent the rest of his life in seclusion, and died Sept. 21, 1860. His characteristic doctrine is pessimism. The world is the worst of possible worlds. We can alleviate our lot in it by sympathizing with the suffering, and in a still more effectual way by an asceticism which destroys our will to live. This view of the world he connects with his doctrine of the Will, but not in a very obvious manner. According to him the Will is the only substantial essence in the universe; it is Kant's "thing in itself." The intellect, consciousness, our entire theoretical activity, is simply a result of the Will in its higher forms. The Will constantly energizes toward life, and the stadia of nature are simply the instrumentalities of the Will created on its way to life. Mere matter, as the product of forces, is the lowest

stage, the result of blind Will; in chemical action, where there is reciprocal excitement to activity, the Will is manifested on a higher stage; finally, the Will objectifies itself in organisms, which do not depend upon externally exciting causes for their activity, but work from internal motives, and select likewise their own food, and hence need intelligence to convert blind exciting impulses into motives. The organism thus evolves a brain in which the Will manifests its highest objectivation. With the brain, and intelligence which is its function, there arises simultaneously, as result, the world as representation with all its forms: subject and object, space and time, causality, etc. The brain with its intelligence is therefore only the tool or instrument of the will to live. He adheres to the Oriental idea of annihilation, and considers the Christian idea of immortality a delusion. Hence "the happiest moment of life is the completest forgetfulness of self in sleep, and the wretchedest is the most wakeful and conscious." The world presents a continual tragedy before us, in which eternal justice becomes visible as the Nemesis which reduces to nullity again the individuals which have arisen like bubbles upon the surface of the Eternal Will. Hence the highest act of morality is resignation, renunciation. Enjoyment of art is the only permissible pleasure, because that is cognition devoid of Will. The Nirvana of the Buddhists is the ultimate desideratum in the view of Schopenhauer. In this world, which was the worst possible, the worst features in it, to Schopenhauer, were the contemporary philosophers, Fichte, Schelling, Hegel, and their followers, who achieved popularity and success, while he failed. He exhausted his ingenuity in inventing opprobrious epithets for these "professors of philosophy"; but the dependence of his own views upon contemporary systems is quite obvious, especially upon those of Fichte and Schelling. Optimism might as well have been the logical consequence of his theory that the energy of the Will develops the intellect as its tool; for the world as representation must be then regarded as the ultimate final product of the Will, and any pessimistic annulment thereof as retrogression to a less complete standpoint. It was therefore illogical to adopt Buddhism as a consequence of his system. Consistent elaboration would have developed a philosophy much resembling the earlier system of Schelling. Besides his three works already named, the following are important: *Upon the Will in Nature* (1836); *The Freedom of the Human Will* (1839); *The Basis of Morals* (1841). *The Parerga and Paralipomena* (1850) contains his views in a fragmentary form, and is the most popular of his works. The following of his works have appeared in English translations: (*a*) *The World as Will and Idea*; (*b*) *The Fourfold Root of the Principle of Sufficient Reason*; (*c*) *On the Will in Nature* (London); selections from his *Parerga and Paralipomena*: (*d*) *On the Misery of Life*, etc. (Milwaukee); (*e*) *The History of Philosophy*, etc.; (*f*) *Religion*, etc. (London). See his *Life*, by Helen Zimmern (1876), and by Wallace (Great Writers' Series, 1890). Julius Frauenstädt has edited his works, and done much to make known his doctrines. Edward von Hartmann, in his *Philosophy of the Unconscious*, presents in a modified form the philosophy of Schopenhauer. See Pessimism. William T. Harris.

Schopp, Kaspar: See Scioppius.

Schouler, James, A. B., LL. D.: lawyer and historian; b. at Arlington, Mass., Mar. 20, 1839; graduated at Harvard 1859; served in the civil war; practiced law in Boston and Washington, D. C.; author of legal text-books on *Domestic Relations*; *Personal Property*; *Bailments*; *Wills, Executors and Administrators*. He is more widely known as the author of *History of the United States under the Constitution* (5 vols., 1880–91). C. H. T.

Schouten, *sk*how'ten, Willem Cornelis: navigator; b. at Hoorn, Holland, about 1567. He was long employed by the Dutch East India Company, but resigned in 1610, and engaged with the merchant Isaac Lemaire to find a new route by the W. to the East Indies. Leaving the Texel June 14, 1615, he passed by the Strait of Magellan, discovered the passage named by him Lemaire Strait, was the first to double Cape Horn, and reached the Indies in safety. There he was arrested, but was subsequently acquitted, re-entered the service of the East India Company, and died on the coast of Madagascar in 1625. The Cape Horn route was speedily adopted as preferable to the Strait of Magellan; it is still used for sailing vessels. H. H. S.

Schouvaloff: another spelling of the name Schuvalov (*q. v.*).

Schrader, Eberhard: Orientalist; b. at Brunswick, Germany, Jan. 5, 1836; studied at the gymnasium in Brunswick and the University of Göttingen; Professor of Hebrew and Semitic Languages successively at Zurich, Giessen, Jena, and since 1875 professor and member of the Royal Academy at Berlin; author of *De linguæ Æthiopicæ cum cognatis linguis comparatæ indole universa* (1860); *Studien zur Kritik und Erklärung der biblischen Urgeschichte* (1863); *Einleitung in das alte Testament* (with de Wette, 8th ed. 1869); *Die assyrisch-babylonischen Keilinschriften* (Leipzig, 1872); *Die Keilinschriften und das alte Testament* (Giessen, 1872; 2d ed. 1883; Eng. trans. *The Cuneiform Inscriptions and the Old Testament* 2 vols., London, 1885–88); *Die Höllenfahrt der Istar* (1874); *Keilinschriften und Geschichtsforschung* (Giessen, 1878). Editor of *Keilinschriftliche Bibliothek* (1889, *seq.*). Benj. Ide Wheeler.

Schrader, Julius Friedrich: painter; b. in Berlin, Prussia, June 16, 1815; studied painting at the academy of his native city, at Düsseldorf 1837–45, and in Rome 1845–47, and was appointed professor at the Academy of Berlin in 1851. His most celebrated pictures are *The Death of Leonardo da Vinci* (1851); the great fresco in the New Museum of Berlin, *The Consecration of the Church of St. Sophia in Constantinople* (1853); *Esther before Ahasuerus* (1856), and a number of portraits.

Schrader, Otto: comparative philologist; b. at Weimar, Germany, Mar. 28, 1855; educated at the gymnasium in Weimar, and at the universities at Jena, Leipzig, and Berlin; teacher in the gymnasium at Jena, and assistant professor in the University of Jena; author of *Linguistisch-historische Forschungen zur Handelsgeschichte und Warenkunde* (1886); *Sprachvergleichung und Urgeschichte* (1883; 2d ed. 1890; Eng. trans., *Prehistoric Antiquities of the Aryan Peoples*, 1890); *Victor Hehn, ein Bild seines Lebens und seiner Werke* (1891); edited the 6th (revised) edition of Hehn's *Kulturpflanzen und Hausthiere* (1894). B. I. W.

Schreiner, W. P.: See the Appendix.

Schreyer, Adolf: animal-painter; b. at Frankfort-on-the-Main, Mar. 9, 1828; studied at the Städel Institute, Frankfort; medals, Paris Salons, 1864, 1865, and 1867; medals at Brussels Exhibition 1863 and Munich 1876; Order of Leopold of Belgium. He traveled and painted in Egypt and Algiers, and lived in Paris until 1870, when he removed to Kronberg, near Frankfort. His pictures of horses and Arabs are very popular in the U. S., and many of his works are in private collections in New York and other cities. D. July 29, 1899. W. A. C.

Schriver, Edmund: soldier; b. at York, Pa., Sept. 16, 1812; graduated at U. S. Military Academy, and promoted brevet second lieutenant of artillery July 1, 1833, captain 1842; resigned July 31, 1846, having served as captain of staff and assistant adjutant-general almost continuously from 1838 to 1846. In Apr., 1861, he accepted an appointment on the staff of Gov. Morgan of New York, with the rank of colonel and A. D. C., and May 14 was appointed lieutenant-colonel of the Eleventh Infantry U. S. army; colonel and A. A. D. C. May, 1862, and served as chief of staff to Gen. McDowell and Gen. Fremont (third corps); appointed inspector-general U. S. army (rank of colonel) Mar., 1863, and assigned to the Army of the Potomac; was engaged at Chancellorsville and Gettysburg 1863, and in the Richmond campaign of 1864, up to the investment of Petersburg. He was breveted brigadier-general in 1864 and major-general in 1865: was inspector of the Military Academy 1866–71; retired 1881. D. Feb. 10, 1899. Revised by James Mercur.

Schröder, Friedrich Ludwig: actor; b. at Schwerin, Germany, Nov. 3, 1744; was abandoned, while still a boy, by his parents, who were strolling actors, at Königsberg; found his parents in 1759 in Soleure, where he was trained to become a dancer; joined them finally in Hamburg in 1764; undertook in 1771 the management of the troupe after the death of his step-father, Ackermann, and raised the stage of Hamburg to a position of literary and artistic influence in Germany, partly by his plays (collected and published in 1831 in four volumes, with an introduction by Tieck), partly by the rigid sense of social propriety with which he governed the theater, but especially by his grand impersonations of some of the principal Shakspearean characters, such as Lear, which he was the first to introduce on the German stage. D. at Rellingen, Sept. 3, 1816. His *Life* has been written by F. L. W. Meyer (1810) and Brunier (1864).
Revised by B. B. Vallentine.

Schröder, Sophie (*Bürger*): actress; b. at Paderborn, Westphalia, Feb. 23, 1781; appeared upon the stage when twelve years of age in St. Petersburg, where the troupe to which her parents belonged was playing; married in 1795 Stollmers (whose true name was Smets), the director of another band, in 1804 the singer Schröder, and in 1825 the actor Kunst; acted in all the principal theaters of Germany, but principally at Vienna, and aequired a great fame by her impersonations of Phædra, Medea, Merope, Lady Macbeth, Sappho, etc. In 1840 she retired from the stage with a pension from the Austrian court. D. at Munich, Feb. 25, 1868. Her *Life* was written by P. Schmidt (Vienna, 1870).—Her daughter, Wilhelmine Schröder-Devrient, b. at Hamburg, Oet. 6, 1804, made her *début* as a singer in 1821 in *The Magic Flute*; sang as Donna Anna, Euryanthe, Fidelio, ete., and was soon aeknowledged as the first singer of Germany; was reeeived with great enthusiasm in Paris, London, and St. Petersburg; retired from the stage in 1847. D. at Coburg, Jan. 26, 1860. She was twiee married, the first time (1823) to the actor Karl Devrient. Her *Life* was written by Claire von Glümer (1862) and Wollzogen (1863).

Schubert, Franz: "the immortal melodist"; b. in Vienna, Jan. 31, 1797; son of a school-teacher in the Lichtenthal district of the city; was trained chiefly by the organist of the parish church; became leader of the choristers' school of the court chapel; composed his first symphony in 1813; taught in his father's school to avoid eonseription; in 1818 beeame teacher of music in the family of Count Esterházy at Zeléez, Hungary; in the same year returned to Vienna, where the publieation (1821) of his *Erl King* gained him popularity; gave his first and only public eoneert in 1828 in Vienna. D. in Vienna, Nov. 19, 1828. He is best known by his songs, several hundred in number, of which some fifty or sixty are celebrated and will live. His music was searcely known to the outside world during his lifetime. His fecundity was marvelous, and the quantity of MS. left behind to be diseovered by the musical world was enormous. His original MSS. prove the great ease and rapidity with which he wrote, rarely making a revision. This, indeed, is the source of a characteristie drawback to the merit of most of Schubert's instrumental compositions—viz., a too great diffuseness, or lack of condensation, coupled frequently with literal repetition of large sections. Among his larger works, aside from the songs, may be speeially mentioned the great *C major Symphony* (No. 9), the *Unfinished Symphony*, many fine sonatas for piano solos, and also with violin, trios for piano, violin, and violoneello, the *Mass in E flat*, etc. He wrote several operas which were not suecessful. Schubert's teehnical handling of his material compares respectably with his eontemporaries, but in this regard he made no attempt at originality. The chief characteristies of Schubert are the continued freshness of his peculiarly delightful melodies, supported by harmonies of equal interest. See the *Lives* by von Hellborn (Vienna, 1865) and Reissmann (Berlin, 1875). Dudley Buck.

Schuchardt, shoo'*kh*aart, Hugo: Romanic philologist; b. at Gotha, Germany, Feb. 4, 1842; educated at the gymnasium in Gotha and at the Universities of Jena and Bonn; 1870–73 privat doeent in Leipzig; 1873–76 Professor of Romanic Philology in Halle; sinee 1876 professor in Graz; author of *Vokalismus des Vulgärlateins* (3 vols., 1866–68); *Ueber einige Fälle bedingten Lautwandels im Churwälschen* (1870); *Ritornell und Terzine* (1874); *Slawo-Deutsches und Slawo-Italienisches* (1884); *Ueber die Lautgesetze* (1885); *Romanisches und Keltisches* (1886); *Kreolische Studien* (1881–91); *Auf Anlass des Volapüks* (1888); *Baskische Studien* (part i., 1893); *Weltsprache und Weltsprachen* (1894).

Schuett, Eduard: See the Appendix.

Schulte, shoo̎l'te, Johann Friedrich, von: polemical writer; b. at Winterberg, Westphalia, Apr. 23, 1827; studied law at Berlin; practiced there and at Arnsberg and Bonn; beeame Professor of Canon Law at Prague 1855. He wrote *Handbuch des katholischen Eherechts* (Giessen, 1855); *Das katholische Kirchenrecht* (2 parts: *Quellen des katholischen Kirchenrechts* and *System des allgemeinen katholischen Kirchenrechts*, 1856–60); *Lehrbuch des katholischen Kirchenrechts* (1863; 4th ed. 1886); *Lehrbuch der deutschen Reichs- und Rechtsgeschichte* (2 parts, Stuttgart, 1860–61; 6th ed. 1892); *Die Rechtsfrage des Einflusses der Regierung bei den Bischofswahlen in Preussen* (Giessen, 1869). He made a sensation by his pamphlet *Die Macht der römischen Päpste über Fürsten, Länder, Völker, Individuen* (Prague, 1871), for in it he set himself against the dogma of papal infallibility. He then (1871) left Prague and removed to Bonn, to whose law faculty he belongs. He is a leader of the Old Catholies. In their behalf he has produced many books and pamphlets, of which may be mentioned a second edition of the pamphlet just mentioned with an addition, *Die entgegengesetzten Lehren der Päpste und Concilien der ersten 8. Jahrhunderte über das Verhältniss der weltlichen Gewalt der Kirche gegenübergestellt*; also *Die Stellung der Concilien Päpste und Bischöfe vom historischen und canonischen Standpunkte und die Päpstliche Constitution vom 18. Juli, 1870* (1878); *Der Cölibatszwang und dessen Aufhebung gewürdigt* (in advocacy of its abolition, Bonn, 1876); *Die Geschichte der Quellen und Literatur des canonischen Rechts von Gratian bis auf die Gegenwart* (3 vols., Stuttgart, 1875–80); *Die Geschichte der Quellen und Literatur des evangelischen Kirchenrechts in Deutschland und Oesterreich und die evangelischen Kirchenrechtsschriftsteller* (1880); *Die Summa der Paucapala über das decretum Gratiani* (Giessen, 1890); *Der Alt-Katholicismus, Geschichte seiner Entwickelung, u. s. w.* (Giessen, 1887); *Die Summa des Stephanus Tornacensis über das Decretum Gratiani* (1891); *Die Summa magistri Rufini zum Decretum Gratiani* (1892).

Samuel Macauley Jackson.

Schultz, John Christian, M. D.: lieutenant-governor of Manitoba; b. at Amherstburg, Ontario, Jan. 1, 1840; graduated as a physician in 1861; assisted Gov. Mactavish and Bishop Anderson in establishing the Institute of Rupert's Land in 1863. In 1867 and 1868 he agitated in favor of the union of all the provinces; and when the Northwest was purchased by Canada in 1869 he and others, loyal to the Government, were captured by insurgents who opposed the transfer, and were imprisoned in Fort Garry. He effected his eseape and in 1870 returned to Manitoba, and at the first general election was chosen to represent Lisgar in the Dominion Parliament, which seat he held until 1882, when he was appointed to the Senate. He was captain of the Lisgar Rifle Company 1871–74; a member of the executive council for the Northwest Territories in 1872; appointed member of the Dominion board of health for Manitoba and the Northwest Territories same year, and one of the board of governors of Manitoba medical board, and has been president of the Southwestern Railway of Manitoba. He was appointed lieutenant-governor of Manitoba July 1, 1888. Neil Macdonald.

Schultze, shoo̎lt'se, Carl August Julius Fritz, Ph. D.: professor of philosophy and pedagogy; b. at Celle, Hanover, May 7, 1846; educated at the gymnasium in Celle, and at the Universities of Jena, Göttingen, and Munich; private tutor 1869–70; high-school teacher 1870–72; privat docent 1872–75; and Professor Extraordinary of Philosophy 1875–76 in Jena University; Professor of Philosophy and Pedagogy since 1876 in the Royal Polytechnic School in Dresden. Of his pedagogical works the best known is *Deutsche Erziehung* (1893), an important contribution to Herbartian literature. Others are *Der Fetischismus, Ein Beitrag zur Anthropologie und Religionsgeschichte* (1871); *Geschichte der Philosophie der Renaissance* (vol. i., 1874); *Philosophie der Naturwissenschaft* (2 vols., 1881–82); *Die Grundgedanken des Materialismus und die Kritik derselben* (1881); *Die Grundgedanken des Spiritismus und die Kritik derselben* (1883); *Die Sprache des Kindes* (1880); *Stammbaum der Philosophie* (1890); *Vergleichende Seelenkunde* (vol. i., 1892); *Der Zeitgeist in Deutschland, seine Wandlung im 19. und seine muthmassliche Gestaltung im 20. Jahrhundert* (1894).

J. E. Russell.

Schultze Powder: See Explosives.

Schumacher, shoo'maa̎*kh*-er, Heinrich Christian: astronomer; b. at Bramstedt, Holstein, Germany, Sept. 3, 1780; studied mathematics and astronomy at Kiel, Jena, Copenhagen, and Göttingen, and became Professor of Astronomy at the University of Copenhagen in 1815; removed in 1821 to Altona, where he died Dec. 28, 1850. In 1821 he founded the *Astronomische Nachrichten*. In 1830 he made the observations of the length of the seconds-pendulum which formed the basis of the Danish scale of measure.

Schu'mann, Robert: composer; b. at Zwiekau, Saxony, June 8, 1810; after a short course in law and philosophy at Heidelberg, he settled in 1830 at Leipzig, in order to study under Wieck, an eminent piano-teacher; but having crippled his right hand he was forced to devote himself to composition instead of piano-playing, and in his studies was guided by Heinrich Dorn. In 1843 he was appointed Professor of Composition in the conservatory at Leipzig, and

in 1850 musical director at Düsseldorf. While living at Düsseldorf he became deranged, attempted suicide in the Rhine, was rescued and taken to an asylum. D. at Endenich, near Bonn, July 29, 1856. With the exception of the oratorio, Schumann's works include almost every art-form. Four symphonies, several cantatas, an opera, a mass, sonatas, concertos, quartets for strings and also for voices, many pieces for the piano, a few for the organ, and a number of much-admired songs. The symphonies have been accorded a rank immediately after those of Beethoven. The opera *Genoveva* was given at Leipzig, but failed. Schumann possessed a highly cultivated literary ability, and founded the *Neue Zeitschrift* in Leipzig, a music review to which he contributed many important articles. He may also be considered the founder of the so-called romantic or emotional school. There is a certain semi-mystical trait about a number of Schumann's compositions, which, however, does not prevent him from being clear and strong in the majority of his works, at least in those composed prior to the time when his mind began to be clouded with coming insanity. The gradual approach of this sad fate may be traced in the works themselves. Several lives of Schumann have been published, including those by Wasielewski (3d ed. Dresden, 1880; Eng. trans. 1878) and Prof. Niecks, of Edinburgh (1892). Also see his *Collected Writings* as editor of the Leipzig *Neue Zeitschrift*, with a number of letters (Leipzig, 1854; 3d ed. 1875).—His wife, Clara (*Wieck*), b. at Leipzig, Sept. 13, 1819, the most celebrated female pianist of her day, contributed greatly to a correct understanding of her husband's works by her masterly interpretation of them. Further, she may be said to have first introduced Chopin to the German music-world. D. May 20, 1896. Dudley Buck.

Schürer, Emil: See the Appendix.

Schurman, Jacob Gould, D. Sc., LL. D.: president of Cornell University; b. at Freetown, Prince Edward Island, May 22, 1854; educated first in Canada, and then (from 1875 to 1880) in England, Scotland, France, and Germany. He was Gilchrist scholar for Canada 1875–78; holder of Hibbert traveling fellowship (for Great Britain) 1878–80; Professor of Logic, Psychology, and English Literature in Acadia College 1880–82; Professor of Philosophy in Dalhousie College 1882–86; Professor of Philosophy in Cornell University since 1886, and president since 1892; editor of *The Philosophical Review* since 1892 and of *The School Review* since 1893; author of *Kantian Ethics and the Ethics of Evolution* (1881); *The Ethical Import of Darwinism* (1888); *Belief in God* (1890); and essays and addresses on social, religious, educational, and philosophical subjects.

Schurz, shoŏrts, Carl, LL. D.: statesman and author; b. at Liblar, near Cologne, Rhenish Prussia, Mar. 2, 1829; educated at the gymnasium of Cologne and at University of Bonn 1846–48; aided Prof. Gottfried Kinkel in the publication of a liberal newspaper, begun after the revolutionary outbreak of 1848; took part in the revolutionary movements of 1849 and in the following year, and succeeded in effecting the escape of his companion, Kinkel, from imprisonment in the fortress of Spandau. After spending some months in Paris (1851–52) he settled in the U. S.; entered with great zeal into national politics, becoming a leader of the German element of the newly founded Republican party. He began the practice of law at Milwaukee in 1859; was prominent in the Republican national convention at Chicago 1860, and in the ensuing presidential campaign; was appointed by President Lincoln minister to Spain Mar., 1861, but resigned in December of the same year in order to enter the army. His war record was highly honorable. He was appointed brigadier-general of volunteers Apr., 1862; became major-general Mar. 14, 1863; commanded a division in the second battle of Bull Run and in the battle of Chancellorsville; was temporarily in charge of the Eleventh Army-corps at Gettysburg; took part in the battle of Chattanooga, and resigned May 6, 1865. Having settled in Missouri, he was U. S. Senator from that State 1869–75, and acquired a high reputation for ability by his speeches on finance and national policy. The policy of Grant's administration drove him into the "Liberal" movement, and he presided over the Cincinnati convention which nominated Horace Greeley for the presidency 1872. On his return from a visit to Europe in 1875 he became a resident of New York. He took part in the political campaign of 1875 in Ohio, advocating the election of Gov. Hayes on a "hard-money" platform, was one of the callers of the independent conference of May 15, in New York, and Secretary of the Interior 1877–81. From 1881 to 1883 he was editor-in-chief of the New York *Evening Post*. In the campaign of 1884 he repudiated the candidacy of Blaine, and was one of the earliest and most vigorous of the Republican supporters of Cleveland. Civil-service reform, tariff reform, and the purification of New York politics have received his hearty support. His *Life of Henry Clay* (1887) has given him a high place as an historical critic and interesting writer. F. M. Colby.

Schus'tar (Arab. *Tostar*): town; in the province of Khuzistan, Persia; on the Karun; in lat. 32° 3′ N., lon. 48° 52′ E. (see map of Persia and Arabia, ref. 3–G). It is fortified, and its streets, though narrow and dirty, are lined with elegant houses, but large parts are in ruins and uninhabited since the plague and the inundation which early in the nineteenth century successively visited the city. It was a flourishing Persian provincial capital, and in ancient times was in a populous district, with Susa (bibl. Shushan) to the N. W. and Ram Hormuz on the opposite side. Pop., according to Hübner, 27,000. Revised by M. W. Harrington.

Schuva'lov, Peter Andreievitch, Count: diplomatist; b. in St. Petersburg, Russia, July 15, 1827; entered the army, and became a general at the age of thirty. As governor-general of the Baltic provinces 1864–66 he showed great tolerance in dealing with the German element in the population and opposed the persecutions of the Protestants. In 1866 he was made chief of the secret service, just as the Nihilist movement began to show its power. In 1873 he was sent as ambassador to London, and arranged the marriage between the daughter of Alexander II. and the Duke of Edinburgh. Again representing his Government at the court of St. James, he did much to avert the threatened war between Russia and Great Britain after the Russo-Turkish war of 1877–78. D. in St. Petersburg, Mar. 22, 1889.

Schuyler, skī'ler: city; capital of Colfax co., Neb.; on the Platte river, Shell creek, and the Union Pac. and the Burlington Route railways; 16 miles E. of Columbus, 29 miles W. of Fremont (for location, see map of Nebraska, ref. 10–G). It contains 6 churches, high school building (cost $25,000), a large U. S. sugar-beet experiment station, flour-mill, cigar factory, 2 national banks with combined capital of $100,000, 3 State banks with capital of $87,000, and 4 weekly newspapers. Pop. (1880) 1,017; (1890) 2,160: (1900) 2,157.
Editor of "Sun."

Schuyler, Eugene, LL. D.: diplomatist; b. at Ithaca, N. Y., Feb. 26, 1840; graduated at Yale in 1859 and at Columbia Law School in 1863. He was U. S. consul at Moscow 1867–69 and at Reval 1869–70; secretary of legation at St. Petersburg 1870–76 and at Constantinople 1876–78; *chargé d'affaires* at Bucharest 1880–82; minister to Greece, Servia, and Roumania 1882–84; consul-general at Cairo from 1889 till his death. In 1873 he traveled in Central Asia; an account of the journey is given in his *Turkestan* (2 vols., 1876). Besides contributions to magazines, etc., he wrote also *Peter the Great* (2 vols., 1884) and *American Diplomacy* (1886). D. at Cairo, Egypt, July 18, 1890.

Schuyler, Peter: soldier; b. probably near Newark, N. J., about 1710; recruited and commanded the regiment called the Jersey Blues, and joined the army for the invasion of Canada 1746; commanded Fort Clinton in Saratoga 1746–47; again joined the colonial army with his regiment 1754; attended the congress convoked by Gov. Shirley at New York 1755; was in command at Oswego when that place was taken by the French Aug. 14, 1756, and for a short time was a prisoner in Canada, and was again in command of the New Jersey regiment in Sir Jeffrey Amherst's campaign, which resulted in the conquest of Canada 1759. D. near Newark, N. J., Nov. 17, 1762.

Schuyler, Philip: b. at Albany, N. Y., Nov. 20, 1733. He was appointed captain of New York volunteers in June, 1755, and was engaged in the expedition against the French at Crown Point. At the end of the campaign of 1756 he left the army, but in 1758 accepted the appointment of commissary with the rank of major. Two days after the battle of Bunker Hill Congress appointed him a major-general, and placed him in command of the northern department. In the expeditions against Canada Schuyler commanded that by way of Lake Champlain, but was compelled, owing to ill health, to relinquish his command to Montgomery in September and return to Albany, after having taken possession of Isle au Noix on Sorel river. At Albany, besides continuing to exercise an active supervision of affairs in the northern department, his influence among the Indians was

of great value. The failure of the Canada expedition excited much hostility toward Schuyler, and insinuations were uttered against his loyalty, which became so offensive that in the autumn of 1776 he sent in his resignation to Congress, which that body declined to accept; but the abuse continuing, Schuyler, in Apr., 1777, proceeded to Philadelphia and demanded a court of inquiry, which entirely approved his management of affairs, and he resumed command of the northern department. The forced abandonment of Ticonderoga by St. Clair, and his retreat to Fort Edward, where Schuyler had just arrived with re-enforcements, compelled the latter to fall back to Saratoga, after using every means to obstruct the advance of Burgoyne. The losses thus sustained in stores, ammunition, etc., caused a widespread consternation throughout the country, and the clamor against Schuyler was renewed, and this time Congress ordered his supersedure by Gates. At the time of the latter's arrival (September) to assume command, Schuyler occupied a fortified position at the mouth of the Mohawk, to which he had fallen back from Saratoga. Gates had, since Schuyler's resumption of the command of the northern department, been unfriendly to Schuyler, and it was with feelings of mortification that the latter received the order deposing him at a time when the feeling of depression arising from former disasters had been dispelled by recent victories, and when volunteers were from all quarters swelling his army. He, however, obediently turned over his command and placed his successor in possession of full information of the situation, and, though without command, remained with the army to aid in any capacity, and was present at the surrender of Burgoyne. A court of inquiry again approved of his management in strong terms, but in Apr., 1779, he resigned, though continuing to render valuable service in the military operations in his native State. From 1778 to 1781 he was a member of the Continental Congress, and in 1789 was appointed U. S. Senator from New York, and again in 1797 to succeed Aaron Burr. In the New York Senate he contributed largely to the code of laws adopted by the State, and was an active promoter of the canal system. D. at Albany, Nov. 18, 1804. See his *Life and Times*, by B. J. Lossing (2 vols., 1860–62; new ed. 1872).

Schuylkill, skool'kil [Dutch, liter., hidden channel, because unobserved by the first explorers]: a river which rises in Schuylkill co., Pa., and after a southeasterly course of 125 miles flows into the Delaware at Philadelphia, which city it traverses. Its lower portion affords extensive wharfage, and is of much commercial importance. The river was (1816–25) adapted to slack-water navigation for freight-boats to Port Carbon, 3 miles above Pottsville. The river affords the greater part of the water-supply for Philadelphia. It enters the Delaware between League island, containing a navy-yard, and Mud island, on which is Fort Mifflin. Revised by I. C. Russell.

Schuylkill Haven: borough; Schuylkill co., Pa.; on the Schuylkill river and canal, and the Lehigh Val., the Penn., and the Phila. and Reading railways; 4 miles S. of Pottsville, 31 miles N. N. W. of Reading (for location, see map of Pennsylvania, ref. 5–H). It is in an agricultural and coal-mining region, has large wharves and canal-boat docks for shipping coal, and contains rolling-mills, hosiery-works, railway car-shops, shoe and soap factories, and a weekly newspaper. Pop. (1880) 3,052; (1890) 3,088; (1900) 3,654.

Schwab, shvaap, Gustav: author; b. at Stuttgart, Germany, June 19, 1792; studied theology and philosophy at Tübingen; was appointed Professor of Ancient Literature in the gymnasium of Stuttgart in 1817; pastor at Gomaringen in 1837, and of the St. Leonhard church in Stuttgart in 1840, where he died Nov. 4, 1850. His poems show purity and warmth of feeling, though they do not possess the simplicity and classic perfection of form of Uhland's songs. Like the latter poet and other members of the Suabian school to which he belonged he wrote many ballads, some of which have become very popular. The first collected edition of his *Gedichte* appeared in 2 vols. in 1828–29; a second revised edition, *Neue Auswahl* (Stuttgart, 1838), has been often reprinted. Of his prose works, the most remarkable are *Schillers Leben* (Stuttgart, 1840; 3d ed. 1859); *Sagen des klassischen Alterthums* (Stuttgart, 1838–40; 14th ed. Gütersloh, 1882); *Deutsche Volksbücher* (1843; 13th ed. Gütersloh, 1880); and *Wegweiser durch die Litteratur der Deutschen* (Leipzig, 1846; 4th ed. 1870). See K. Klüpfel, *Gustav Schwab als Dichter und Schriftsteller* (1884).
Revised by Julius Goebel.

Schwalbe, shvaal'be, Gustav Albert, M. D.: professor of anatomy; b. at Quedlinburg, Germany, Aug. 1, 1844; educated in the gymnasium at Quedlinburg, and at the Universities of Zurich, Bonn, and Berlin; became privat docent at Halle Jan., 1870; professor at Freiburg in Baden May to Halle Jan., 1870; professor extraordinary at Leipzig Oct., 1871, to Oct., 1871; professor extraordinary at Leipzig Oct., 1871, to Oct., 1873; ordinary Professor of Anatomy at Jena Oct., 1873, to Apr., 1881; held same position at Königsberg Apr., 1881, to Oct., 1883, when he accepted a chair at Strassburg. His principal works are *Lehrbuch der Neurologie* (1881) and *Lehrbuch der Anatomie der Sinnesorgane* (1887). He is editor of *Morphologische Arbeiten* (begun 1891), and has edited part i. of *Anatomy* (20 vols., 1872–92), and with Hoffmann and Hermann a *Yearly Report of Anatomy and Physiology*.

Schwal'ber [better known as Chelidonius, the punning Græco-Latin translation of the German *Schwalbe*, a swallow; Gr. χελιδών]: a friend of Albert Dürer, and the author of the text in Latin verse to his three series of wood-cuts, *The Apocalypse*, *The Passion of Christ*, and *The Life of the Virgin Mary*. Schwalber was a monk of the abbey of St. Egidius (St. Julian, St. Gilgan, St. Giles), built by Conrad III. in 1140 for a society of Scotch Benedictines. He was nicknamed Musophilus, from his love of learning, and he had a reputation for considerable knowledge of the classic Latin poetry. While a member of this monastery he wrote the text for Dürer's wood-cuts, besides verses about his monastery, *Versic. de Fund. Cœnob. Egid.*, and about the abbots, *Versic. de Abbat. nonnullis ejusdem Cœnob.* In 1515 Schwalber left Nuremberg to become abbot in the Schotten Kloster, near Vienna. D. there Sept. 8, 1521.

Schwann, Theodor: physiologist; b. at Neuss, Prussia, Dec. 7, 1810. He studied at the Jesuits' College, Cologne, at Bonn, Würzburg, and Berlin, where he graduated in medicine in 1834. He was assistant to Johannes Müller in the Anatomical Museum at Berlin till 1838. He discovered pepsin and its function in digestion, the envelop of nerve-fibers, the organic nature of yeast, and made a series of researches on muscular contractility, and other physiological subjects. He was Professor of Anatomy at the Roman Catholic University of Louvain 1838–48, and at Liège from 1848. D. at Cologne, Jan. 14, 1882. His cell-theory, which is the basis of modern histology, was published in *Microscopical Investigations on the Accordance in the Structure and Growth of Plants and Animals* (Berlin, 1839; trans. by Sydenham Society, 1847).

Schwann, White Matter of: See Histology (*Nerves* and *Nerve-centers*).

Schwanthaler, shvaan'taal-er, Ludwig Michael: sculptor; b. at Munich, Aug. 26, 1802, the son of a sculptor; studied in Rome, but wrought in Munich. His statues, decorations, and models, are seen in the great cities of Germany, but chiefly in Munich. He executed the frieze of the Barbarossa hall, the colossal statue of Bavaria, and the metopes of the Ruhmeshalle which adjoins it, the colossal bronze statues in the throne-room of the palace at Munich, and the monumental images in the Walhalla. D. Nov. 28, 1848.

Schwartz, shvaarts, Christian Frederick: missionary; b. at Sonnenburg, Prussia, Oct. 26, 1726; studied in the University of Halle 1746–49; was ordained at Copenhagen 1749; embarked at London for India, where he arrived July, 1750; settled at Tranquebar, a Danish mission on the Coromandel coast; transferred his services to the English Society for Promoting Christian Knowledge 1766, when he removed to Trichinopoly, and in 1778 to Tanjore; was sent as ambassador to Hyder Ali at Seringapatam to negotiate a peace, and admitted by him after all other envoys had been refused, and succeeded in relieving the city of Tanjore from imminent danger of famine by his influence with the native farmers, who brought in their cattle on his personal pledge of payment. D. at Tanjore, Feb. 13, 1798. He was one of the most celebrated missionaries of modern times. He aided Schultz in translating the Bible into Tamil, and was tutor to the son and heir of the rajah of Tanjore, who erected to his memory in the mission church a magnificent monument designed by Flaxman; the East India Company also placed a monument of him by Bacon in St. Mary's church, Madras. See *Memoirs of his Life and Correspondence*, by Hugh Pearson, D. D. (2 vols., 1833; 3d ed. 1839).

Schwartz, Maria Sofia (*Birath*): novelist; b. at Boraas, Sweden, July 4, 1819; was married in 1840, and became a widow in 1858. She was the author of a number of novels, all of which have been translated into German and

Danish, and many of them into English. Their interest lies chiefly in their plot. Among them may be mentioned *Mannen af börd och qvinnan af folket* (The Man of Birth and the Woman of the People, 1858); *Börd och bildning* (Birth and Education); *Arbetet adlar mannen* (Labor Ennobles Man, 1859); *Ädlingens dotter* (The Nobleman's Daughter, 1860); *The Organ-grinder's Son* (1863); *A Child of the Time* (1873). D. 1894. D. K. Dodge.

Schwarz, Berthold, whose true name is said to have been Konstantin Anckl itzen: the reputed inventor of gunpowder; received the name of Berthold on entering a Franciscan monastery at Mentz, Cologne, or Gosslar, and was called Schwarz (black) on account of his passion for the black arts. According to legend, he invented gunpowder in 1259 (the dates 1320 and 1354 are also given), and in Freiburg, his reputed birthplace, a monument was raised in his honor in 1853. All the details of his life are uncertain, however, while it is certain that gunpowder was known before 1320, though not used in war or hunting.

Schwarzburg-Ru'dolstadt: principality and state of the German empire, between the Saxon duchies; comprising an area of 363 sq. miles, with 92,657 inhabitants in 1900. It is covered with well-wooded spurs of the Thüringerwald, and mining and cattle-rearing are the principal industries. Flax is very extensively grown, and some linen manufactures are carried on. The total revenue for 1893 was 2,542,950 marks; public debt, 4,018,688 marks. Capital, Rudolstadt.

Schwarzburg-Sondershausen, -zon'ders-how-zen: principality and state of the German empire, in the Prussian province of Saxony; comprising an area of 333 sq. miles, with 80,678 inhabitants in 1900. It resembles in every respect Schwarzburg-Rudolstadt, except that it is a little smaller. Capital, Sondershausen.

Schwarzenberg, shvaärts'en-bärch: a princely family of Germany, descended from Erkinger von Seinsheim, who was ennobled in 1417 by the Emperor Sigismund, and in 1420 bought the estate of Schwarzenberg in Franconia. In 1670 the head of the family was made a prince of the empire by the Emperor Leopold I., and in 1746 this dignity was conferred on all members of the house by the Emperor Francis I. The most celebrated names of the family are—(1) Karl Philipp: soldier; b. in Vienna, Apr. 15, 1771; received a military education, and distinguished himself in the battles of Würzburg, Ulm, Hohenlinden, and Wagram. After the peace of Vienna (Oct. 14, 1809) he went to Paris as Austrian ambassador, and negotiated the marriage between Napoleon and Maria Louisa. Napoleon placed great confidence in him, and demanded that he should command the Austrian contingent in the Russian campaign of 1812. The slowness of his movements and the inefficiency of his measures have provoked much criticism from French historians, but Napoleon himself never uttered a doubt of his loyalty, and requested the Austrian emperor to make him a field-marshal. In the next year he commanded the Austrian army of observation in Bohemia, and when Austria joined Russia and Prussia he was made commander-in-chief of the allied army, gained the battle of Leipzig (Oct. 16–18, 1813), and led the army victorious into Paris. D. at Leipzig, Oct. 15, 1820.—(2) Felix Ludwig Johann Friedrich: statesman; a nephew of the preceding; b. at Krumau, Bohemia, Oct. 2, 1800; entered the Austrian army in 1818, and was made a lieutenant field-marshal in 1848, shortly before the battle of Custozza, but was mostly employed in diplomatic missions to Russia, Great Britain, Brazil, and Naples, and Nov. 22, 1848, was placed at the head of the Austrian Government as chancellor of the empire. He found the state nearly dissolved, Vienna, Prague, Hungary, and the Italian provinces in open insurrection, the treasury on the very verge of bankruptcy, the Austrian influence in Germany almost annihilated, and the German states about to reorganize their union under the leadership of Prussia, etc. All these difficulties he confronted with a courage and energy which excited admiration, even among those who were very far from approving either his aims or his measures. By the aid of Russia he put down the revolution in Hungary, and in a very short time succeeded in tying together once more the discordant parts of the Austrian empire by means of a military and bureaucratic government. He was, however, by no means a mere repetition of Metternich. He was not averse to reform when it could be achieved in a regular and settled manner. He raised the credit of the state, and he baffled all the Prussian plans in Germany by drawing the southern and middle states over to the Austrian side. D. in Vienna, Apr. 5, 1852.—(3) Friedrich Johann Joseph Celestinus: a brother of the preceding; b. in Vienna, Apr. 6, 1809; was made Archbishop of Salzburg 1836, cardinal 1842, Archbishop of Prague 1849. He opposed the declaration of the dogma of the papal infallibility as inopportune, but accepted it afterward. D. in Vienna, Mar. 27, 1885. Revised by F. M. Colby.

Schwarzwald: See Black Forest.

Schwatka, Frederick: explorer; b. at Galena, Ill., Sept. 29, 1849; graduated at the U. S. Military Academy at West Point, N. Y.; commissioned second lieutenant in 1871; pursued his studies while in the army, and was admitted to the bar in Nebraska in 1875; graduated in medicine at Bellevue Medical College, New York, in 1876. In 1878 he obtained leave of absence from the army and conducted the Arctic expedition which cleared up the mystery surrounding the fate of Sir John Franklin's expedition. He returned to duty in the army in 1880, but finally resigned in 1885. Between 1883 and 1889 he made three journeys to Alaska for the purpose of exploration, and in one of these trips descended the Yukon on a raft from its source to its mouth. In 1889 he conducted an expedition to Northern Mexico to study the remains of Aztec civilization and those of the cliff and cave dwellers. He received the Roquette Arctic medal of the Geographical Society of Paris, and a medal from the Imperial Geographical Society of Russia. D. at Portland, Ore., Nov. 2, 1892. See his *Along Alaska's Great River* (New York, 1885); *Nimrod of the North* (1885); and *The Children of the Cold* (1886).

Mark W. Harrington.

Schwegler, shvāch'ler, Albert: philosopher and theologian; b. at Michelbach, Würtemberg, Feb. 10, 1819; studied theology at the University of Tübingen, where he was appointed Professor of Classical Philology in 1848, and later of Ancient History. D. at Tübingen, Jan. 5, 1857. In theology and criticism he belonged to the Tübingen school of Dr. Baur. Besides annotated editions and translations of the Clementine homilies (1847), Aristotle's *Metaphysics* (1847–48), and Eusebius (1852), he published *Der Montanismus* (1841), which brought him into conflict with the Church and caused him to give up his ministry; *Das Nachapostolische Zeitalter* (1846); and *Römische Geschichte* (unfinished; 1853–58). His best-known work is his *Geschichte der Philosophie* (1848; 11th ed. 1882), originally written for the *Neue Encyklopädie für Wissenschaften und Künste*, but afterward often reprinted and translated into most European languages—into English by J. H. Seelye of Amherst (New York, 1856), and by Stirling in England. His *Geschichte der griechischen Philosophie* appeared in 1859.

F. M. Colby.

Schweid'nitz: town of Prussian Silesia; on the Weistritz; 36 miles by rail S. W. of Breslau (see map of German Empire, ref. 5–H). It is well built, contains several interesting public buildings, and carries on a flourishing manufacturing industry in cloth, paper, leather, chemicals, beetroot-sugar, vinegar, etc. Pop. (1895) 26,130.

Schweigger, shvīg'ger, Karl Ernst Theodor, M. D.: ophthalmologist; b. at Halle, Prussian Saxony, Oct. 29, 1830; studied medicine at the Universities of Erlangen and Halle, graduating at the latter 1852; was assistant in Krukenberg's medical clinic 1852–55; in 1856 studied the microscopic anatomy of the eye under H. Mueller at Würzburg; from 1857–64 was an assistant of A. v. Grafe at Berlin; in 1860 became privat docent of ophthalmology at the University of Berlin; in 1868 was appointed Extraordinary Professor of Ophthalmology and director of the eye clinic at the University of Göttingen; in 1871 was appointed extraordinary and in 1873 ordinary professor at the University of Berlin; in 1885 was made privy councilor. He became coeditor of the *Archiv für Augenheilkunde* in 1881. His best-known work is *Handbuch der speciellen Augenheilkunde* (Berlin, 1871). S. T. Armstrong.

Schweighäuser, shvīch'hoi-zer, Johann: classical scholar; b. at Strassburg, Germany, June 26, 1742: studied theology and the Oriental languages; went to Paris to perfect his linguistic studies under de Guignes; visited Germany, England, and Holland: was appointed Adjunct Professor of Philosophy at Strassburg in 1770, and in 1778 Professor of the Greek and Oriental Languages. After the organization of the university at Strassburg he was made Professor of Greek Literature and dean of the faculty of letters, and was also appointed librarian. His editions are esteemed for

the elaborate and learned commentaries annexed; among the most valuable are Appian (3 vols., 1782–85); Polybius (8 vols., 1795; 5 vols., 1831, Oxford) with *Lexicon Polybianum*; Seneca's *Epistolæ* (2 vols., 1809); Epictetus (5 vols., 1799); Athenæus (14 vols., 1801–07); Herodotus (6 vols., in 12 parts, 1815), to which was added a *Lexicon Herodoteum* (2 vols., 1824); *Opuscula* (2 vols., 1806). D. at Strassburg, Jan. 19, 1830. Revised by ALFRED GUDEMAN.

Schweinfurth, shvīn'fo͝ort: town of Bavaria: on the Main; 28 miles N. E. of Würzburg by rail (see map of German Empire, ref. 5–E). It is beautifully situated and well built, and has large manufactures of chemicals and pigments, especially ultramarine blue and Schweinfurth green. Large cattle and wool markets are held here. Pop. (1895) 13,515.

Schweinfurth, GEORG AUGUST: explorer and botanist; b. at Riga, Russia, Dec. 29, 1836; studied botany and natural science at Heidelberg, Munich, and Berlin; made several journeys in the valley of the Nile to investigate the flora and fauna of those regions 1864 to 1886, and wrote *Plantæ quædam Nilotiæ* (1862); *Beitrag zur Flora Æthiopiens* (1867); *Reliquiæ Kotschyanæ* (1868); *Im Herzen von Afrika* (2 vols., 1874; translated into English as *The Heart of Africa* in 1874); *Artes Africanæ* (1875), etc.
Revised by M. W. HARRINGTON.

Schweinfurth Green, or **Paris Green**: a pigment said to have been discovered by Rusz and Sattler at Schweinfurth in 1814, but there is reason to believe that it was manufactured at Vienna at an earlier date under the name of *Mitis green*. Other names are *Imperial*, *Vienna*, *Emerald*, and *Kaiser Green*. Some varieties of berg or mountain green and of Neuwied green consist of this pigment mixed with gypsum or heavy spar. The first chemical paper by Justus von Liebig related to this color: it was published by him in July, 1822, in the *Repertorium der Pharmacie*.

Schweinfurth green is an aceto-arsenite of copper of variable composition. It has been very extensively used for wall and other paper staining, for tarlatans, artificial flowers, and as a vermin exterminator, especially for cockroaches and potato-bugs. Its use for wall-paper has greatly diminished. Much has been written with regard to the dangers of arsenical wall-paper. It has been alleged that not only may green papers, to which the pigment is loosely attached, give off arsenical dust, which may enter the mouth and air-passages and produce harm, but that paper containing even very small quantities of arsenic, in any form, may evolve arseniuretted hydrogen or other arsenical gases of a very poisonous character. Distinguished chemists, however, deny the possibility of the production of any arsenical gases from wall-paper, and the alarming suggestions concerning arsenical wall-paper are regarded as entirely without foundation. Revised by IRA REMSEN.

Schweinitz, EDMUND ALEXANDER, de, S. T. D.: bishop: son of Lewis David von Schweinitz; b. at Bethlehem, Pa., Mar. 20, 1825; studied theology in the Moravian seminary of his native town and at the University of Berlin; became a clergyman, and was pastor of several churches in Pennsylvania: edited *The Moravian* for several years; consecrated bishop at Bethlehem 1870; was president of the Moravian College and Theological Seminary 1867–84; was one of the translators of Herzog's *Realencyclopädie* (Philadelphia, 1856, *seq.*), and author of *The Moravian Manual, being an Account of the Moravian Church* (Philadelphia, 1859; 2d ed. Bethlehem, 1869); *Systematic Beneficence* (1861); *The Moravian Episcopate* (Bethlehem, 1865; 2d rev. ed. London, 1874); a *Life of Zeisberger, the Western Pioneer and Apostle to the Indians* (1870); and *The History of the Church known as the Unitas Fratrum* (1885). D. Dec. 18, 1887.

Schweinitz, EMIL ALEXANDER, de: See the Appendix.

Schweinitz, GEORGE EDMUND, de, A. M., M. D.: ophthalmologist; son of Bishop de Schweinitz; b. in Philadelphia, Pa., Oct. 26, 1858; educated at the Moravian College, Bethlehem, Pa., and at the University of Pennsylvania, where he graduated in 1881; prosector of anatomy in the university 1883–88; lecturer on medical ophthalmology 1891–92; Professor of Ophthalmology, Philadelphia Polyclinic, 1891; Clinical Professor of Ophthalmology, Jefferson Medical College, Philadelphia, 1892; ophthalmic surgeon to Children's, Philadelphia, Methodist, and Orthopædic Hospitals. His principal published works are *Congenital Anomalies of the Eye* in *American System of Obstetrics* (1889); *Affections of the Eyelids, Lachrymal Apparatus, Conjunctiva, and Cornea* in *Cyclopædia of Diseases of Children* (vol. iv., 1890); *Affections of the Conjunctiva, Cornea, and Sclera* in *System of Therapeutics* (1892); *Diseases of the Eye: a Handbook of Ophthalmic Practice* (Philadelphia, 1892). He was editor, with Dr. Hare, of *The University Medical Magazine* Oct., 1888–Sept., 1889, and of the same journal with Dr. E. Martin Oct., 1889–Sept., 1891. Since 1892 he has been ophthalmic editor of *The Therapeutic Gazette*.

Schweinitz, LEWIS DAVID, von, Ph. D.: botanist; b. at Bethlehem, Pa., Feb. 13, 1780; educated in Germany, where he resided from 1798 to 1812; Moravian minister at Salem, N. C., 1812 to 1821; settled in his native town 1821, and resided there until his death Feb. 8, 1834. He added by his own researches more than 1,400 new species to the catalogues of American flora, the greater part being fungi which had been previously little studied. He was the author of *Conspectus Fungorum in Lusatiæ superioris agro Niskiensi crescentium e methodo Persooniana* (with Albertini, 1805); *Synopsis Fungorum Carolinæ superioris*, etc. (1822); *Synopsis Fungorum in America Boreali media degentium* (1831–34); and monographs on *Viola*, *Carex*, and other genera. Revised by CHARLES E. BESSEY.

Schweizer-Sidler, shvīt'ser-zid'ler, HEINRICH: Latinist; b. at Elgg, Switzerland, Sept. 12, 1815; educated at Zurich; teacher in gymnasium of Zurich, docent in the university, and professor from 1871; author of *Elementar- und Formenlehre der lateinischen Sprache* (1869; 2d ed. as *Grammatik der lateinischen Sprache*, 1888); *Germania of Tacitus* (5th ed. 1890); and numerous articles in journals. D. at Zurich, Mar. 31, 1894. B. I. W.

Schwenk'feld, HANS KASPAR, von: sectarian leader; b. at Ossig, Silesia, 1490; employed in the service of the Duke of Liegnitz; embraced the Reformation with great enthusiasm, but developed afterward its ideas in a manner which brought him in conflict with the Reformers. It was especially his conception of the Lord's Supper as a sacrament of spiritual nourishment without change in the elements and his demands for the establishment of a Church to which only the saints, the truly converted, should be admitted, which gave offense. His teaching was known as The Middle Way. Political pressure having forced the Duke of Liegnitz to adopt Lutheranism, Schwenkfeld voluntarily left Silesia (1529) and went to Strassburg. There he was suspected of Anabaptism, tried, and banished (1533). The next two years were passed in Augsburg, but again Lutheran antagonism drove him away and he went to Ulm, and from there as a center went about preaching. D. at Ulm, Dec. 10, 1561. In his *Grosse Confession* (1540–57, 3 parts) he gave a representation of his doctrines. An edition of his numerous writings appeared at Frankfort 1564–70 in 4 vols. folio. A sect, the Schwenkfelders, was organized in Silesia, but most of them emigrated in 1734 and settled in Pennsylvania, where they number about 1,000 members, and have their own churches and schools. See O. Kadelbach, *Ausführliche Geschichte Kaspar von Schwenkfelds und der Schwenkfelder in Schlesien, der Ober-Lausitz und Amerika* (Lauban, 1861). Revised by S. M. JACKSON.

Schwerin': capital of the grand duchy of Mecklenburg-Schwerin, Germany; on the western side of Lake Schwerin (see map of German Empire, ref. 2–F). It is connected by railways with Hamburg and Wismar, and is beautifully situated, surrounded with old walls, generally well built, and contains many magnificent buildings, among which the ducal palace is the most remarkable. It has good educational institutions, museums, galleries, and collections, and numerous manufacturing establishments. Pop. (1895) 36,388.

Schwerin, KURT CHRISTOPH, Count von: soldier; b. in Swedish Pomerania, Oct. 26, 1684; studied at Leyden, Greifswald, and Rostock; entered the Dutch army in 1700, and fought at Ramillies and Malplaquet; took service with the Grand Duke of Mecklenburg in 1706, and distinguished himself by repelling the Hanoverians, who invaded the country; after that part of Pomerania in which his estates were situated was ceded to Prussia, he entered the service of that country, and was sent by Frederick William I. on several important diplomatic missions. He enjoyed in a still higher degree the confidence of Frederick the Great, who raised him to the rank of field-marshal and gave him the title of count. He won the battle of Mollwitz Apr. 10, 1741, in the first Silesian war, stormed Prague Sept. 16, 1744, in the second, and fell in the battle of Prague May 6, 1757, in the Seven Years' war. See Varnhagen von Ense, *Biographische Denkmale* (Leipzig, 1873). F. M. COLBY.

Schwestriones: See Brethren and Sisters of the Free Spirit.

Schwytz, shwīts: one of the four so-called forest cantons in the middle of Switzerland: borders N. on the Lake of Zurich and S. on the Lake of Lucerne, and comprises an area of 351 sq. miles. It is entirely covered with mountains, but only one peak, the Rieselstock, on the eastern frontier, 8,890 feet high, reaches the line of everlasting snow. Agriculture can be pursued only to a limited extent, though fruits and wines are produced. Cattle-breeding is the principal industry, and cheese, cattle, and timber are largely exported. Manufactures are confined to home demands. The inhabitants speak German, and are Roman Catholics. Pop. (1888) 50,307. The capital is Schwytz; pop. 6,700.

Schytte, Ludwig: See the Appendix.

Sciacca, shaak'kăa: town; in the province of Girgenti, Sicily; 37 miles N. W. of Girgenti (see map of Italy, ref. 9–E). It occupies a site near the ruins of the ancient *Thermæ Selinuntinæ*, the birthplace of Agathocles (330 B. C.) The cathedral was founded in 1090 by Julia de Hauteville, daughter of Roger I. At the foot of Monte S. Calogero are hot wells that have been used as baths from Phœnician times. Off the coast coral-banks are worked. Pop. 21,451.

Sciæ'nidæ [Mod. Lat., named from *Sciæ'na*, the typical genus, from Lat. *sciæ'na* = Gr. σκίαινα, a sea-fish, the maigre; cf. σκιά, shadow]: a family of fishes of the order *Teleocephali*, including the drums, croakers, kingfishes, and weakfishes. The body is more or less elongated and compressed; the scales ctenoid and distributed in very oblique rows; the lateral line continuous and extending generally between the median rays of the caudal fin; dorsal fins two, the first short and with the spines generally feeble, the second longer and with branched rays; anal fin comparatively short, generally with two, but sometimes with one or three, spines; pectoral fins with branched rays; ventrals thoracic, each with a spine and five rays; the skull is channeled by muciferous cavities, bridged over by osseous bars; the stomach is cæcal, and pyloric appendages are developed in moderate number; the air-bladder has generally a number of slender cæcal appendages. The family is represented by about 130 or 140 species, distributed in different parts of the world; most of them are marine and inhabitants of the tropical and subtropical regions, but a few are confined to fresh waters. The most celebrated fish of this family is the famed sciæna of the ancients, *Sciæna aquila* of modern systematists. This grows to a very large size, sometimes attaining a weight of more than 60 lb. It was much esteemed by the Romans for the delicacy of its flesh, and was generally sold in slices. The otoliths or ossicles of the ear are comparatively large in this fish, as in others of the family, and they were esteemed in former times as "colic-stones," and were encased in gold and suspended from the neck. Theodore Gill.

Scialoia, shaă-lō'yaă, Antonio: economist; b. at Procida, near Naples, in 1817; studied law, and gave himself to its practice, but in 1846 he was called to the University of Turin as Professor of Political Economy; in 1848 was Minister of Agriculture and Commerce at Naples; was arrested and imprisoned in 1849, and after three years of confinement was banished. He then returned to Turin, where he resumed his chair in the university, and in 1859 was elected to Parliament; in 1860 became chief secretary of the ministry of finance, and two years later was sent to Paris to negotiate a commercial treaty between Italy and France; in 1865 he took the portfolio of finance, and during the war of 1866 signed the decree for a legal-tender paper currency and for a forced loan. He also warmly advocated the imposition of a tax upon personal property. In 1872–73 he was for some months Minister of Public Instruction. His chief works are *I Principi dell' Economia Sociale* (Naples, 1840); *Sulla Proprietà de' Prodotti d'Ingegno* (Naples, 1843); *Industria e Protezione* (Leghorn, 1843); *Trattato elementare d'economia sociale* (Turin, 1848); and *Prolusione alla prima parte del corso d' economia e diritto* (Turin, 1853). D. at Procida, Oct. 14, 1877. See de Cesare, *La vita, i tempi e le opere di Antonio Scialoia* (Rome, 1879). F. M. Colby.

Sciat'ica [from Lat. *sciat'icus*, for Lat. *ischiat'icus* = Gr. ἰσχιαδικός, subject to pain in the loins, deriv. of ἰσχιάς, pain in the loins, deriv. of ἰσχίον, hip-socket]: *neuralgia ischiadica*, a neuralgia or neuritis of the great sciatic nerve, the sacral plexus, or any of the nerves of the thigh and hip. According to Niemeyer, the cutaneous nerve of the thigh, the superficial branches of the peroneal nerve, and the sural nerve are the principal seats of what is called sciatica. Exposure, rheumatism, gout, tumors near the nerve, fæcal masses, hæmorrhoids, diseased vertebræ, metritis, and perimetritis, are reckoned among the causes. It sometimes follows a severe labor in childbed. Laxatives, cupping, the moxa blisters, hot baths, and local or general anodynes are frequently palliative, and sometimes curative. Periodic sciatica may often be relieved by quinine. Iodide of potassium and turpentine are both sometimes extremely useful, and so is the constant electric current. Absolute rest with fixation, and douching alternately with hot and cold water, or the application of ice for a short time daily, will sometimes cure obstinate cases. Revised by W. Pepper.

Science [viâ O. Fr., from Lat. *scien'tia*, knowledge, skill, science, deriv. of *sci're*, know]: in a general sense, knowledge reduced to order; that is, knowledge so classified and arranged as to be easily remembered, readily referred to, and advantageously applied. All science is based on the assumption that the laws of nature are immutable. From this point of view science may be regarded as a knowledge of the laws of nature, embracing the processes of experiment, observation, and comparison, by which they are discovered, and the modes of reasoning by which their operation in the production of phenomena is made known. Hence most widely it signifies the knowledge of a truth in relation to other truths. Various attempts have been made to classify the sciences, so as to make clear their relations to each other. Of these the best known is that of Comte, who first explicitly drew the distinction between abstract and concrete sciences. See Herbert Spencer on the *Classification of the Sciences* and *Genesis of Science*, and the article Positivism. R. A. R.

Science, Christian: a doctrinal and curative system discovered in 1866, by Mrs. Mary Baker Eddy (a native of New Hampshire then resident in Lynn, Mass.), and now professed and practiced by several hundred thousand disciples in both Europe and America. As stated in their Church Tenets, its members acknowledge and adore one Supreme God, and take the Scriptures for their guide to eternal Life. They acknowledge God's Son and the Holy Ghost, and man as the Divine image and likeness. They acknowledge God's forgiveness of sin in the destruction of sin, and believe that sin and suffering are not eternal. They accept the atonement as the efficacy and evidence of Divine Love, of man's unity with God, and the great merits of the Way-shower. They hold the way of Salvation demonstrated by Jesus to be the power of Truth over all error, sin, sickness, and death, and solemnly promise when they unite with the Church to strive, watch, and pray for that Mind to be in them which was in Christ Jesus, viz.: to love one another, and to be meek, merciful, just, and pure. The curative system is variously spoken of as "Christian Science Mind-healing," or "Metaphysical Healing," and is based on the theory of the unreality or non-existence of matter. All is Mind, and there is, in reality, but one Mind, viz., God. Man is the idea of God.

The following authoritative statement in regard to the history and principles of the system was specially prepared for this cyclopædia by Mrs. Eddy, and is given just as it left her pen:

CHRISTIAN SCIENCE is the Science of God and His universe, including man. Its Principle is the divine triunity of Life, Truth, and Love. There is but one God, one Christ, and one Jesus of Nazareth. God is Mind, and All-in-all; therefore there can be nothing real but infinite Mind, and its manifestation.

The compound individual idea of the Divine Principle is Christ, the spiritual idea of Truth, personifying the primal order of Being, and as perfect as its source.

Jesus represented the incarnation of Christ's Principle, he stood for Truth, healing the sick and sinful, and triumphing over the tomb. By his metaphysical therapeutics, it was proved that miracles do not violate, but fulfill law.

Jesus' mission was not limited to any period, but touches universal humanity. Hence his promise: "Verily, verily, I say unto you, he that believeth in me, the works that I do shall he do also; and greater works than these shall he do." And "these signs shall follow them that believe;" the word *them*, instead of *you*, clearly making this assurance applicable to all Christians in all ages. Jesus' atonement for sin was a human sacrifice which demonstrated man's life in God, divine Good, and this verity when understood is the way of salvation, for it destroys sin. (See Romans xii, 1.)

In the material world, like produces like,—a bird is not the product of a beast. In the spiritual world—that is the real world,—matter is not the progenitor of mind. If Mind is first, it cannot produce its opposite, matter. If matter is first, it cannot produce mind. Hence the irresistible, logical, cardinal point in Christian

Science.—There is no matter, All is Mind. Christian Science defines Soul and dreams. In truth Soul is God. In error soul is sense. Dreams are the conscious and unconscious states of matter; wherein the night dream is quite as real and tangible as the day dream; for Life or mind in matter, is a dream at all times, and is never the reality of Being.

That matter is substance, or includes mind, is pantheism which has no kinship with Christ. Spirit must be substance, since matter is neither the substance of Spirit, nor its reflex universe.

Man's origin is not material but spiritual. The universe is not the result of physical propulsion, but is an evolution from infinite Mind. "God is Spirit." Truth. As matter is the opposite of Spirit, Truth, so must it be the opposite of God. Matter is the subjective state of error, deflecting from the everlasting uprightness, and eventuating in false personal beliefs in sin, disease, and death, only to be overcome by conquering Truth,—eradicated not by drugs or hygienic rules, that is, laws of matter, but by the power of Mind. Jesus, referring to this original evil, which he cast out in healing the sick, called it "the devil," and "a liar from the beginning."

This theory is corroborated by Jesus' supremacy over all phases of matter,—a control not supernatural, but divinely natural, in one abiding in God, Good, the centre and circumference of the universe. From this it follows that genuine healing must be wrought upon thought, not body. When following these leadings of scientific Revelation the Bible was the writer's only text book.

Practically Christian Science is the fulfilling of the law of Love, namely, loving God supremely, loving your neighbor as yourself, and loving your enemies.

These doctrines were brought into modern light by the present writer, in the years 1866-7. When apparently near death, her convictions laid hold upon the sublime verity that all evil, whether moral or physical, must be non-existent because contrary to the omnipotent Good, God. She found in the Bible a new meaning, whereby she was snatched from the Valley of shadows, and her feet set on the Rock. As it was through this understanding of God, through Christ, God's idea, that all healing must come, she adopted Christian Science as the name of this curative system.

In 1867 she began healing others with wonderful success, and taught her first student.

Her textbook, *Science and Health with Key To The Scriptures*, is the outgrowth of her experience, and was first published in 1875. On July 4th, 1876, the first Christian Scientist Association was organized. In June, 1879, the first Church of Christ, Scientist, was founded in Boston, with twenty-six members, the writer becoming its pastor, though she did not receive ordination till 1881. This Mother Church has, in 1895, a membership of five thousand one hundred in different parts of the country, about eight hundred being local residents. During the same year she founded her Massachusetts Metaphysical College in Boston, the laws then enabling her to obtain a charter for medical instruction; though no such privileges were granted after 1883. She started in 1883, as editor and proprietor, *The Christian Science Journal*, still the official organ of the Scientists. The first National Association was convened in New York, on February 11, 1886, and still meets, though discarding organized action.

The first denominational chapel was erected at Oconto, Wisconsin, in 1886, and has been followed by others. In 1894 the Boston Church completed a beautiful edifice, as a Testimonial to the writer of this. It was dedicated on Jan. 6th 1895, and cost, including the land, nearly two hundred and fifty thousand dollars. In 1894, it was estimated that in Europe and America there were at least two hundred thousand disciples, while half a million people more attest its power. In the U. S., in 1894, there were three hundred societies meeting regularly for worship, twenty-six teaching institutes, and sixty-six dispensaries and reading rooms.

The Christian Science Publishing Society, issues *The Christian Science Journal*, the *Quarterly Bible Lessons*, and many tracts, some in German and Norwegian. The writer's works include *Science and Health with Key to the Scriptures* (already mentioned), *Retrospection and Introspection* (1891), *Christ and Christmas*, a poem, illustrated (1893), *Pulpit and Press* (1895), *Unity of Good and Unreality of Evil* (1887), *No and Yes* (1891), *Rudimental Divine Science* (1891), *People's Idea of God* (1886), and *Christian Healing* (1886). MARY BAKER EDDY.

Though numerous books and pamphlets purporting to deal with Christian Science have been published, Mrs. Eddy and her followers recognize as authoritative only those enumerated above. ROBERT LILLEY.

Scientific Schools: See *Technical Schools*, under SCHOOLS.

Scilla: See SCYLLA.

Scilly (sil'lĕe) **Islands** (anc. *Cassiterides*): a group of islands belonging to Great Britain, situated 30 miles W. of Land's End, the southwestern promontory of Cornwall. It consists of 140 isles and rocks, of which six are inhabited—St. Mary, Tresco, St. Agnes, Sampson, Bryher, and St. Helen's. Total area, 3,560 acres. Pop. about 2,500, of whom about 1,300 live on St. Mary, where Hugh Town, the capital, is situated. On St. Agnes is a lighthouse; and on Bishop Rock, 6 miles westward, is one of the finest lighthouses of its kind. All the islands are rocky, consisting of granite with a thin layer of light sandy soil. Agriculture and fishing are the principal occupations; good crops of barley, oats, and potatoes are raised. The navigation around these isles is very dangerous. In 1705 the fleet under Admiral Sir Cloudesley Shovel fell upon these rocks, when his ship and several others were lost. Revised by M. W. HARRINGTON.

Scin'cidæ [Mod. Lat., named from *Scin'cus*, the typical genus, from Lat. *scin'cus* = Gr. *σκίγκος*, *σκίγγος*, a kind of lizard]: an extensive family of lizards of the group *Leptoglossa*. As limited by Gray, it includes those forms in which the body is subcylindrical or fusiform, and with the tail cylindrical or tapering; the scales generally smooth, but sometimes keeled or striated; the head sub-quadrangular and regularly shielded, with the rostral plate moderate, and the nostrils lateral, and in a special nasal shield interposed between the frontal and labial shields; the limbs variable in development, typically four, generally more or less weak, sometimes atrophied. According to Prof. Cope, the temporal fossa is roofed, the premaxillary double, the palatine maxillary laminæ dilated, and rarely a xiphisternal fontanelle is developed. The tongue is short, flat, and squamous. The family embraces numerous genera, distributed in almost all parts of the world. There is every gradation in the development of the members, from those forms in which the limbs are quite strong and provided with five digits each, to those in which they are entirely wanting, and the number or development of these parts is of comparatively little systematic value in the group. The family is well represented in the U. S. chiefly by species of the genus *Eumeces*.

Revised by F. A. LUCAS.

Scinde: a province of India. See SINDH.

Scio, or **Chios** (Turk. *Sakiz Adasi*): island; in the Ægean, in the latitude of Smyrna, and separated from the western extremity of Asia Minor by a strait less than 5 miles wide where narrowest; 32 miles long from N. to S., and from 18 to 8 from E. to W.; area, 579 sq. miles. It is rocky, but so fertile and beautiful as to justify its title of Queen of the Ægean. Water-springs abound. There are few forests near the coast, but the interior of the island is covered with firs. Toward the south there are remarkable plantations of mastic-trees, the culture of which furnishes the main support of twenty villages, and from which a valuable hygienic gum is obtained. Its many harbors render the island easy of access from every direction. The Ionians colonized Scio about 1130 B. C., and it formed a part of the Ionian confederacy. It heroically resisted the Persians, from whom it was delivered by the treaty of Cimon (449 B. C.). During the Peloponnesian, Roman, and mediæval wars, it experienced many vicissitudes. Under the Genoese it enjoyed prosperity from 1346 until 1566, when it was conquered by the Ottoman admiral Piali Pasha. As the private property of the sultana, the island was mildly governed, and the inhabitants became unwarlike and effeminate, and were undisposed to join in the struggle for Greek independence. Hence the atrocious massacre of Apr., 1822, was without provocation and almost without pretext. The Ottomans slew or enslaved 30,000 persons; 20,000 who escaped were scattered over the world, some even reaching America, and by August the population had shrunk to 10,000. Scio has suffered much from frequent earthquakes, yet the industry and intelligence of the people have largely restored their former prosperity. Pop. 70,000, of whom 68,000 are Greeks, and 1,200 Mussulmans. Scio, the capital, was founded by the Genoese at the extremity of the plain of Cambos. It has dockyards and a good harbor, and is the maritime center of the Archipelago. The principal exports are lemons, oranges, olives, almonds, anise, beans, mastic, and worked leather. E. A. GROSVENOR.

Scioppius, stsĕe-op'pĕe-ŏos (*Kaspar Schopp*): classical scholar and controversialist; b. at Neumark, in the Palatinate, May 27, 1576; studied at Heidelberg, Altdorf, and Ingolstadt; visited Italy, Bohemia, Poland, and Holland; abjured Protestantism and became a Roman Catholic in 1598. His fanatical propaganda earned for him the titles of Duke of Clara Valle in Spain and patrician of Rome. His virulent invectives against the Jesuits and Joseph Scaliger (see SCALIGER, JOSEPH), and his insane diatribes against Cicero, Varro, and many post-Augustan writers, alienated even his own partisans, so that he was compelled to publish many of his polemical writings under an assumed name. He died in Padua, Nov. 19, 1649. Among his scientific writings may be mentioned his *Grammatica philosophica*

(1628), his best work; *Observationes linguæ Latinæ*; *De arte critica*; *Verisimilium libri iv.*; *Paradoxa litteraria*, and an edition of Sanctius's *Minerva* (1663). See C. Barth, *Cave canem sive de vita, moribus, rebus gestis, et divinitate G. Scioppii* (Hanover, 1612); C. Nisard, *Les gladiateurs de la république des lettres au XV^e^, XVI^e^. et XVII^e^ siècles* (vol. ii., pp. 1–206, Paris, 1860); H. Kowallek, *Forschungen zur deutschen Geschichte*, vol. ii., pp. 401–482 (Göttingen, 1891).

ALFRED GUDEMAN.

Scioto (sī-ō′tō) **River**: a beautiful stream which rises in Auglaize co., O. Its course to Columbus is S. E., and from that city it flows S. to Portsmouth, where its waters are discharged into the Ohio. It is 200 miles long, and when the water is high may be navigated for 130 miles. Its valley is very productive.

Scipio, sip′ĕe-ō: the name of a distinguished Roman family of the Cornelian gens. (1) PUBLIUS CORNELIUS SCIPIO, father of the elder Africanus, was consul in 218 B. C., the year of Hannibal's advance into Italy. He attempted to thwart the Carthaginians at the Rhône, but Hannibal had already passed the river when Scipio arrived. Scipio thereupon returned by sea to Cisalpine Gaul, and prepared to meet the enemy as they descended the Alps. He suffered defeat, however, in the first engagement at the river Ticinus, and again in the same year at the Trebia. In the following year he joined his brother in Spain, where they continued successful campaigns against the Carthaginians until 211 B. C., when they both lost their lives in battle.—(2) PUBLIUS CORNELIUS SCIPIO, called Africanus, a son of the foregoing, was present as a mere boy at the battle of the Trebia, and served as a military tribune at Cannæ (216). In 210, after the death of his father and uncle in Spain, he presented himself as a candidate for the office of proconsul to continue their campaign, and was enthusiastically elected. His success warranted the choice, and in the course of three years he had made the Romans complete masters of Spain. He was consul in 205, and advocated an aggressive policy upon Carthage; but the conservative party at Rome was too strong, and while he was granted the province of Sicily and permission to go on to Africa, the necessary forces were withheld. Hereupon Scipio called for volunteers, and with an army thus composed he landed on the African coast in 204, and in the following year defeated the Carthaginian army and their allies (under Syphax). In this crisis Hannibal was recalled from Italy and placed in command of the home forces. The decisive battle was fought at Zama, ending in the complete rout of the Carthaginians. Terms of peace were then made, by which the political and military importance of Carthage was greatly reduced, though its commercial interests were not disturbed. The demands of narrow-minded patriots like Cato that Carthage should be destroyed Scipio always withstood stoutly, not only realizing that Carthage could now do Rome no harm, but doubtless also believing that her commercial interests must be of positive value to Rome. Scipio lived in honored leisure for some years after his return from Africa, but in 194 he was again chosen consul, and in 193 he was one of the ambassadors to King Antiochus, at whose court he is said to have met Hannibal. In 190 he served with his brother in the conduct of the war against Antiochus, and with him was accused of misappropriating funds received from the king. The charges were probably not true, but Scipio with great arrogance refused the vindication of a trial and averted the prosecution by an appeal to the memory of his patriotic services. Though they were not renewed, Scipio withdrew from Rome at this evidence, as he esteemed it, of his countrymen's ingratitude, and spent the remainder of his life on his estate at Liternum, where he died about 183 B. C. He was a friend of the new culture and the refinements of civilization which were beginning to come into Rome during his lifetime, a circumstance which was made the basis for many attacks upon him by his political opponents; but he seems to have possessed a truly cosmopolitan mind conspicuously in advance of the narrow patriotism of his contemporaries. His personal bearing was characterized by extreme haughtiness and by a consciousness of his own superiority. His conduct, too, was often characterized by a disregard of the forms of government, and thus in spite of his great popularity with the masses he constantly provoked the dislike and jealousy of others in public life.—(3) PUBLIUS CORNELIUS SCIPIO AFRICANUS, the younger (a son of Æmilius Paulus), was the grandson, through adoption, of Scipio Africanus. In the years between the death of the elder Africanus and 150 B. C. Carthage had recovered its commercial importance, and because of wars with the Numidian king Masinissa, who shared with it the control of Africa, was suspected of planning to recover its ancient political position. On this plea the party of Carthage-haters at Rome succeeded in bringing about a declaration of war in 149, and in the following year Scipio was elected consul to take charge of it. After two years of fierce fighting and siege Carthage was taken and totally destroyed. In 134 Scipio was again consul, and by his administrative and strategic ability put an end to the long siege of Numantia in Spain, capturing and destroying it. Scipio was always a moderate aristocrat, and in the political storms aroused by the reforms of Tiberius Gracchus he made enemies, at whose instigation he was believed to have been assassinated in his bed (129), though the exact circumstances of his death always remained a mystery. Like the elder Africanus, he was devoted to the new Greek culture, especially in literature, and was the center of a famous coterie of literary men (the Scipionic circle), to which the poet Terence, the Greek historian Polybius, the philosopher Panætius, the poet Lucilius, and others less famous belonged.

G. L. HENDRICKSON.

Scire facias, sī′rēe-fā′shi-ăs [so called from these words occurring in the original (Lat.) form of the writ; *sci′re*, to know + *fa′cias*, sec. pers. sing. pres. subjunc. of *fa′cere*, make, cause]: in law, a common-law writ founded upon a record ordering the party against whom it is issued to appear in court and show cause why some act should not be done in favor of the party in whose behalf the writ was issued.

At the common law a *scire facias* was issuable upon three kinds of records—judgments, recognizances, and letters patent. The purpose of the writ when issued upon a previous judgment is either (*a*) to revive such judgment in order to have executions by or against the same party where the right to take out execution has been lost by delay (at the common law for a year and a day); or (*b*) to extend a judgment by or against a new party to a suit, who since the recovery of the judgment has become so related to the original parties that the same rights or liabilities exist for or against them—as in the case of members of joint-stock companies, executors, a feme sole who has married since the judgment, etc. In these cases the writ is in the nature of a continuance of a previous action.

Where the writ is issued upon a RECOGNIZANCE (*q. v.*), its purpose is to secure the issuance of an execution for the purpose of enforcing the obligation which must have been forfeited, and the writ is in the nature of an original action.

The writ when issued to reverse or annul a grant (as of a franchise, monopoly, or the like) by letters patent is the beginning of an original action, and is issued actually or nominally in the interest of the government to revoke the letters for some cause affecting their validity or for abuse, etc. In the U. S., in the Federal courts, a proceeding in the nature of a *scire facias* may be used to annul letters patent for an invention obtained through fraud.

In the U. S., in some States, the writ is used as a mode of foreclosing mortgages and also as a method of enforcing mechanics' liens. There are other uses in which it has been made available by statute in various States, and in some other (code) States it has been abolished for some purposes and a simple motion substituted in its stead. See Foster's *Writ of Scire Facias* and Kelly's *The Law and Practice of Scire Facias*.

F. STURGES ALLEN.

Scissorsbill: See SKIMMER.

Scissorstail: a bird, *Milvulus forficatus*, of the family *Tyrannidæ*. It has an extremely long, forked tail, which it has a habit of opening and closing like the blades of a pair of scissors. The general color is ashy gray; there is a spot of orange on the crown, and another of scarlet on the sides below the wings; the outermost feathers of the tail, which reaches a length of from 8 to 12 inches, are white. It is found from Missouri, southward through Texas, to Central America.

F. A. L.

Sciu′ridæ [Mod. Lat., named from *Sciu′rus*, the typical genus, from Lat. *sciu′rus* = Gr. *σκίουρος*, squirrel; popularly interpreted as *σκιά*, shadow + *οὐρά*, tail, but probably connected with O. H. G. *scēri*, quick]: a family of rodent mammals of the sub-order *Simplicidentati*, including the squirrels, marmots, etc. The skull is well developed and delicate in organization; the infraorbital foramen is only represented by a small anterior foramen, the zygomatic process of the upper jaw being an imperforate, thin, and oblique plate,

which rises from the general level and forms a dead wall in front of the orbit; post-orbital processes are more or less developed; the lower jaw has its descending ramus subquadrate, the upper angle acute and sub-erect, and the lower rounded or subtruncate and bent inward; molar teeth $\frac{4-5}{4} \times 2$, provided with roots, and (except the anterior upper one when present) of nearly equal size, with tubercular crowns; perfect clavicles are developed: the hind limbs moderately large; the fibula and tibia separate from each other. At least 150 species are known, represented in almost all quarters of the world, except Australia. There are all gradations, between the slender and graceful form of the squirrel and the heavy, almost bear-like, form of the woodchuck. This transition is manifest from the arboreal squirrels (*Sciurus*) through the ground-loving *Tamias* with well-developed tails; the *Spermophilus*, or prairie-squirrels, with shorter tails; *Cynomys*, or the prairie-dogs, with stouter forms; and *Arctomys*, or the woodchucks, with still more robust forms.

Revised by F. A. Lucas.

Sclater, Philip Lutley, Ph. D., F. R. S., F. L. S.: ornithologist; b. at Hoddington House, Hampshire, England, Nov. 4, 1829; educated at Winchester College and Corpus Christi College, Oxford, graduating in 1849; took a first class in mathematics, and subsequently became a fellow; was called to the bar at Lincoln's Inn in 1855, and practiced in the western circuit for several years. In 1859 he became secretary to the Zoölogical Society in London, and in 1860 editor of *The Ibis*, positions which he has held ever since. He is a member of the council of the Royal Geographical Society, and from 1877 to 1882 was one of the general secretaries of the British Association. He has published about 1,000 papers on ornithology and other branches of natural science. Among his more important works are *Monograph of the Tanagrine Genus Calliste* (1857); *Monograph of the Jacamars and Puff-birds* (1882); *Nomenclator Avium Neotropicalium* (1872); *Catalogue of Birds in the British Museum*, vol. xi., *Cœrebidæ*, *Tanagridæ*, and *Icteridæ* (1886), vol. xiv., *Oligomyodæ* (1888), vol. xv., *Tracheophonæ* (1890).

F. A. Lucas.

Scleren'chyma: See Histology, Vegetable (*Stony Tissue*).

Scleroder'ma [Mod. Lat.; Gr. *σκληρός*, hard + *δέρμα*, skin]: a sub-order of plectognath fishes, in which the bones of the upper jaw are but imperfectly united, the teeth independently developed, and the scapular arch, with the hypocoracoid and hypercoracoid bones both developed. The form is typically fish-like, in which respect the species differ much from the other members of the order. The dermal armature is developed in the form of small scale-like plates or bristles; the dorsal fin is represented by from one to six spines; the pelvic elements are well developed. To the group thus distinguished belong two well-defined families—*Triacanthidæ*, including the most fish-like forms, and *Balistidæ*, comprising the more aberrant species.

Sclerotica: See Eye.

Sclo'pis, Federigo Paolo, Count: politician and writer on historical law; b. at Turin, Italy, Jan. 10, 1798; took his legal degree in the university of his native city in 1818, and in 1827 gave his first historical lecture, *I Longobardi in Italia*, before the Turin Academy of Sciences. This was followed by *La Storia dell' Antica Legislazione nel Piemonte* (Turin, 1833); *La Storia della Legislazione Italiana* (4 vols., Turin, 1840–64); *Ricerche Storiche sopra le Relazioni Politiche tra la Dinastia di Savoia ed il Governo Britannico* (Turin, 1853). In 1845 he was elected corresponding member of the Institute of France, and in 1869 foreign member of the same; in 1847 was made president of the superior commission of press censorship in Piedmont; in Mar., 1848, accepted the portfolio of justice; in 1849 was named senator, and from 1861 to to 1864 was president of the Italian Senate; was also elected president of the Turin Academy of Sciences. In 1868 Victor Emmanuel bestowed upon him the highest order of the kingdom, that of the Annunziata; in 1871, being selected as representative of Italy in the congress of arbitration which assembled at Geneva for the settlement of the Alabama question, he was elected president of this congress, and performed the duties of his office with signal ability. D. Mar. 8, 1878. Revised by F. Sturges Allen.

Sclot, Bernat: See d'Esclot, Bernat.

Scollard, Clinton: poet; b. at Clinton, N. Y., Sept. 18, 1860. He graduated at Hamilton College 1881, and studied in the graduate department of Harvard University and for a short time at Cambridge University, England. In 1888 he was chosen Assistant Professor of Rhetoric at Hamilton College, and subsequently Professor of English Literature. He has published *Pictures in Song* (1884); *With Reed and Lyre* (1886); *Old and New World Lyrics* (1888); *Giovio and Giulia* (1891); *Songs of Sunrise Lands* (1892); and an edition of Ford's *Broken Heart* (1895). H. A. B.

Scolopac'idæ [Mod. Lat., named from the genus *Sco'lopax*, from Lat. *sco'lopax*, *scolo'pacis* = Gr. *σκολόπαξ*, *σκολόπακος*, snipe, woodcock]: a family of wading birds, including snipe, woodcock, sandpipers, and related forms. The bill is long and slender, rather soft and flexible, and with the sides compressed and grooved to the tip, which is blunt; the lower mandible has no angle at its lower margin; the nostrils are basal, elongated, and situated in a groove closed by a membrane; the wings are long and pointed, the first or second primary being longest; the tail is usually short and even; the legs elongated: the thighs exserted and naked; the tarsi elongated and slender; the toes moderately long and attenuated, the anterior being connected more or less by a basal membrane, the hinder short or wanting. Some members of the family are found in uplands far from water, and others in inland forests. See Curlew, Sandpiper, Snipe, Woodcock, etc. Theodore Gill.

Scombereso'cidæ [Mod. Lat., named from *Scombe'resox*, the typical genus; Lat. *scomber*, from Gr. *σκόμβρος*, mackerel + Lat. *e'sox*, *eso'cis*, pike]: a family of fishes comprising the flying fishes, half-beaks, and other remarkable forms. The body is more or less elongated, the scales are cycloid, a lateral peak developed along each side of the belly: the head is more or less quadrangular and flattened above; the jaws are very variable in development, sometimes very much elongated, and sometimes short and subtruncate; the upper is constituted by the intermaxillaries at the middle and the maxillaries at the sides; the teeth are variable in development; the branchial apertures confluent below; branchiostegals in considerable number; the dorsal fin single and far back, composed mostly of branched rays; anal fin opposite the dorsal; caudal distinct and generally emarginated, and with its lower lobe longest; pectorals with branched rays and variable in development; ventrals abdominal. The air-bladder is generally present, but is shut off from any communication with the intestinal canal; the pseudobranchiæ are hidden and glandular; the stomach is not distinct from the intestine, which is straight and without pyloric appendages. The species are mostly inhabitants of the tropical seas. Revised by F. A. Lucas.

Scom'bridæ [Mod. Lat., named from *Scom'ber*, the typical genus, from Lat. *scom'ber*, from Gr. *σκόμβρος*, mackerel]: an important family of fishes, including the mackerels, tunnies, bonitoes, and related forms. The body is elongated and fusiform; the scales very small or wanting (generally cycloid, but about the thorax larger and sometimes ctenoid ones are developed, which form the so-called corselet of the tunnies); dorsal fins two, the first composed of rather slender spinous rays, the second with branched rays, the posteriors of which are free and developed as finlets; anal similar to the second dorsal; caudal forked, and well adapted for powerful propulsion; pectorals pointed; ventrals thoracic, each with one spine and five rays; numerous (more than twenty-five) vertebræ; numerous pyloric cæca developed. The species vary in size from the dimensions of a small mackerel to those of the great tunny, which sometimes attains a weight of over 1,000 lb. Some are great wanderers. In the summer of 1871, for example, there appeared suddenly on the coast of Massachusetts large numbers of a small tunny (*Orcynus alliteratus*) which had previously been unknown along the coast of America, although familiar as a Mediterranean fish. See Mackerel and Tunny.

Sco'pas (Gr. *Σκόπας*): sculptor; b. in the island of Paros, flourished B. C. 390–350, and was one of the most celebrated of Grecian artists. He worked mostly in marble, the product of his native place, and chose his favorite subjects from the myths of Dionysus and Aphrodite. With Praxitcles, he formed the character of the second or later Attic school of sculpture, in contradistinction to the earlier school of Phidias. He was celebrated also as an architect, and constructed the temple of Athena Alea at Tegea, and engaged with Leochares and others in embellishing the mausoleum at Halicarnassus. The statement that he assisted in the erection of the temple of Artemis at Ephesus rests on a doubtful passage of Pliny. Among the most noted works ascribed to Scopas were a statue of Aphrodite Pandemos in Elis, one of Apollo Smin-

theus in Chryse, the group of Niobe and her children, and the group of sea-deities escorting Achilles to the island of Leuce. His separate figures are enumerated by Sillig in his *Dictionary of Ancient Artists.*

Scopel'idæ [Mod. Lat., named from *Sco'pelus*, the typical genus, from Gr. σκόπελος, high rock, cliff]: a family of fishes allied to the *Salmonidæ*, etc., many members of which are noticeable from the possession of phosphorescent spots. They have an elongate body, either naked or covered with cycloid scales, no barbels, the upper lip formed of the intermaxillary bones alone; a large gill-opening and an adipose fin; air-bladder lacking. The fifty species are arranged in some fifteen genera. All are marine, some living at the surface of the sea in the warmer waters, others being found at considerable depths. The phosphorescent spots of *Scopelus* have been regarded as accessory eyes by Ussow.

J. S. Kingsley.

Scoresby, William, D. D., F. R. S.: Arctic explorer and physicist; b. near Whitby, England, Oct. 5, 1790; son of a noted whale-fisher of the same name; went to sea in one of his father's ships when ten years old; spent the intervals between his annual voyages in scientific studies at Edinburgh; reached the highest northern latitude that had then been attained May, 1806; made important observations on the electrical phenomena of the Arctic regions, and by his communications to Sir Joseph Banks, president of the Royal Society, was instrumental in inducing the Government to send the first (1817) of the long series of Arctic exploring expeditions. After seventeen voyages to the Greenland or Spitzbergen regions, he published his *History and Description of the Arctic Regions* (2 vols., 1820) and his *Journal of a Voyage* (1823). When above forty years of age Capt. Scoresby passed through a course of literary and theological study, graduating in divinity at Cambridge; filled several pastorates; received the degree of D. D.; was noted for philanthropic labors; visited the U. S., in 1842 and 1848, and made a voyage around the world for magnetic research 1855–56. D. at Torquay, Mar. 21, 1857. He published valuable works on magnetism and several scientific books, and wrote a *Life* of his father (1851). His own *Life* was written by a nephew (1861). Revised by M. W. Harrington.

Scorpæn'idæ [Mod. Lat., named from *Scorpæ'na*, the typical genus, from Lat. *scorpæ'na* = Gr. σκόρπαινα, the *Scorpæna scrofa*, deriv. of σκορπίος, scorpion]: a family of fishes of the sub-order *Acanthopteri.* The body is more or less oblong and compressed: the scales (sometimes wanting) typically ctenoid and imbricated; the lateral line continuous; the head compressed, often inflated laterally, and more or less armed with ridges and spines; teeth acute and present on the jaws as well as palate; dorsal fin differentiated into a longer spinous and a shorter rayed portion; anal with its rayed portion smaller than that of the dorsal, and armed generally with three spines; caudal well developed and free; pectorals with at least the inferior rays generally somewhat enlarged and simple, not branched; ventrals thoracic, with a spine and generally five rays; the stomach is sacciform, and pyloric appendages are developed in moderately small number. The family includes many genera, the principal of which are *Scorpæna*, *Sebastes*, *Sebastosomus*, *Pterois*, *Pterodichthys*, *Tæniotus*, and *Apistus.* They are chiefly inhabitants of the tropical or sub-tropical regions, but *Sebastes* proper is peculiar to the northern seas, and of *Sebastosomus* and *Sebastomus* a number of species are found on the western coast of the U. S., as well as corresponding latitudes of the Asiatic portions of the Pacific. In some (*Apistus* and *Minous*) an independent pectoral filament or ray is developed. Revised by J. S. Kingsley.

Scorpio: See Scorpius.

Scorpio'nes [from Lat. *scor'pio*, scorpion]: a group of arachnid (spider-like) animals in which the body is divided into a short leg-bearing cephalothorax and a long abdomen, the seven basal joints of which are as broad as the thorax, the last six, including the terminal sting, being much narrower. To the cephalothorax are attached six pairs of appendages, the first pair being very short, and, like the long second pair, bearing lobster-like pincers at the end. The remaining four pairs are for locomotion. The abdomen is without evident appendages except a pair of comb-shaped organs (pectines) upon the second segment. These are supposed to be sensory in function. There are from three to six pairs of eyes upon the cephalothorax. A peculiarity is noticeable in the respiratory organs, which consist of four pairs of sacs (lungs) upon the basal joints of the abdomen. In each lung is a series of plates, through the walls of which oxygen passes to the blood. The young are born alive. Scorpions are best known for their poisonous character. The poison-gland is in the last joint of the abdomen, its duct emptying in the terminal spine. In tropical countries this sting is not infrequently fatal to man, but in the U. S., while very painful, it only occasionally causes death. The scorpions are largely nocturnal, living under logs and stones and in burrows by day. They feed upon the juices of spiders and insects, which are killed by the sting. In confinement they will eat bananas. The scorpions are inhabitants of warm countries, but have been found as far N. as Nebraska. About 200 species are known. They occur as fossils in the Silurian rocks. To the zoölogist the scorpions possess great interest, as they are the most primitive of the *Arachnida* and because they show most striking resemblances to the horseshoe-crab (*Limulus*). See Thorell, *Classification* (*Annals and Magazine of Natural History*, 1876); Lankester, *Limulus an Arachnid* (*Quarterly Journal of Microscopical Science*, 1881); Laurie, *Embryology* (*Quarterly Journal of Microscopical Science*, 1890).

Black scorpion (*Scorpio afer*).

J. S. Kingsley.

Scorpion-flies: See Entomology (order *Mecoptera*).

Scorpius, or **Scorpio**: the eighth sign of the Zodiac (*q. v.*), also a constellation, the Scorpion. Two thousand years ago the constellation and the sign coincided, but now, owing to the precession of the equinoxes, the constellation Scorpio is situated in the sign Sagittarius. It may be recognized by the bright red star Antares, with a smaller companion on each side of it, and a curved row of stars toward the W. S. N.

Scorzone'ra [Mod. Lat., from Ital. *scorzonera*, appar. liter., black bark; *scorza*, bark + *nera*, fem. of *nero*, black]: a garden vegetable popular in parts of Europe, but unknown in the U. S. The *Scorzonera hispanica*, *S. glastifolia*, *S. deliciosa*, and *S. tuberosa* (family *Compositæ*) furnish edible roots, whose taste is compared to that of asparagus, celery, hazelnuts, and salsify. The black skin is washed off, and the root is soaked in fresh water and then boiled fifteen minutes. Scorzonera is very highly esteemed by many, and is especially praised as food for invalids. It is very hardy and of easy cultivation.

Scotch Confession of Faith: a confession drawn up by John Knox and his compeers at the request of the Scotch Parliament, which assembled at Edinburgh in Aug., 1560, after the death of the queen-regent, Mary of Guise (June), and the close of the civil war. It consists of a preface and twenty-five articles on the chief doctrines of religion, which are briefly, tersely, and vigorously stated. It agrees with the other Reformed confessions of the sixteenth century, but is more pronounced in its opposition to the Roman Catholic Church than most of them. It was rather hastily composed in four days, twice read article by article in Parliament, and adopted by the same as being "based upon the infallible word of God." Only three temporal lords voted against it, for the reason that they believed as their forefathers believed. The Roman Catholic bishops were called upon to object and refute, but kept silence. Seven years later (1567), after the abdication of Queen Mary, the confession was readopted, and the Reformed Kirk of Scotland formally acknowledged and established. In 1580 the confession was signed by King James II., and a supplementary confession (sometimes called the *second* Scotch Confession) added to it. It continued to be the only doctrinal standard of Scotland recognized by the civil government till the Revolution of 1688, but it was practically superseded by the Westminster Confession, which is more logical and complete, and was adopted by the Covenanters and the General Assembly during the Commonwealth. The Scotch Confession is printed in the acts of the Scotch Parliament for 1560, in Knox's *History of the Scotch Reformation* (ed.

Laing, vol. ii.), in Calderwood's *History of the Kirk of Scotland*, in Dunlop's *Collection of Scotch Confessions* (vol. ii.), in Niemeyer's *Collectio Confess. Reform.*, and in Schaff's *Creeds of Christendom* (vol. iii.).

Scoter: any sea-duck belonging to the genus *Oidemia* of Fleming. The species are distinguished by the bill being much swollen at the base, with the terminal part depressed and broad, and the extension of the feathers of the chin forward as far as the nostrils. The color is to a great extent black. The American species are *Oidemia americana* (the common scoter), *O. fusca* (velvet scoter), *O. perspicillata* (commonly called surf-duck or sea-coot), and *O. deglandi* (the velvet duck or white-winged coot).

Scotists: among the SCHOOLMEN (*q. v.*), the followers of John Duns Scotus. Their principal adversaries were the Thomists. The Scotists held to freedom of the will and the immaculate conception of the Virgin. Franciscans were generally Scotists; the Dominicans, Thomists.

Scotland: that part of Great Britain which lies N. of the Cheviot Hills and the Tweed. It is bounded on the N. and W. by the Atlantic Ocean, on the E. by the North Sea, on the S. by England and the Irish Sea. Its greatest extent, from Dunnet Head in the N. (58° 41′ N.) to the Mull of Galloway (54° 38′ N.), is 288 miles. The area is 29,785 sq. miles, of which the islands comprise over one-seventh.

Coast.—The development of the coast-line is very considerable in proportion to the area of the kingdom, for it amounts to 2,300 miles, which gives 1 mile of coast-line to every 12 sq. miles of area. No point of the country is farther than 40 miles from the sea.

No contrast could be greater than that between the east and west coasts. The former resembles that of England. It is generally formed of soft sandstones and clays and generally low and shelving, although marked by a few bold headlands, such as Duncansby Head, Tarbat Ness, Kinnaird Head, Buchan Ness, Fife Ness, and St. Abb's Head. Its indentations, including the Firths of the Forth and the Tay, and the Moray Firth, which bifurcates into Loch Beauly and Cromarty Firth, are few, but they penetrate far inland, and form the estuaries of comparatively important rivers. The west coast, on the other hand, as far S. as the Firth of Clyde, is formed of hard rocks, rises boldly from the sea, and is intersected by numerous narrow sea-lochs, bounded by steep hills, and separated from each other by mountainous peninsulas. The most considerable of these peninsulas is that of Kintyre or Cantire. It is nearly 60 miles in length and terminates in the Mull of Kintyre. Narrow sounds separate the mainland from Skye, Mull, and others of the Inner Hebrides; and a broad strait, the Minch, separates these from the Outer Hebrides, or Long Island.

The eastern coast of the Firth of Clyde is generally level, while that of the peninsula of Galloway, farther S., is generally steep, and juts out in the Mull of Galloway, the most southerly point of Scotland, in lat. 54° 38′ N. The northern coast, between Duncansby Head and Cape Wrath, is wild and rugged and marked by bold headlands.

Relief.—In its broad features Scotland may be divided into a highland region in the north, a lowland plain in the center, and an upland region in the south. The Highlands are cleft in two by a long and narrow valley, the Great Glen (Glenmore), which extends along an anticlinal axis from Loch Eil to the Beauly Loch. This valley is occupied by a chain of lakes connected by the Caledonian Canal, and its summit-level is only 105 feet above the level of the sea. The mountain region to the N. of this glen is, for the most part, sterile and inhospitable and very thinly peopled. Lofty mountains lift their summits above its extensive moors, the most considerable being Ben Dearg (3,547 feet), Ben Wyvis (3,929 feet), and Mam Soul (3,862 feet). Toward the N. E. this mountain region merges into the undulating sandstone plains of Caithness, which form bold and striking headlands on the coast.

The mountain region to the S. of Glenmore is known as the Grampians. In its arrangement it is much more linear than the Northern Highlands. A central chain can be traced from Ben Nevis (4,406 feet) in the southwest to the coast of Aberdeen. The Pass of Drumochter, on the confines of Perthshire and Inverness, crosses this chain at an elevation of 1,488 feet. The Northern Grampians branch off from the central chain near the head-waters of the Dee, and attain an elevation of 4,296 feet in Ben Macdhui. The Southern Grampians culminate in Ben Lawers, 3,984 feet. The Grampians are almost as sterile as the Northern Highlands, and moors abound, but there are excellent pastures in the valleys; and where these open out toward the N. E. and S. E. they offer every facility for a successful pursuit of agriculture. The western coast of the Highlands is generally steep and rugged, and sea-lochs penetrate far into the land; their interior abounds in picturesque lakes. Strathmore (the great vale) extends along the foot of the Highlands from Loch Lomond, in the southwest, to Stonehaven, in the northeast. It is separated from the sea and the great central plain extending between the Forth and the Clyde by a series of hills broken through by the Forth and Tay, and known as the Campsie Fells, the Ochil Hills (2,363 feet), and the Sidlaws (1,399 feet). Southern Scotland consists of an extensive hilly region stretching from St. Abb's Head on the German Ocean to Stranraer on the Irish Sea, and culminating in the Broad-Law (2,754 feet) and the Merrick (2,764 feet). The valleys of the Tweed and Clyde almost cut off from the main mass the outlying ranges of the Lammermuir and Pentland Hills toward the N. The range forming the boundary toward England is known as the Cheviots (2,636 feet). The southern hills are generally broad and flat; they are intersected by deep grassy glens, which open out into fertile valleys and plains. Among the latter that called the Merse, at the mouth of the Tweed, is the most considerable.

The western islands are generally of considerable height (Ben More, on Mull, 3,185 feet); the Orkneys and Shetlands, though they present bold cliffs toward the sea, and are much broken up by intricate channels, rise to a height of only 1,600 and 1,475 feet respectively.

Geology.—The rocks are chiefly of Palæozoic age. The clay and chlorite slates and the graywacke, interstratified with mica-schist and gneissose flagstones, which form nearly the whole of the Highlands, are classed by Prof. A. Geikie as metamorphosed Lower Silurian. On the west coast there occur sandstones of Cambrian age, while crystalline gneiss, equivalent to the Laurentian rocks of North America, occupy the Outer Hebrides and the west coast of Sutherland. These rocks are frequently broken through by igneous rocks, which form some of the highest summits. Granites predominate, but porphyry is found in the southwest, and basalt is highly developed on the islands of Skye and Mull. On the S. E., from the Clyde to Stonehaven, around Moray and Dornoch Firths and in Caithness, these Silurian rocks of the Highlands are bounded by flagstones and sandstones of the Devonian formation, which prevails in the Orkneys, while the Shetlands exhibit the geological features of the Highlands.

The great lowland plain is occupied by limestones and coal-measures of the Carboniferous system, the hills being largely formed of porphyritic rocks and basalt. Tuff and volcanic agglomerate occur in various localities. A narrow belt of Devonian rocks separates these lowlands from the southern uplands, whose graywacke and shale of Silurian age, pierced by masses of porphyry (Cheviots) and granite (in the west), are the prevailing rocks. Indications of an ancient glaciation are frequent. Subsequently an upheaval of the country, evidenced by raised beaches, took place. Scotland is rich in coal and iron. Lead is found in the southern hills. Excellent building-stones abound. Aberdeen is known for its granite; Craigleith for its freestone. Scotch pebbles, garnets, amethysts, and other precious stones are among the minor products of the mineral kingdom.

Hydrography.—The rivers rise in the hills, and frequently pass through mountain lakes. Their course is more rapid than that of the rivers of England. The water-parting being near the west coast the rivers of the eastern slope are much the longest. The Tweed is a rapid stream, forming, in its lower course, the boundary between England and Scotland, and entering the German Ocean at Berwick. The Forth, though an inconsiderable stream, deserves to be mentioned because of its firth. It is navigable to Stirling. The Tay is the most important river of Scotland. It rises to the N. of Loch Lomond, flows through Loch Tay, leaves the mountains at Dunkeld, intersects the Strathmore, and finally enters the Firth of Tay. It is navigable as far as Perth. The remaining rivers, with the exception of the Clyde, are of little use to navigation, but they abound in fish. The Clyde rises in a small lake on the southern confines of Lanarkshire, and enters the Firth of Clyde below Glasgow. Its current is very rapid, and it forms several waterfalls, but at a vast expense for dredging it has been made navigable for large vessels as far as Glasgow.

Scotland abounds in lakes. They are almost without exception in the Highlands and collectively cover an area of

SCOTLAND
English Miles
5 10 20 30 40 50
Longitude East 71 from Washington
Longitude West 5 from Greenwich
ATLANTIC OCEAN
WESTERN ISLANDS
HEBRIDES OR
LEWIS
HARRIS
THE MINCH
LITTLE MINCH
ISLE OF SKYE
Butt of Lewis
Stornoway
North Uist
Benbecula
South Uist
Barra
Rum I.
Eigg I.
Muck I.
Coll
Tiree
MULL
Iona
Colonsay
Oronsay
ISLAY
JURA
Kintyre
ARRAN
FIRTH OF LORN
NORTH CHANNEL
SOLWAY FIRTH
IRELAND
ENGLAND
SUTHERLAND
CAITHNESS
ROSS
CROMARTY
INVERNESS
NAIRN
ELGIN
BANFF
ABERDEEN
KINCARDINE
FORFAR
PERTH
FIFE
STIRLING
DUMBARTON
LINLITHGOW
EDINBURGH
HADDINGTON
BERWICK
LANARK
PEEBLES
SELKIRK
ROXBURGH
DUMFRIES
KIRKCUDBRIGHT
WIGTOWN
AYR
ARGYLL
Grampian Mounts
Ben Nevis
Cheviot Hills
MORAY FIRTH
FIRTH OF FORTH
Pentland Firth
Dornoch Firth
Thurso
Wick
Inverness
Aberdeen
Dundee
Perth
Stirling
Glasgow
Paisley
Kilmarnock
Ayr
Dumfries
Carlisle
Oban
Fort William
Montrose
Arbroath
Peterhead
Fraserburgh
St. Andrews
Dunbar
Hawick
Galashiels
Kelso
Stranraer
Campbelltown
Mull of Galloway
Luce Bay
ORKNEY & SHETLAND Is.
SHETLAND ISLANDS
NORTH SEA
ORKNEY Is.
Pomona or Mainland
Kirkwall
Lerwick
Fair I.
Foula I.

640 sq. miles. The largest among them are Loch Lomond (45 sq. miles), Lochs Awe and Ness (30 sq. miles each), Loch Shin (25 sq. miles), Loch Maree (24 sq. miles), and Loch Tay (20 sq. miles).

Climate.—The climate is influenced by the warm waters of the Gulf Stream, which wash its western shore, the proximity of the Arctic Ocean with its masses of floating ice, and its position to the W. of continental Europe. Cold N. and E. winds prevail during spring; damp, warm winds from the S. and W. during summer and autumn, while the alternation between N. and S. winds during winter yields most rain. The rains are heavier on the west coast than on the east, the annual amount along the former varying between 40 and 80 inches, while along the latter it does not exceed 23 to 30 inches. Much heavier quantities, up to 130 inches, fall in the Western Highlands. Snow in the hills remains on the ground for two or three months. The mean temperature in the Lowlands and on the coast varies between 45° and 47° F. The January temperature varies between 37° and 40°, that of July between 55° and 58°. The winters are colder in the east than in the west (Edinburgh 37°, Glasgow 40°), but the summer temperature is nearly the same.

Scotland has been described as the land of the pine and heather, though in the Lowlands the forest-trees of England, beeches, oaks, and elms, grow well.

Politically it is divided into the following counties:

COUNTIES.	Area, sq. miles.	Pop. 1901.	Pop. to a sq. mile.
I. NORTHERN:			
Shetland*	551	27,755	52
Orkney*	376	27,723	81
Caithness*	685	33,619	54
Sutherland*	2,028	21,389	11
II. NORTHWESTERN:			
Ross and Cromarty*	3,078	76,149	25
Inverness*	4,089	89,901	22
III. NORTHEASTERN:			
Nairn	195	9,291	47
Elgin (Moray)	476	44,757	91
Banff*	641	61,439	97
Aberdeen	1,955	303,889	145
Kincardine (Mearns)	383	40,891	93
IV. EAST MIDLAND:			
Forfar (Angus)	875	283,729	317
Perth	2,528	123,255	47
Fife	492	218,350	387
Kinross	73	6,980	91
Clackmannan*	48	31,991	690
V. WEST MIDLAND:			
Stirling	447	141,894	264
Dumbarton	241	113,660	407
Argyll*	3,213	73,166	23
Bute	218	18,659	84
VI. SOUTHWESTERN:			
Renfrew	245	268,418	942
Ayr	1,128	254,133	201
Lanark	882	1,337,848	1,254
VII. SOUTHEASTERN:			
Linlithgow (West Lothian)	120	64,787	440
Edinburgh (Mid-Lothian)	362	437,553	1,200
Haddington (East Lothian)	271	38,653	138
Berwick*	461	30,785	70
Peebles	355	15,066	42
Selkirk*	257	23,339	108
VIII. SOUTHERN:			
Roxburgh*	665	48,793	80
Dumfries	1,063	72,562	70
Kirkcudbright (East Galloway)*	898	39,359	44
Wigtown (West Galloway)*	486	32,591	74
Totals	29,785	†4,471,957	135

* In counties marked thus * the population has decreased since 1891.
† Includes a shipping population of 9,583.

Population.—The population rose from 2,888,742 in 1851 to 4,025,647 in 1891, and to 4,471,957 in 1901. Between 1881 and 1891 the population increased 7·77 per cent., but had there been no emigration the increase would have amounted to at least 12 per cent., for the excess of births over deaths during these ten years amounted to 441,761. The number of emigrants who left Scotland during the same period for countries outside Europe was 270,459, besides which 282,271 natives of Scotland were enumerated in England, and 27,323 in Ireland. This emigration affects more especially the Highlands, and emigration from these is by no means all voluntary. Thousands of homes have been destroyed and their tenants and fellow clansmen evicted by the landowners in order that the holdings might be converted into sheep-walks or still more profitable deer-forests. These last alone in 1891 covered 4,040 sq. miles.

The bulk of the inhabitants are concentrated in the lowland plain, and there, too, are nearly all the large towns, the only exceptions being Inverness (21,193 inhabitants, the capital of the Highlands), Aberdeen and Peterhead (12,226 inhabitants) in the north, and Galashiels (17,367 inhabitants), Hawick (19,204 inhabitants), and Dumfries (17,821 inhabitants) in the south. Of towns of over 50,000 inhabitants in 1901 there are nine, viz., Glasgow, pop. 760,423; Edinburgh, 316,479; Dundee, 160,871; Aberdeen, 153,108; Leith, 76,667; Paisley, 79,355; Govan, 76,351; Greenock, 67,645; and Partick, 54,274.

The population is the outcome of a fusion of various races, still in progress. The Gaelic Highlanders may be looked upon as the descendants of the ancient Picts and Scots, but they have also absorbed many Northmen, Danes, and Frisians who settled all around the coasts and on the islands. The Lowlanders, on the other hand, have for their stock an Anglo-Saxon element, especially strong in Lothian, and these early immigrants have absorbed not only many Highland Gaels, but also the Cymric Britons of Southwest Scotland and the Scandinavian settlers. English has thus become the predominant speech throughout Scotland. Gaelic, however, is still spoken by about 250,000 Highlanders, but it is rapidly dying out. The old patriarchal constitution of the Highland clans ceased to exist in 1747, and the land formerly held in common by all the members of the clan has been appropriated by the chieftains. Of the inhabitants in 1891, 3,688,700 were born in Scotland, 194,807 in Ireland (besides numerous persons of Irish parentage), 14,045 in England, 14,534 in British colonies, and 16,561 in foreign parts.

The Lowland Scotch are of average height, long-legged, spare, and muscular. Their features are regular, the cheekbones rather prominent. They are intelligent, persevering, shrewd in business, and thrifty almost to avarice, although on occasions and with patriotic objects in view they spend their means most freely; they value education quite apart from the material advantages it may yield, and have furnished some of the most redoubtable champions to free thought or secularism. Throughout the world they retain a love for their native country, and do everything in their power to push the interests of their fellow countrymen. The Highlander is represented by the poets as the type of bravery, loyalty, and every manly virtue, but until compelled by forts and military roads to settle down peaceably he led the life of a predatory herdsman.

Occupations.—Of the total population (1891) 722,329 males and 1,526,366 females, for the most part children and wives, follow no regular trade or profession. Of the remainder 12·3 per cent. are engaged in agriculture, 1·7 per cent. in fishing, 12·2 per cent. in mining and metallurgical works, 11·8 per cent. in textile industries, 34·2 per cent. in all other industries, 3·3 per cent. in commerce, 6·9 per cent. in transportation, 6·2 per cent. in the professions, 11·4 per cent. in rendering personal services, as servants, innkeepers, and the like.

Agriculture.—Scottish farmers enjoy a high reputation for the intelligence which they bring to bear upon the cultivation of the soil. Of the total area only 25·2 per cent. is under the plow (nearly half of which is sown with clover or grasses), 21·9 per cent. is permanent pasture, 4·5 per cent. is covered with woods, and 48·4 per cent. consists of mountain-heath and land used for grazing. The principal cereal crops are oats, barley, and wheat. Great quantities of strawberries, gooseberries, currants, and damsons are grown for export. The live stock numbered (1894) 1,201,506 head of cattle and 7,272,864 sheep; Scotch beef (from Buchan) and Highland mutton are highly esteemed in England. The whole of Scotland was owned (1877) by 132,131 persons, of whom 171 held nearly 60 per cent. of the entire area. There were (1895) 79,639 agricultural holdings of an average size of 61 acres.

Fishing.—The fisheries employ about 29,000 men permanently and 25,000 occasionally. Their produce (1900) was valued at £2,325,742, and 268,457 tons of fish were landed, exclusive of shellfish or salmon. Herrings form a valuable article of export. Dundee and Peterhead still fit out whalers for the Arctic and Antarctic regions.

Mining.—The country is rich in coal and iron. The coal-basin of Lanarkshire is the most extensive, but there are three others, and jointly they yielded (1899) 31,142,612 tons. Iron ores are usually associated with the coal-measures, and the ore is smelted on the spot. Lead is mined at Warlockhead (Dumfries) and at Leadhills (Lanark); a little copper near Loch Tay. The oldest iron-works are those of Carron, in Stirlingshire. Mining and metallurgical works employ 216,110 workmen.

Manufactures.—These are of considerable importance, especially in the lowlands. The textile industry (1891) gave employment to 206,550 persons, and there were 747 factories with 2,413,735 spindles, 71,471 power-looms, and 154,591 hands. The cotton industry has its centers at Glasgow and Paisley; the woolen manufacture is carried on at Hawick and Galashiels on the Tweed, but also in Stirling, Kilmarnock, and Bannockburn; carpets are made at Kilmarnock and Glasgow; Dundee and Dunfermline are the principal seats of the linen, hemp, and jute industries. Knitting is widely carried on as a domestic industry. The making of machinery, which employs 51,426 men, and shipbuilding (23,518 workmen) have their chief seats on the Clyde, where the largest ocean steamers and ironclads are built. Other industries of importance are printing (20,317 workmen), paper-making, sugar-refining, the preserving of provisions, glass-making, and the manufacture of chemicals.

Commerce.—Glasgow is the commercial capital of the country, although as a shipping-port it ranks seventh in the United Kingdom, being preceded not only by London or Liverpool, but also by Cardiff, Hull, Newcastle, and Southampton. The railways at the end of 1899 had a length of 3,480 miles, and there were also about 100 miles of tramway and 153 miles of canal. For further details, see GREAT BRITAIN.

National Wealth.—In 1886 the total value of property and profits assessed by the income-tax amounted to £59,406,708; in 1893 to £65,606,195 (all incomes of less than £150 are exempt). This increase, however, did not extend to the owners or occupiers of lands and tenements. The number of depositors in savings-banks (1893) was 596,179 and £12,583,676 stood to their credit, an increase of £4,338,681 since 1883. In 1892 there existed 342 co-operative industrial and provident societies, with 195,919 members, a capital of £2,983,303, and a turn-over of £9,743,238; and 61 building societies employing a capital of £976,255. On the other hand, in Jan., 1894, there were 61,978 paupers with 33,218 dependents (2·3 per cent. of the total population).

Religion.—Scotland since 1560 has an Established Church, organized on the Presbyterian system, and now governed by 1,348 parochial kirk sessions of ruling elders, with the minister as moderator; 84 presbyteries, 16 synods, and a General Assembly which meets annually in May. It claims 656,112 communicants, and about 45 per cent. of the entire population are claimed to adhere to it. Since 1874 its ministers are elected by the congregations. This question of patronage led in 1843 to a secession and the foundation of the Free Kirk, with 1,260 ministers and missionaries, 1,050 churches, 343,069 communicants, and the adherence of 34 per cent. of the population. On Oct. 31, 1900, the Free Church of Scotland and the United Presbyterian Church of Scotland met together in Edinburgh, through representatives, and constituted the United Free Church of Scotland with 1,656 congregations, 1,781 ordained ministers, and 495,174 members. There are small bodies of other denominations. The Episcopal Church now has 7 bishops, 354 churches and missions, and 336 clergy. The Roman Catholics are supposed to number 365,000 souls, and besides the Irish in the towns they embrace the inhabitants of the islands of Barra, South Uist, Eigg, and Canna, and of a few Highland valleys. See SCOTLAND, CHURCH OF.

Education.—Scotland has long been in advance of England in educational matters, more especially as regards secondary education. Since 1872 all public, elementary, and middle-class schools are administered by school boards, and education is free for all children between the ages of five and fourteen. In 1899 there existed 3,062 of these schools, attended by 731,272 children. In addition to these there are numerous superior schools in the enjoyment of endowments or supported by public bodies, the more famous among these being the Edinburgh Academy, Fettes College, the Edinburgh High School, Merchiston College, and the five schools supported by the Merchant Company. There are four universities and 2 university colleges, with 293 professors and 5,766 students. The oldest of these universities, that of St. Andrews, was founded in 1411. Among schools for special purposes may be mentioned the theological colleges, seven training-colleges for teachers, an agricultural college, veterinary colleges, and a school of medicine for women. Many of these schools are at Edinburgh, which is likewise the seat of the Royal Society (founded 1783) and of the Royal Scottish Academy. See SCHOOLS and COMMON SCHOOLS.

Political Institutions.—Scotland sends 72 members to the House of Commons, and 16 representative peers to the House of Lords, who are elected for the duration of each Parliament (the Scottish peerage numbers 87 members, of whom 48 are also peers of the United Kingdom). At the time of the Union (1707) the Scottish Church and the judicial system were left intact, and Scottish law differs in many notable respects from that of England. The high court of justice includes a court of session for civil cases, and a high court of justiciary for criminal offenses. The inferior jurisdiction is exercised by sheriff courts, by borough magistrates and justices of the peace (bailies). The police force numbers 4,488 men. In 1899 2,153 persons were committed for trial, and 1,785 convicted.

Local government was reorganized in 1889 on the outlines followed in England. Elected county councils have taken the place of the old commissioners of supply and road trustees. Municipal bodies, presided over by a provost, exist in numerous cities and burghs. In 1897–98 (the last year for which there is a complete return) the local expenditure amounted to £12,924,848, inclusive of £1,085,728 for the relief of the poor, and £2,222,686 for the support of schools. Of the total amount required £5,939,719 was raised by rates, tolls, and dues, £1,847,602 was contributed by the imperial Government, and £2,255,099 was raised by loans.

History.—When Scotland first became known to the Romans its Highlands were occupied by Gaelic Picts, while the south was held by Cymric Britons. The Highlands were known to them as Caledonia (a corruption of Gael Dun, Land of the Gael). Julius Agricola (80–85) first penetrated this "Barbaria" as far as the Tay, and inflicted a defeat upon the Picts at Mons Grampius, but his conquests were only temporary, and when the Emperor Hadrian was in Britannia (122) he caused a wall to be built from the Solway to the Tyne as a protection of the Roman provinces against the predatory northern tribes. Twenty years afterward, in the reign of Antoninus Pius, the legate Q. Lollius Urbicus once more advanced into Caledonia, and constructed the Antonine wall between the Forth and Clyde. In 208, however, Severus once more retired to the Tyne, and although Flavius Theodosius, the father of Theodosius the Great, once more recovered the country between the two walls (369), and bestowed upon it the name of Valentia, in honor of the Emperor Valentinian I., the Romans finally retired from their conquests and abandoned Britannia.

The Picts again swept down over the lowlands and far into England, ravaging and devastating the country with savage but irresistible valor. The Britons now called the Anglo-Saxons to their aid, and the Picts were once more confined to their Highlands; in 449 a Saxon chieftain, Edwin, founded Edinburgh. In 503 the Scots—that is, the Celts from Ireland—crossed over to Britain and founded, under the leadership of Fergus, a Scottish kingdom along the western coast of Caledonia, from the Firth of Clyde to the present Ross-shire. The Celts of Ireland were Christians, having been converted by St. Patrick, and in 563 St. Columba went over from Ireland and settled among the heathen Picts, spending the rest of his life, till 597, in converting them to Christianity. In the beginning of the seventh century Scotland formed four independent kingdoms, namely, that of the Scots, along the west coast to the N. of the Clyde; that of the Picts, to the N. of the Forth; Strathclyde in the southwest, which was held by the Britons; and the Saxon domain of Bernicia. In 836, Kenneth, a lineal descendant of Fergus, became King of the Scots, and in 843 he also became King of the Picts, transferring his residence to Forteviot in Stratherne, the old capital of the Picts. Thus the Scots and the Picts, two tribes of the Celtic race and speaking two dialects of the Celtic language, coalesced and formed one empire, which was originally known as Alban (Highlands), but developed in course of time into Scotia or Scotland, a designation by right belonging to Ireland. In 945 the King of England bestowed upon Malcolm I. (942–954) a portion of the Cambrian kingdom, and thus was established that claim for homage which subsequently led to many wars. In 970 King Edgar of England bestowed upon Kenneth III. the purely Saxon district of Lothian. The same king occupied also Strathclyde, and his successor, Malcolm II. (1003–33), acquired the Merse and Teviotdale from the Prince of Northumberland, thus extending Scotland to the Tweed.

While the Scottish kingdom was externally much extended, the Scottish people underwent an internal change by which the Celtic character almost disappeared. So many Teutonic elements were absorbed that in the course of two centuries a new national type was developed, in which the

Celtic element was hardly more than recognizable. Teutonic language, ideas, and races invaded Scotland both from the north and the south. The Norwegians and the Danes held the islands before the time of Kenneth, and afterward, at times, also large tracts of the mainland, and a lively intercourse took place between the Scots and the Scandinavians, both as friends and as foes. The Hebrides and the Isle of Man were not united to Scotland until the reign of Alexander III. (1249–86), who defeated Haco, King of Norway, at Largs, on the coast of Ayr; and the islands of Orkney and Shetland not until the reign of James III. (1460–88), who married Margaret, daughter of King Christian I. of Denmark, and received them as her dowry. Still greater was the Teutonic influence coming from the south—first Anglo-Saxon, then Norman. Malcolm III., who slew and succeeded Macbeth in 1057, was educated at the English court and married an English princess. Her brother, Edgar Atheling, and many Anglo-Saxon nobles sought refuge and support with Malcolm after the Norman invasion of England, but in 1072 William the Conqueror penetrated into Scotland and compelled Malcolm to submit and do homage to him. David (1124–53), the youngest son of this Malcolm, who had resided for several years at the polished court of his brother-in-law, King Henry of England, marched thrice into England to support the claims of his niece Matilda to the throne, but was defeated on each occasion. He is famous among Scottish kings for having introduced into Scotland the type of feudal civilization which obtained in England. He secured peace throughout his dominions, promoted trade and industry, and established schools of learning. During the whole of this period the Scottish kings were looked upon as vassals of the English crown. William the Lion (1165–1214), who resisted the claims of Henry II. of England, was captured at Alnwick (1174), and only liberated on renewing his allegiance. This question of homage and the meddling of the Scottish kings in the affairs of England led to frequent wars, for the concessions made by Richard Cœur de Lion in 1189, in return for a money payment, were of a temporary nature, as John again enforced the claims of the English crown (1209), and Alexander II., after an unsuccessful invasion of England, was compelled to do homage to Henry III. in 1217. When Margaret, the so-called Maiden of Norway, daughter of King Eric of Norway, granddaughter of Alexander III., and heiress to the Scottish crown, died on her voyage from Norway to Scotland, several pretenders appeared, and finally John Baliol obtained the crown by the aid of Edward I., to whom he swore allegiance. But he was deposed by the king after the battle of Dunbar (1296), and then the Scottish people arose and made the fiercest resistance to the English usurper—first under William Wallace, who fell into the hands of Edward I., and was put to death in London 1305; then under the younger Robert Bruce, who routed the English under Edward II. at Bannockburn June 24, 1314, invaded England twelve times in fourteen years, and ravaged the country so fearfully that Edward III. was glad to conclude a truce for thirteen years. But in 1333 a fresh war broke out, and, after the battle of Halidon, and again after that of Neville's Cross (1346), the Scottish kings were compelled to acknowledge themselves vassals of England.

With Robert II. (1371–90) the house of Stuart ascended the throne, and the history of Scotland from this time to the establishment of the union with England is given in the articles on Robert II. and III., James I.–VI., Mary Stuart, Knox, etc. Most of the kings of the Stuart dynasty were valiant and energetic men, but seven of them ascended the throne as minors, and five ended their lives by untimely deaths. This circumstance gave the power of the nobility an exorbitant development, and for centuries the history of Scotland became one long contest between the crown and the nobility, and one confused maze of feuds between the various noble families. In these troubles the kings sought support from the Church; they flattered and enriched it. The Scotch Church was the richest in Christendom. In the sixteenth century it owned half of all the real estate in the country. But its members were the most debased set of men within the pale of Romanism, and were able to maintain their social position only by means of the dense ignorance which they spread around them. The nobility were jealous and afraid of the Church, and embraced the Reformation with great eagerness; and the great crisis in Scotch history in the sixteenth century was essentially a contest between Romanism and absolutism on the one side, represented by the crown, and Protestantism and feudalism on the other, represented by the nobility—a contest in which the final decision was given by a third party, the middle class, the burghers, who, under the leadership of Knox, carried the Reformation through and put certain limits to the power both of the crown and the nobility. Other elements were mixed up in the contest. The relation between Scotland and England during this period consisted mainly in a continuous border feud, which was carried on almost without intermission, and which now and then grew into actual warfare on a great scale. Nevertheless, by degrees there developed an English party within the Scotch people. During the wars between England and France the Scotch went to France to fight against the English, and this circumstance opened the way for a French influence in Scotland, which became of very great importance when James V. (1513–42) married Mary of Guise. France understood that, in a conflict with England, Scotland could be used as one of the most effective weapons, but in her attempts to form a close alliance with this country Roman Catholic France was compelled to seek her main support from the Roman Catholic clergy in Scotland, and thus she caused, most unwillingly, the nobility and the Protestants to turn their eyes to England. Meanwhile, statesmen arose on both sides of the border who wished to stop the perpetual hostilities, and who understood that a union between the two countries was the only means of achieving this end. It was a favorite idea with Henry VIII., and after the death of James V., during the regency of the Count of Arran, a treaty was made by which Mary, the Queen of Scotland, was betrothed to the Prince of Wales, the son of Henry VIII., and it was agreed that when ten years of age she should be taken to England, in order to be educated there. But Henry's demand of political supremacy soon brought discord, and before the treaty was half a year old it was broken, and war was declared. After the death of Henry VIII. the Duke of Somerset tried to re-establish the treaty, but in vain; and after the battle of Pinkie (Sept. 10, 1547), Scotland threw herself into the arms of France. The queen-mother, Mary of Guise, assumed the regency, and the queen was taken to France to be educated, and betrothed to the dauphin. At last, however, by the victory of Protestantism in Scotland, and the extinction of the house of Tudor in England, the union actually took place. The most prominent points in the history of the united kingdoms are the contest between Presbyterianism and Episcopacy, the former being supported by the common people, the latter by the sovereign, the nobles throwing their weight into either scale as it suited their policy at the time, and the Jacobitic reaction which was called forth by the corrupt and oppressive government of Charles II. and James II., and which gradually became so strong that nothing short of an incorporating union seemed capable of averting the danger of a civil war. The act of union with England was formally ratified by the Parliament of Scotland on Jan. 16, 1707.

The history of Scotland has been written by Hume (1657), Maitland (1757), Guthrie (1770–77), Dalrymple (1776–79), Heron (1794–99), Burton (1867–70), Mackenzie (1867), and Keith (1886). Works dealing with particular periods are Skene's *Celtic Scotland* (1876–80); Leslie's *The Early Races of Scotland* (1866); Anderson's *Scotland in Pagan Times* (1883–86); Pinkerton's, Tytler's, and Robertson's *Histories*; R. Chambers's *Domestic Annals of Scotland* (1859–61); Mackintosh's *History of Civilization in Scotland* (1878–83); and Rogers's *Social Life in Scotland* (1884–86).

Revised by E. G. Ravenstein.

Scotland, Church of: the established Church of Scotland, frequently since the Reformation called the Reformed Church of Scotland.

Early History.—There are traditions of the introduction of Christianity into Scotland in very early times, traditions in which figure such names as those of St. Andrew, St. Rule, and St. Ninian. About 563 A. D. St. Columba founded his monastery on the lone isle of Iona, and extended his missionary work all over Scotland, and even into England. His followers and successors are known as the Culdees. In later centuries another stream of Christian influence was poured into Scotland from the South, representing the Roman form of ecclesiasticism; and after the Scottish and Pictish monarchies were united in one king during the reign of Malcolm III., and largely through the influence of Margaret, his Saxon queen, many of the Culdees yielded to the powerful influence of the Roman Church. From this time, the middle of the twelfth century, till the dawn of the

Reformation, the history of the Church in Scotland is one of constantly increasing power and wealth, and of growing corruption. The parochial system of Scotland owes its establishment to this period, and the Scottish ecclesiastics maintained a brave and successful struggle for independence against the claims of the primacies of Canterbury and York, who successively sought to assume control over the Scottish bishops.

In the end of the fifteenth century half the wealth of Scotland had passed into the hands of the Church. The feudal power of the greater nobles was greatly weakened by this, and also by the rising up of a middle class of lesser landholders and burghers, who had become the most powerful party in Scotland in intelligence, industry, and resources. In the beginning of the sixteenth century the writings of the continental Protestant divines were introduced into Scotland, and the result was seen in the awakened intelligence and spiritual earnestness of this middle class. Patrick Hamilton, a youth of high mental endowments, returned from Wittenberg in 1527 and began to preach the Reformed doctrines. He was tried for heresy and burned at the stake (1528). Persecutions followed for thirty years, and then came the triumph of the Reformation in Scotland. See KNOX, JOHN; HENDERSON, ALEXANDER; and PRESBYTERIAN CHURCH.

Distinctive Characteristics.—The peculiar and essential features of the Reformed Church of Scotland, besides the profession of the evangelical faith common to all the churches of the Reformation, were—(1) The government of the Church by that order of men which is indicated in the New Testament by the terms presbyters and bishops or overseers; (2) the subjection of the Church in all things spiritual to Christ as her only Head, and to his word as her only rule.

The First Covenant and Book of Discipline.—In 1557 the First Covenant or Common Bond was signed. The subscribers to this document, after declaring their faith in "the Evangel of Christ," promise "before the majesty of God to maintain and defend the whole congregation of Christ, and every member thereof, to the death," and "to renounce and forsake all superstitions, abominations, and idolatries." The word *congregation* was then used as the distinctive name of all those who held to the doctrines of the Reformed Church, having the same signification as the work *kirk*, which was subsequently introduced, and the leaders of the Reformation in Scotland were known as "the Lords of the Congregation." The various congregations which belonged to the Congregation used the liturgy of Edward VI.; and the Apostles' Creed and King Edward's Catechism formed the articles of religion by which they were bound into a doctrinal unity. At the death of the regent, Mary of Guise, in 1560, the Parliament of Scotland met, and on Aug. 24 an act was passed which is described as "The Confession of Faith and Doctrines believed and professed by the Protestants of Scotland, and authorized by the Estates in Parliament." This confession was in fact "the Order of Geneva," including the confession of faith prepared for the English congregation at Geneva by John Knox. Immediately afterward, on Dec. 20, 1560, the first General Assembly of the Kirk of Scotland was held, and from this date the Assembly "took order for God's glory and the weal of his Kirk in the realm of Scotland." At this Assembly "the Book of Discipline of the Church was allowed and approved." This book was afterward submitted to the council, which refused to sanction it. Nevertheless, the Church proceeded at once to carry it into execution. The principles of religious liberty were not understood in that age, and the Scottish Reformers did not hesitate to enact laws which involved the infliction of civil penalties for offenses that were purely religious, though, to their credit, it should be stated that these penalties were seldom inflicted; but with these exceptions the great principles, both of faith and order, which were then agreed to, remain, amid all the changes of confessions, as those held by all the branches of the Reformed Church in Scotland to this day. It is especially worthy of note that in this "first Book of Discipline," while "the duty of nations and their rulers to own the truth of God and to advance the kingdom of his Son," is clearly stated, it is at the same time maintained that the Kirk possesses an independent and exclusive jurisdiction, "which flows directly from God and the Mediator, Jesus Christ, and is spiritual, not having a temporal head on earth, but only Christ, the only King and Governor of his Church." For seven years, from the death of the regent Mary of Guise (1560) till the abdication of Mary Queen of Scots, the Kirk was without state endowment, and indeed without any recognition by the state of her jurisdiction.

Patronage.—At a very early period lay patronage was introduced into Scotland. Laymen who had endowed churches and monasteries reserved for themselves and their heirs the right of presenting incumbents to the benefices thus founded. At a later period these rights of presentation were to a large extent annexed to bishoprics, priories, abbacies, and other religious houses, so that at the time of the Reformation there were only 262 out of the 940 benefices the patronage of which remained in the hands of laymen. The rights of presentation which belonged to the religious houses were after the Reformation a continual subject of contention between the Assembly and the queen. In 1565 the General Assembly asked that the absolute right of the queen or of any lay patron to present a minister without examination be disallowed. To this the queen answered that it seemed to be "no way reasonable that she should defraud herself of so great a part of the patrimony of the crown as to put the patronage of benefices forth of her own hands." The patronage to these benefices continued to be held by the queen, or was by her distributed among her favorite nobles.

Immediately after the queen's abdication the Parliament met on Dec. 15, 1567, and passed an act in favor of the Reformed Kirk, ratifying the act of 1560 by which the Confession of Faith was sanctioned and adopted, and among other statutes one for the examination and admission of ministers by the Kirk, reserving the right of presentation to the lay patrons. This Parliament also "declared and granted the jurisdiction of the Kirk anent preaching of the true word of God, correction of manners, and administration of the holy sacraments." A similar act was passed in 1592, ratifiying and enlarging the rights of the Kirk in regard to her jurisdiction over the appointment or deprivation of ministers. The acts of 1567 and 1592 have always been regarded as the solemn recognition and sanction by the nation of the constitution of the Reformed Church, and the great charters of her Presbyterian government and freedom from the supremacy of the crown in all causes spiritual and ecclesiastical.

The Solemn League and Covenant and the Westminster Standards.—In 1603 James ascended the English throne. After a long and bitter struggle, both in England and in Scotland, against the royal encroachments on the civil and religious liberties of the people, an ordinance of the English Lords and Commons in Parliament was passed on June 12, 1643, calling the Westminster Assembly. The General Assembly of the Kirk met in Edinburgh on Aug. 2 in the same year. Commissioners from England were present, and the result of their conferences was that on Aug. 17 "the Solemn League and Covenant" was passed unanimously by the General Assembly; it was then carried to the Convention of Estates and unanimously ratified by them. Commissioners were also appointed to represent the Kirk of Scotland in the Westminster Assembly. The Confession of Faith of the Westminster divines was finished in 1646, and on Aug. 4, 1647, it was adopted by the Scottish General Assembly, with two modifications; and two years later the Estates of Parliament ratified this decision.

Later History.—Charles II. was restored to the throne in 1660, and an attempt was then made to conform the Scottish Church to that of England by the establishment of the episcopal form of government. So severe was the persecution that even to be present at a field conventicle was punishable by death and confiscation of goods. Yet the great body of the Scottish people steadfastly resisted. In the year 1688 William of Orange became king. In Apr., 1689, the Scottish Parliament met and passed an act abolishing prelacy. In 1690 the Parliament passed acts rescinding the statute of 1669, which had declared the king's supremacy, and ratifying the Confession of Faith and settling Presbyterian church government. The same Parliament passed an act abolishing lay patronage, though the new monarch was known to be strenuously opposed to its abolition. In 1693 the Parliament passed an act for "settling the quiet and peace of the Church," but this act expressly provided for summoning the General Assembly by royal authority. The General Assembly met in May, 1694. The king instructed the royal commissioner that if the act of supremacy was not accepted he should at once dissolve the Assembly, but at last the threat of dissolution was withdrawn, and the independence of the Kirk was again confirmed.

Daughter Churches.—In the articles on the FREE CHURCH OF SCOTLAND and PRESBYTERIAN CHURCH (*qq. v.*) will be found

a statement of the successive legislative acts in reference to the law of patronage and the independence of the Church, and also of the long-continued struggles between the two parties in the Church itself, which resulted in the first secession in 1733, in a second secession in 1752, and ultimately in the formation of the Free Church of Scotland in 1843. In the beginning of the nineteenth century the Church of Scotland established missions in Australia and in the provinces of British North America. These missions grew into presbyteries and synods, and at length dissolved their ecclesiastical connection with the parent churches, and occupy a separate position as churches possessing supreme jurisdiction.

Present Condition.—The Church of Scotland has missions in India and missions to the Jews in Alexandria, Smyrna, and Salonica. During the last thirty years there has been a remarkable development of spiritual and intellectual life among the clergy of the Scottish Church and a corresponding growth of religious power in the congregations. The law of patronage has been abolished, so that each parish as it becomes vacant, on the payment of a small sum to the patron, has the right of electing its own minister, subject to the assent of the presbytery. The General Assembly is the supreme court of the Church, and meets annually in Edinburgh. It consists of representatives from all the presbyteries, and also from the royal burghs and the four universities. The Queen is represented in the General Assembly by the lord high commissioner, but he takes no part in the deliberations. According to what is called the Barrier Act, no law introducing an innovation or change in the established laws can be passed until it is approved by the majority of the presbyteries. Revised by W. J. Beecher.

Scots Law: See the Appendix.

Scots Money: See the Appendix.

Scott, Charles: soldier; b. in Cumberland co., Va., in 1733; served in Braddock's campaign 1755: raised and commanded the first company S. of James river for service in the war of the Revolution; became colonel of the Third Virginia Battalion Aug. 12, 1776; brigadier-general Apr. 2, 1777; distinguished at Trenton, Germantown, Monmouth, and Stony Point; taken prisoner at the surrender of Charleston 1780; settled in Woodford co., Ky., 1785; brigadier-general of Kentucky Volunteers in St. Clair's unfortunate expedition against the Miami Indians 1791, but made an incursion to the Wabash, defeating the Indians; commanded part of Wayne's army at the battle of Fallen Timbers 1794; was Governor of Kentucky 1808–12. D. Oct. 22, 1813. A town and a county in Kentucky bear his name.

Scott, Colin Alexander: See the Appendix.

Scott, David: painter; b. in Edinburgh, Oct. 10, 1806; son of a landscape-engraver; educated at the High School; showed precocious talent for designing and engraving; visited Italy in 1832; was a member of the Royal Scottish Academy. Among his paintings are *Nimrod*, *Sarpedon*, *Wallace*, *Mary Queen of Scots receiving her Death-warrant*, *Jane Shore found Dead in the Street*, *Achilles*, *Orestes*, *Paracelsus*, and *Christ in the Garden*. He wrote papers in *Blackwood* (1840). D. Mar. 5, 1849.

Scott, Dred: See Dred Scott Case.

Scott, Rev. Frederick G.: See the Appendix.

Scott, Sir George Gilbert, R. A., F. S. A.: architect; grandson of Thomas Scott, biblical commentator; b. at Gawcott, Buckinghamshire, England, in 1811; became an architect and a prominent member of the school which effected the so-called "Gothic revival"; was largely employed in the restorations of the ancient cathedrals of England, as well as Westminster Abbey, and the building of new churches, colleges, and secular public edifices. Among his works are the university buildings at Glasgow, the Indian, Foreign, Home, and Colonial offices, London, and the national memorial to Prince Albert in Kensington Gardens. He was knighted Aug. 9, 1872. He was the chief promoter of the Architectural Museum at Westminster, was lecturer on architecture at the Royal Academy, and published several professional treatises. D. in London, Mar. 27, 1878.

Scott, Sir John: See the Appendix.

Scott, John Morin: patriot; b. in New York in 1730, a descendant of the baronial family of the Scotts of Ancram; graduated at Yale 1746; became a prominent and wealthy lawyer in New York; was an early and vigorous opponent of the oppressive measures of the British ministry, co-operating with William Livingston, Sears, Lamb, and the Sons of Liberty, in which organization he was a popular orator; was defeated as a candidate for the Continental Congress of 1774; was perhaps the most influential member of the general committee of New York, appointed in 1775, and of the provincial Congress 1775–76; aided in drawing up the constitution of New York 1776; was made brigadier-general of New York troops June 9, 1776; served at the battle of Long Island, and in Westchester County until Mar., 1777, when he became Secretary of State of New York, which office he filled until 1779; was delegate in the Continental Congress 1780–83, and chosen an honorary member of the Society of Cincinnati 1784. D. in New York, Sept. 14, 1784.

Scott, Julian: See the Appendix.

Scott, Levi, D. D.: bishop of the Methodist Episcopal Church; b. at Cantwill's Bridge (now Odessa, Newcastle co.), Del., Oct. 11, 1802; educated at a neighborhood school, but mainly self-taught; received the degree of A. M. from the Wesleyan University in 1840, and D. D. at Delaware College, Newark, Del., in 1846, both honorary; joined the Philadelphia Conference in 1826; served in the pastorate fourteen years, except one (1832–33) supernumerary from failure in health; was principal of Dickinson grammar school, Carlisle, Pa., from 1840 to 1842; was pastor in Philadelphia 1843–48; presiding elder 1845–48; assistant book-agent at New York 1848-52; and bishop of the Methodist Episcopal Church from 1852 to his death July 13, 1882.

Scott, Richard William, LL. D.: statesman; b. at Prescott, Ontario, Feb. 24, 1825; educated there, and admitted to the bar in 1848. He was mayor of Ottawa in 1852; represented that city in the Canadian Assembly 1857–63, and in the Ontario Assembly 1867–73; was elected Speaker of the Ontario Assembly in 1871, but resigned that office the same year upon being appointed Provincial Commissioner of Crown Lands, which portfolio he retained until 1873. He was Secretary of State for Canada from Jan. 9, 1874, until Oct., 1878; was appointed to the Senate Mar. 13, 1874. In July, 1896, he became Secretary of State and Registrar-General. He prepared and carried in 1863 the Separate School Law of Ontario, and framed the Canada Temperance Act, which was carried through Parliament chiefly owing to his exertions.

Scott, Robert, D. D.: classical scholar; b. in Devonshire, England, in 1811; graduated at Oxford 1833; became a fellow of Baliol; took orders in the Church of England; was rector of Duloe, Cornwall, and of South Luffenham, Rutlandshire; became master of Baliol 1854, Professor of Exegesis 1861, and dean of Rochester 1870. He translated part of the Oxford *Library of the Fathers*, and was associated with Dean Liddell in the preparation of a well-known *Greek-English Lexicon* (1845; 7th ed. 1882). D. Dec. 2, 1887.
Revised by B. I. Wheeler.

Scott, Robert Henry, M. A., F. R. S.: meteorologist; b. in Dublin, Jan. 28, 1833; was educated at Rugby School, Trinity College (Dublin), and in Berlin and Munich; became secretary of the British Meteorological Office, and executive of the British weather service in 1867. He is the author of *Handbook of Volumetric Analysis* (1862); *Weather Charts and Storm Warnings* (1876); *Elementary Meteorology* (1883); and of many papers in the *Proceedings* of the Royal Society, the *Quarterly Journal* of the Royal Meteorological Society, the *Journal* of the Royal Geological Society of Ireland, and other periodicals. M. W. H.

Scott, Robert Nicholson: soldier; b. at Winchester, Tenn., Jan. 21, 1838; appointed second lieutenant of Fourth U. S. Infantry Jan. 21, 1857, adjutant July, 1861, and captain Sept., 1861. He served on the Pacific coast until 1861, being in command of the U. S. steamer Massachusetts during the San Juan difficulties in 1859. He was with the Army of the Potomac as acting adjutant-general from Mar., 1862, until June, 1863; was engaged in the siege of Yorktown and battle of Gaines's Mill, where he was wounded and breveted for gallantry. From June, 1863, to Sept., 1864, he was senior aide-de-camp to Maj.-Gen. Halleck. He continued to serve on staff duty till 1870; was Professor of Military Science at Faribault, Minn., 1872–73; commanded Fort Ontario 1873–77; major Third Artillery 1879; was engaged from 1877 till his death in publishing the official records of the civil war. Author of *Digest of the Military Laws of the United States* (1872). D. at Washington, D. C., Mar. 5, 1887.

Scott, Sir Walter: novelist and poet; b. in Edinburgh, Aug. 15, 1771; the son of Walter Scott, a writer to the sig-

net, and Anne Rutherford, daughter of Dr. John Rutherford, Professor of Medicine in the University of Edinburgh. He was lineally descended from the ancient chieftain Walter Scott, traditionally known as Auld Walt of Harden. He was a strong and healthy child until about eighteen months old, when he became incurably lame in his right leg—a weakness which sadly interfered with his love of active sports, but never marred his cheerfulness, good temper, or courage. His early childhood was passed in the farmhouse of Sandy-Knowe. At the age of eight he was placed in the High School of Edinburgh, where he remained for four years, the first two in the class of Luke Fraser, and the remaining time under the tuition of the distinguished rector, Dr. Alexander Adam, of whom Scott gives a pleasant account in his fragment of *Autobiography*. Personally popular, and making himself respected by his courage and general ability to take care of himself, he was not regarded as a very bright scholar, although even then giving evidence of his love of knowledge, of a strong memory for whatever pleased him, and of special delight in history, poetry, fairy tales, and romances. In 1783 he entered the university, and for a year or more attended the classes in Greek, Latin, logic, and ethics, giving some attention also to history and law. In the ancient languages he made but little progress, although more successful in other studies. It is not surprising, then, that in thorough knowledge and discipline he should have found himself at fault. Years afterward, and when he had become famous, he writes in his *Autobiography*: "It is with the deepest regret that I recollect in my manhood the opportunities which I neglected in my youth. Through every part of my literary career I have felt pinched and hampered by my own ignorance; and I would at this moment give half the reputation I have had the good fortune to acquire if by doing so I could rest the remaining part upon a sound foundation of learning and science." His progress in the university was arrested by a severe attack of illness, which seems to have broken up all plans of further study, and in 1785–86 he entered into indentures with his father to serve the usual apprenticeship to a writer to the signet. In 1792 he was called to the bar. During these and the succeeding years he was crowding his mind with vast accumulations of "ponderous and miscellaneous" knowledge of poetry and archæology, fiction, and history, not easy to condense or reduce to system and order. "My memory of events," he says, "was like one of the large old-fashioned stone cannons of the Turks, very difficult to load well and discharge, but making a powerful effect when by good chance any object did come within range of its shot." He had already begun to collect books and articles of antiquarian interest, "the germ of the magnificent library and museum of Abbotsford." His mind was already turning toward letters, and in 1796 he made his first considerable publication, being translations from the German of Bürger. This was followed in 1799 by a translation of Goethe's *Goetz von Berlichingen*, *The House of Aspen*, which was not published till 1829, and several ballads.

In the meantime, in Dec., 1797, after a serious disappointment in love, he was married to Charlotte Margaret Carpenter, or Charpentier, a young lady of French birth and parentage, but a resident in England. Two years later, through the influence of his friends, he obtained the appointment of sheriff-depute of Selkirkshire, an office with light duties, which brought the important addition to his resources of £300 a year. In Jan., 1802, he published two volumes of the *Minstrelsy of the Scottish Border*, which was completed the next year by a third volume. It was received with great favor, and may be considered as opening the way to his general fame. It brought him also into familiar acquaintance with men of genius and lovers of legendary lore, such as Richard Heber, long member of Parliament for the University of Oxford, and that eccentric genius John Leyden.

From this time onward to the year 1831, when, at the age of sixty, he gave to the world the fourth series of *Tales of my Landlord*, there was but one year (1807) which was not marked by some independent work in verse or prose, bearing the impress of his genius, giving new impulse to literature and new fame to the land of his birth. There is room to mention only the most important of these. In 1805 the *Lay of the Last Minstrel* was published. It took the world by surprise, and was received with unbounded delight, not only for its chivalric spirit, its "vivid richness of coloring," its pathos, beauty, grace, and airy freshness, but as giving the promise of original poetic fervor and power to which the kingdom had long been a stranger. Edition after edition was called for, and sold as soon as published. "In the history of British poetry," says Lockhart, "nothing had ever equaled the demand for the *Lay of the Last Minstrel*." This was followed in 1808 by *Marmion*, perhaps the strongest and boldest of his poems, and in 1810 by *The Lady of the Lake*, in some respects more pleasing than any. In these his poetic power culminated. The poems subsequently published—*The Vision of Don Roderick* (1811), *Rokeby* (1812), *The Bridal of Triermain* (1813), *The Lord of the Isles* (1815)—were unequal to the earlier, and in various ways gave evidence of a waning popularity, which Scott was among the first to recognize. Another reason for this perceptible loss of popular favor was the appearance of another brilliant light in the early poetry of Lord Byron.

During these six or eight years Scott had been advancing in fame and in pecuniary resources. In 1804 he took the house of Ashestiel, in the Ettrick Forest, overlooking the Tweed. In 1806 his friends had procured for him the appointment to one of the clerkships of the court of sessions, worth about £1,300 a year, the emoluments of which, however, by an express arrangement, he did not receive until the death of his predecessor in 1812. Still earlier, in 1805, he had become a regular partner in the printing-house of James Ballantyne & Co., although this connection was kept a profound secret from nearly every one of his most intimate friends. This was undoubtedly one of the most important steps of his life. "He continued bound by it," says his son-in-law, "during twenty years, and its influence on his literary exertions and his worldly fortunes was productive of much good, and not a little evil." In 1808 he took a prominent part in establishing *The Quarterly Review* in London, in opposition, politically, to *The Edinburgh Review*, the acknowledged advocate of the Whigs. In 1811 he purchased Abbotsford, a property of 100 acres of land on the banks of the Tweed, near Melrose, for £4,000. To this he added estate after estate adjoining, purchasing at high rates, till he had expended nearly or quite £40,000, to which must be added £25,000 more for preparing the grounds and erecting the mansion where for a few years he dispensed a splendid hospitality, and to which his fame drew visitors from every part of the civilized world.

In 1813, on the death of Pye, he was offered the office of poet-laureate, which he refused; but in Mar., 1820, he accepted a baronetcy, and in November of the same year the presidency of the Royal Society of Edinburgh. His exertions, two years later, during the visit of George IV. to Edinburgh, seem to have tended, in company with overwork, to undermine his health.

On the decline of his popularity as a poet his fertile mind turned to another form of literature, with which for ten or twelve years he surprised and enchanted the world. In 1814 appeared, anonymously, a novel under the title of *Waverley*. The next year *Guy Mannering* was published; in 1816, *The Antiquary* and the first series of the *Tales of My Landlord*; in 1817, *Rob Roy*; in 1818, *The Heart of Midlothian* (second series of *Tales of My Landlord*); in 1819, *Tales of My Landlord* (third series) and *Ivanhoe*. This splendid series of novels, thrown off with an ease and rapidity without parallel, marks the high tide of his genius. Those which follow are on a somewhat lower level, but the abundance of the production was hardly diminished. *The Monastery* and *The Abbot* followed in 1820; *Kenilworth* and *The Pirate* in 1821; *The Fortunes of Nigel* in 1822; *Peveril of the Peak*, *Quentin Durward*, and *St. Ronan's Well* in 1823; *Redgauntlet* in 1824; *The Tales of the Crusaders* in 1825; and *Woodstock*, written in the midst of impending troubles, in 1826. *The Chronicles of the Canongate* (first and second series) followed in 1827 and 1828. *Anne of Geierstein* and *The Tales of My Landlord* (fourth series) in 1829 and 1831 close the long list.

The secret of the author of *Waverley*, although known to some and confidently conjectured by almost every one, was not acknowledged until after the bankruptcy of Constable and the Ballantynes had rendered even a formal concealment no longer possible. Early in 1826 Constable was obliged to stop payment, and the Ballantynes, including Scott as partner in the house, being closely connected, failed for a very large amount. The humiliation to Scott was indescribable, but he met the trial with remarkable strength and dignity. The most liberal offers of assistance were made to him by friends and admirers, among them one of £30,000 from an anonymous correspondent, but he firmly declined them all. He refused to take any advantage of circumstances which might have freed him from the claims

of his creditors, but insisted that they should stand, and pledged the labor of his future life to the payment of these debts. He at once entered upon that course of untiring industry in writing new works and in the republication of the old with notes and prefaces which enabled him within a few years to pay to his creditors £40,000, and to put things in such shape that soon after his death the principal of the whole was paid by his executors. It was a tremendous exertion, and it cost him his life. In 1830 alarming symptoms, which had appeared the preceding year, were followed by a paralytic attack, from which he partially recovered. In Apr., 1831, the shock was renewed, and in September he left Abbotsford for the Continent, a great part of which he had never visited. The admiralty furnished him a ship of war, on which he proceeded to the Mediterranean, touching at Malta, and thence going to Naples. Here his mind almost entirely gave way, and he hurried homeward as rapidly as possible, stopping for a few weeks in London, and reaching Abbotsford in July, 1832. He died Sept. 21, and on the 26th was buried in the grounds of Dryburgh Abbey; Mrs. Scott had died in 1826. His two sons and two daughters survived him.

Of the standard editions of his works, probably the most complete and discriminating list is to be found in Allibone's *Dictionary of Authors*. Extended memoirs of Scott have been written by David Vedder, William Weir, George Allan, and (in the *Encyclopædia Britannica*) by William Spaulding; but the great work on the author and the man, and one of the best pieces of biography in any language, is the *Life* by his son-in-law, Lockhart. See Novel and English Literature.

Revised by Edmund Gosse.

Scott, William Bell: poet and artist; b. near Edinburgh, Scotland, Sept. 12, 1811; brother of David Scott, engraver; became a distinguished painter and archæologist and head master of the Government School of Design at Newcastle-on-Tyne; afterward resided chiefly at London, associated with the Pre-Raphaelite brotherhood of English painters. Till 1885 was art-examiner under the education board. Published *Hades, and other Poems* (1839); *The Year of the World, a Philosophical Poem* (1846); a *Memoir* of his brother David (1850); *Antiquarian Gleanings in the North of England* (in quarto numbers, 1849–51); *Chorea Sancti Viti* (1851); *Poems* (1854); *Half-hour Lectures on the History and Practice of the Fine and Ornamental Arts* (1861); another volume of *Poems* (1875), with illustrations by himself and by Alma Tadema. D. Nov. 22, 1890. See *Autobiographical Notes of the Life of William Bell Scott*, edited by W. Minto (New York, 1892, 2 vols.).

Revised by H. A. Beers.

Scott, Winfield: soldier; b. in Dinwiddie co., near Petersburg, Va., June 13, 1786; educated at William and Mary College; studied law, and was admitted to the bar. On May 3, 1808, he accepted an appointment as captain of light artillery, and was ordered to New Orleans, where a year later, for disrespectful allusion to the conduct of his superior officer (Gen. Wilkinson), he was suspended by a court martial for one year, rejoining his command at Baton Rouge in the fall of 1811. Promoted to be lieutenant-colonel July, 1812, he was sent to Philadelphia to organize troops for the field, but on application was ordered to the Niagara frontier, reporting to Gen. Smyth Oct. 4, near Buffalo. The attack on Queenstown occurred Oct. 13; Scott did not participate in the carrying of the heights and battery, but the ensuing battle was fought under his command. After a gallant resistance he was overpowered, and, the militia refusing to cross to his support, he was obliged to surrender, but he was exchanged soon after. In Mar., 1813, he was appointed adjutant-general with the rank of colonel, and the same month attained the colonelcy of his regiment. Reporting with his battalion to Gen. Dearborn on the Niagara frontier in May, he led the advance in the assault on Fort George, May 27. In June he commanded the rear-guard in the retreat from Stony Creek to Fort George, and in connection with the navy made the descent on Burlington and York in September. In October he joined Gen. Wilkinson's army in Western New York, but the attack on Montreal being abandoned, he was ordered to Washington, and in Mar., 1814, promoted to be brigadier-general. Reporting to Gen. Brown at Buffalo, he established a camp of instruction. On July 3, 1814, the Niagara river was crossed by Scott's and Ripley's brigades and Fort Erie captured. The battle of Chippawa ensued July 5, in which Scott greatly distinguished himself; the battle of Lundy's Lane next followed (July 25), where Scott was severely wounded after having had two horses shot under him. He was (July 25) promoted to be brevet major-general, and Congress voted him a gold medal. In October, when but partially recovered, he was ordered to Baltimore, then again threatened; thence to Washington, where he was engaged as president of a board on infantry tactics and of a court of inquiry in the case of Gen. Winder. Declining to act as Secretary of War, he sailed for Europe in July, 1815, returning the following year. In 1818 he began the preparation of *General Regulations of the Army*, and in 1826 his *System of Infantry and Rifle Tactics*. During the nullification troubles (1832–33) Scott was ordered to South Carolina, where his tact and decision prevented civil war. He next served in Florida and in the Creek Nation against the Indians, but, being charged with dilatoriness, a court of inquiry was ordered, which resulted in Scott's acquittal. The Canada border troubles (1837–38) next demanded his attention, followed in 1838 by the task of removing the Cherokee Indians to the upper Arkansas, and in 1840–41 he was engaged in Maine during the disputed territory controversy, conducting the management of each of these important duties with great success. In July, 1841, he succeeded to the command of the army as general-in-chief. In the war with Mexico he was ordered in Nov., 1846, to take command. Assembling his troops at Lobos island, whence he moved in transports in February, a landing was effected (Mar. 9) at Vera Cruz, which surrendered, together with the castle of San Juan d'Ulloa, Mar. 29. (See Vera Cruz.) The battle of Cerro Gordo (*q. v.*) was fought Apr. 18, and the battles of Contreras, Churubusco, and San Antonio (see Churubusco) Aug. 19–20. On Sept. 8 the battle of Molino del Rey (*q. v.*) was fought; the heights of Chapultepec (*q. v.*) were carried Sept. 13, as well as the San Cosme and Belen gates of the city of Mexico, the army entering next day (Sept. 14), and practically ending the war. Declining the proffered presidency of the Mexican republic, Scott, having been superseded by Gen. W. O. Butler, and a court of inquiry ordered in his case, arrived in New York May, 1848. Congress in March had extended to him a vote of thanks and authorized a gold medal. In June he was a candidate for nomination in the Whig convention which nominated Gen. Taylor for the presidency. In 1852 he received the nomination from the Whig party, but was signally defeated by Franklin Pierce, though receiving a large popular vote. In 1855 the rank of lieutenant-general by brevet was conferred upon him. In 1859 he was sent to Puget's Sound to arrange the difficulty caused by the occupation of San Juan island by Gen. Harney.

Though too infirm to undertake the conduct of the army in the great civil war, Gen. Scott unhesitatingly threw the weight of his influence in favor of the Government, and in the exciting events preceding actual hostilities rendered important service. On Nov. 1, 1861, he was retired from active service, but without reduction of pay or allowances. He published his *Autobiography* in 1864. D. at West Point, May 29, 1866.

Revised by James Mercur.

Scottdale: borough; Westmoreland co., Pa.; on the Penn. and the Balt. and Ohio railways; 17 miles S. of Greensburg, the county-seat (for location, see map of Pennsylvania, ref. 5–B). It is in a coal-mining region, and contains a rolling-mill, large pipe-works, and other iron manufactories, a national bank with capital of $50,000, a private bank with capital of $50,000, and two weekly newspapers. Pop. (1880) 1,275; (1890) 2,693; (1900) 4,261.

Scotticisms: words and expressions proper to the English of Scotland, and not recognized as belonging to standard English. *Suddenty* for "suddenness," used by Sir Walter Scott, is an example. In the U. S. many of the following words or phrases appear to be due to the speech of settlers from Scotland: *Anunder* (under), *backset* (relapse), *blatherskite*, *big-coat* (great-coat), *bore-tree* (elder), *check* (*chack* (?), a slight repast), *clash* (slanderous talk), a *cut* of yarn, *fornent* (opposite), not a *hait* (whit), *keel* (ruddle or red chalk), *killogue* (to plot), *red* (to comb out), *red up* (to arrange) a room, *scrunty* (stunted), *storm-staid*, *sundown* (sunset), *trap* (to get the place of a higher pupil by a correct answer), and others. Many words and phrases not now admitted as standard English are, however, also used in other English dialects, and the use of such words as those mentioned does not necessarily prove the speaker to be of Scotch descent. It is probable that the common misuse of *will*, *would* for *shall*, *should* in the U. S. is in great part due to the influence of the speech of settlers from Scotland and

Ireland, and the same cause perhaps has something to do with the very common pronunciation of *r* in cases where in Southern England and some regions in the U. S. that sound has been lost (though the Scotch *r* is not like the sound heard in the U. S.), as well as with the fact that in the U. S. speakers rarely drop or misplace the sound of *h* in standard English, and more generally distinguish *wh* from *w* than is the case in England. But it is not necessary to assume that Scotch pronunciation is the only or even the chief cause of these and some other features of American pronunciation. See, further, Jamieson's *Etymological Dictionary of the Scottish Language* (revised ed. 4 vols., 1879–82); J. A. H. Murray, *The Dialect of the Southern Counties of Scotland in Transactions of the* (London) *Philological Society* (1870–72, part ii.); A. J. Ellis, *Early English Pronunciation* (part v., 1889), etc.

Revised by E. S. Sheldon.

Scottish Language: the language spoken in Scotland. This is well known to be not a Celtic dialect, but a form of English which differs from the standard speech by reason of a separate development, and because of external influences to which the latter has not been subjected in the same degree. English became the language of Scotland owing to political events in the early history of the country. The Northumbrian kingdom in the seventh century included the Lowlands of Scotland in its supremacy. As a result, English, the language of Northumbria, began to spread more widely over the Lowlands. When the Scottish kingdom became separated from England, the struggles for supremacy between the Saxons of the Lowlands and the Celts of the Highlands resulted in a victory for the former, and English became after a time the recognized literary language.

The form of English thus adopted was that called Northern English, spoken from the Humber northward. Up to the middle of the fifteenth century Scotch-English did not differ from that used in Yorkshire and Northumberland. From about this time, however, owing to the development of a separate national life and literature, that form of Northern English spoken in the capital city, Edinburgh, became the standard literary language of Scotland. The literature produced in this language includes such important names as Barbour, James I. (of Scotland), Wyntoun, Henryson, Dunbar, and Douglas.

The various external influences affecting Scotch-English differ considerably in degree from those affecting the language of England. Celtic, which remained as a linguistic sub-stratum in the Lowlands and as the dominant speech of the Highlands for many years, influenced the English of Scotland more than that of any other part of Britain. Thus many Celtic words, not found in English, belong to Scotch. The Norse or Scandinavian influence was probably as great as upon Northern English as a whole, and thus greater than upon Southern or Midland English. The French influence was due not so much to the Norman conquest as to those close political relations between Scotland and France which enabled the former to retain her independence for so many years. The revival of classical learning powerfully affected Scotland, as it did the rest of Britain, but the earlier classical influence was probably not so great upon the language of the north as upon the language of the south. More powerful than all other influences has been the effect upon the Scottish language of the standard language of England. Its earliest marked effect was at the time of the Reformation, and this was greatly increased by the union of the two countries under the same king in 1603. In fact, since that time, except for a partial revival of the popular speech in the poems of Ramsey, Fergusson, and Burns, the Scottish language has gradually given place to the literary language of England. Even the speaking of Scotch-English, as distinct from the English of the south, has more and more been given up by educated people, so that this form of the language, so long dominant in the northern kingdom, has been gradually sinking to the position of a mere dialect, without a literature or a considerable body of cultivated speakers.

A systematic treatment of the subject may be found in *The Dialect of the Southern Counties of Scotland*, by James A. H. Murray, *in Transactions of the* (London) *Philological Society* (1870–72). See English Language.

Oliver Farrar Emerson.

Scottish Literature: See English Literature.

Scotus, Duns: See Duns Scotus.

Scotus, Johannes: See Erigena.

Scouller, James Brown, D. D.: clergyman; b. near Newville, Pa., July 12, 1820; educated at Dickinson College and the United Presbyterian Theological Seminary, Allegheny, Pa.; pastor of the United Presbyterian churches, Fourth of Philadelphia 1844–47, Cuylerville, N. Y., 1847–52, Argyle, N. Y., 1852–62; editor, 1862–63, of *The Christian Instructor*, for which he had written *Forty Letters from Abroad, principally Italy and Egypt* (1860–61). Dr. Scouller's principal published works are *A Manual of the United Presbyterian Church* (1881; 2d ed. 1887); *Calvinism: its History and Influence* (1885); and *History of the United Presbyterian Church*, in American Church History Series (New York, 1894). D. in Newville, Pa., Sept. 11, 1899.

Scovel, Sylvester Fithian: clergyman and educator; b. at Harrison, O., Dec. 29, 1835; educated at Hanover College, Indiana, and New Albany (now McCormick) Theological Seminary; pastor of Presbyterian church, Jeffersonville, Ind., 1852–61, First Presbyterian church, Springfield, O., 1861–66, First Presbyterian, Pittsburg, Pa., 1866–83, and since 1883 has been president of Wooster University, Ohio. He has published sermons, addresses, and *Centennial Volume of the First Presbyterian Church of Pittsburg* (Pittsburg, 1884).

C. K. Hoyt.

Scranton: town; capital of Jackson co., Miss.; on the Pascagoula river and the Louisville and Nashville Railroad; half a mile N. of the Gulf of Mexico, 45 miles S. W. of Mobile, Ala. (for location, see map of Mississippi, ref. 9–H). It saws and ships large quantities of pine lumber, has an extensive oyster industry, and contains a State bank with a capital of $25,000, and two weekly newspapers. Pop. (1880) 1,052; (1890) 1,353; (1900) 2,025.

Scranton: city; capital of Lackawanna co., Pa.; on the Lackawanna river, and the Cent. of N. J., the Del. and Hud., the Del., Lack. and W., E. and Wyo., and the N. Y., Ont. and W. railways; 18 miles N. E. of Wilkesbarre and 107 miles N. of Philadelphia (for location, see map of Pennsylvania, ref. 3–I). It is the fourth city in the State in population and the center of the great anthracite coal region, and has a picturesque location in the Lackawanna valley on a plateau at the confluence of Roaring brook and the Lackawanna river. The city is laid out with wide straight streets; has several public parks and squares, and a beautiful drive to Elmhurst; and contains 150 miles of streets, many paved with asphalt and brick, improved water-works, gas and electric light plants, and electric street-railways. The area is 19½ sq. miles. Among the notable public buildings are the U. S. Government building, court-house, municipal building, Albright Memorial Library, Moses Taylor Hospital, Home of the Friendless, and the Oral School for the deaf and dumb.

Finances and Banking.—The assessed valuation of real and personal property in 1900 was $22,106,533, and the net debt, Jan. 1, 1895, was $438,232. In 1895 there were 3 national banks with combined capital of $650,000, 6 State banks with capital of $630,000, and a trust and safe deposit company with capital of $250,000. Scranton has 15 building and loan associations, all local and all but two on the terminating plan, with an aggregate of 4,851 shareholders, 1,708 borrowers, and 25,746½ shares in force.

Churches, Schools, etc.—Scranton is the seat of a Roman Catholic bishopric and has 70 churches of various denominations. There are 38 public-school buildings, public-school property valued at over $900,000, 4 colleges, a nunnery, 6 public libraries, 4 hospitals, and 4 daily, 17 weekly, and 6 monthly periodicals.

Business Interests.—The census returns of 1890 showed 138 manufacturing establishments (representing 41 industries), with a combined capital of $25,144,936, employing 8,498 persons, paying $3,921,831 for wages and $15,968,846 for materials, with products valued at $22,801,028. The principal industry is the manufacture of iron and steel, 4 establishments, with $8,840,706 capital, employing 3,298 persons, paying $1,726,229 for wages and $10,716,206 for materials, with products valued at $13,278,299. Then follow the manufacture of malt liquor, 3 establishments, $471,700 capital; silk and silk goods, 3 establishments, $440,660 capital; planed lumber, 8 establishments, $429,536 capital; flour and feed, 5 establishments; carriages and wagons, 9. The city is an important center for general trade and one of the principal distributing-points for the anthracite coal trade.

History.—The city was founded by Joseph H. and George

W. Scranton in 1840, and was incorporated as a borough in 1854 and as a city in 1866. The first rolling-mill was put into operation in 1844. Pop. (1880) 45,850; (1890) 75,215; (1900) 102,026. Revised by E. J. Lynett.

Screamer: any bird of the family Palamedeidæ (*q. v.*).

Screw [M. Eng. *scrue*, from O. Fr. *escroue* > Fr. *écrou*, an internal screw, nut; akin to Germ. *schraube*, Dutch *schroef*, Icel. *skrúfa*]: an elementary mechanism consisting of a cylinder having around it a projecting helicoidal rib or thread. When the helicoidal rib is formed on the interior of a hollow cylinder within a movable block the combination is called a nut. The screw is really a particular case of the inclined plane.

The screw was known in Egypt in the days of Hero of Alexandria (B. C. 150), who shows it in several propositions of his *Spiritalia*, and it is also figured in his *Automata*. It was also known to Archimedes (B. C. 250), and he has been credited with its invention for the purpose of launching a large vessel built under his direction. At the beginning of the Christian era it was well known to the nations on the shores of the Mediterranean, and its use in presses seems to have been well understood, for a wall-painting discovered at Pompeii illustrates a press for linen which has two screws and a massive frame.

The earliest writer who described the laying out of a screw-thread was Pappus of Alexandria, a Greek mathematician of the fourth century. His method consisted in winding a right-angled triangle of thin brass around a cylinder and then tracing the screw-thread from the hypothenuse; the space between the threads was then cut or filed out. A similar method was used but a few years ago by native workmen in India for making (of native wrought iron) press-screws 5 inches in diameter and 12 feet in length, having threads three-quarters of an inch thick. At one time it was not uncommon to find in the Southern U. S. plantation cotton-presses having wooden screws 14 inches in diameter and 5 feet long, the threads being 3 inches thick. These screws were cut out by a millwright using ordinary hand-tools. Jesse Ramsden (1775) was the first to pay especial attention to the making of screws by machinery, and his invention may be regarded as the first example of the modern form of screw-cutting lathe, although fifty years before there had been made in France a machine for cutting the thread on the fusees of watches, and 200 years before Jacobi Bessoni had designed a rude lathe for cutting wooden screws. Great attention was given to the making of accurate screws by Henry Maudslay. Sir James Barton and Sir Joseph Whitworth also made improvements in screw-cutting machinery, and the latter developed what is known as the Whitworth standard thread, which is almost universally used in Europe for screw-bolts. The threads on ordinary bolts and nuts in general use in the U. S. are known as the United States standard thread, or the Franklin Institute standard, being based upon the investigations of William Sellers, as set forth in a paper read by him before the Franklin Institute in Apr., 1864.

Of the many varieties of screws, that known as the wood-screw (from their exclusive use in wood) is the most common, and it has been made by machinery for many years. At first such screws had blunt points, and therefore it was necessary to bore a hole for their reception, but about 1850 Thomas J. Sloan, a native of the U. S., devised the well-known gimlet-pointed screw and machinery for its manufacture. The thread of this screw and those of its predecessor were formed by cutting away the metal between them; but in recent years, by a system of rolling combined with forcible compression, the threads are raised and all the metal between them is utilized in their formation.

One of the more important uses to which the screw is applied is the moving of the tool in lathes for turning metal, and it was used for that purpose as early as 1671; but the lathe was not intended for cutting screws, and it is somewhat remarkable that the lead-screw or guide-screw, as applied to lathes especially designed for screw-cutting, did not appear till about 100 years later.

The screw has been applied to iron piles for forming a secure foundation in loose soil, to mooring-chains for vessels, to the raising of heavy weights by jacks and cranes, to micrometers for microscopes and astronomical instruments, to the raising of water and the propulsion of vessels—in fact, there is no mechanism so delicate or machinery so ponderous that is not dependent either for its manufacture or operation upon some application of the screw. W. F. Durfee.

Screw-pines: the *Pandanaceæ*, a small family of about eighty species of mostly tropical, erect, or climbing monocotyledonous trees and shrubs. The family as restricted consists of but two genera (*Pandanus* and *Freycinetia*), and the species are confined to the Old World. They bear some resemblance to the palms, some of which were formerly included in this family, but their strongest affinities are doubtless with the aroids, hence they are placed in the *Nudifloræ*. Screw-pines bear naked, diœcious, spiked flowers; the stamens are many; the ovaries are compound with many ovules, or (by reduction) simple with solitary or few ovules. Many species are cultivated in greenhouses. C. E. B.

Screw Propeller: See the Appendix.

Scribe, skrēēb, Augustin Eugène: playwright; b. in Paris, Dec. 24, 1791; studied law; wrote in 1811 his first play, *Les Dervis*, which failed; achieved his first success in 1816 with *Une Nuit de la Garde nationale*, written in connection with Delestre Poirson; provided from 1816 to 1820 the Théâtre de Vaudeville and the Théâtre des Variétés with as many vaudevilles and small comedies with songs as they could perform; wrote for the Gymnase between 1820 and 1830 about 150 plays, mostly one-act comedies of a sentimental or satirical character; composed, finally, from 1830 to his death, Feb. 20, 1861, more than 100 plays in three or five acts, historical, satirical, and even tragical, for the Théâtre Français and other houses, besides a similar number of opera librettos for Boieldieu, Adam, Auber, Donizetti, Meyerbeer, Verdi, and other composers, and some novels and romances. Most of these plays he produced in connection with some other playwright—Germain Delavigne, Mélesville, Bayard, Dupin, Legouvé, etc.—and at one time, between 1820 and 1830, this artistic copartnership was organized in thorough business style; one made the plot, another sketched the characters, a third wrote the dialogue, etc. After 1830, however, it became necessary to be a little more careful in order to satisfy the public. In general, his success was complete. For nearly forty years he reigned supreme in all the theaters of the world. Nor can it be said that his success was entirely undeserved; his plots have a novelty and originality, their movements an adroitness and rapidity, and the dialogue an eloquence and piquancy which always will be of value; but his picture of characters is superficial, and of passions and sentiments untrue; he lacks ideas, and is deficient in style. The best are his earlier one-act comedies, such as *Les premiers Amours* (1825); the worst are his later historical dramas in five acts, such as *Bertrand et Raton* (1833) and *Le Verre d'Eau* (1840). At present his plays are very seldom acted. His collected *Œuvres* comprise 76 vols. (1874–85). Revised by A. G. Canfield.

Scribes [plur. of *scribe* (from Lat. *scrī'ba*, clerk, scribe, deriv. of *scrī'bere*, write), trans. of Gr. γραμματεύς (deriv. of γράφειν, write) and Heb. *sāphēr*, scribe, deriv. of *sāphar*, write]: originally, officers of state who drew up the decrees of kings, wrote their letters, and kept records. Among the Israelites in Egypt (Ex. v. 6–19) and in the desert (Num. xi. 16) there were scribes whose business apparently it was to keep the genealogical registers, serve processes, and the like. In Palestine the scribes appear to have been chosen from the Levites (1 Chron. xxiii. 4; 2 Chron. xix. 11, xxxiv. 13). From the time of Ezra (fifth century B. C.) they were the copyists and then naturally expounders of the Law. In the New Testament they are generally named in connection with the Pharisees, as they belonged to that party, and were noted for their hypocrisy, ostentation, and arrogance.

Scribner, Charles: publisher; b. in New York, Feb. 21, 1821; son of Uriah R. Scribner, a prominent merchant; educated at New York University and at Princeton, where he graduated 1840; studied law for three years, and was admitted to the bar, but never practiced the legal profession; began the business of book-publishing in the old Brick Church, New York, in partnership with Isaac D. Baker in 1846, under the style of Baker & Scribner. In 1850 Mr. Baker died, and the business was thenceforth carried on in Mr. Scribner's name. In 1870 *Scribner's Magazine* was established. D. at Lucerne, Switzerland, Aug. 26, 1871.

Scribo'nius Lar'gus: physician to the Emperor Claudius. He composed, about the year 47 A. D., a book of medical formulas, *Compositiones*, which is valuable for the history of medicine. Best edition by G. Helmreich (Leipzig, 1887).

Scriptures, Holy: See Bible.

Scrivener, skriv'ner, Frederick Henry Ambrose: biblical scholar; b. at Bermondsey, London, Sept. 29, 1813;

graduated at Cambridge, 1835; was for many years master of classical schools, especially that at Falmouth, where he was also incumbent of a church 1846–61; became rector of St. Gerrans, Cornwall, 1861; vicar of Hendon and a prebendary of Exeter 1876. D. at Hendon, Oct. 26, 1891. He holds a high rank in the philological criticism of the New Testament; published valuable editions of the *Greek Testament* of Stephens (1860; 7th ed. 1877) and of the *Codex Bezæ* (1864); a *Full Collation of the Codex Sinaiticus with the Received Text of the New Testament* (1863); and the *Cambridge Paragraph Bible, with the Text Revised and a Critical Introduction prefixed* (1873); *Greek Testament, with the Changes of the New Testament Revisers* (1881); wrote a *Plain Introduction to the Criticism of the New Testament* (1861; 4th ed. by E. Miller, revised and enlarged, 1894, 2 vols.), and other works of kindred character; was appointed one of the company of revision of the authorized version of the New Testament 1870, and was granted a pension from the civil list 1872, "in recognition of his services in connection with biblical criticism."

Scrivener's Cramp: See NEUROSIS.

Scrof'ula, or **Struma** [*scrofula* is from Lat. *scro'fulæ*. scrofulous swellings, scrofula, plur. of **scro'fula*, liter., dimin, of *scro'fa*, sow, swine being affected by a similar disease; *struma* is from Lat. *struere*, to build, since the lymphatic glands are enlarged in this condition]: a constitutional disease characterized mainly by defective nutrition of the tissues. Persons of the lymphatic temperament are most liable to develop the marked symptoms of struma or scrofula. Scrofula is hereditary in many families. In other persons it may arise *de novo* from bad hygiene and regimen, especially in children when rapidly developing. Most cases formerly considered scrofulous are now regarded as tuberculous, directly caused by the presence of the *Bacillus tuberculosis*. Many symptoms, too, of disordered blood-states formerly grouped as scrofulous are now distinguished as having definite causes. Eczema, though often an exponent of struma, is as often due to other causes—nervous influences, gouty or rheumatic taint, gastric and intestinal derangements. The scrofulous person is often light-complexioned, the skin white, the body full, or even obese, but the muscles soft and flabby. In other individuals, of what is called the dark strumous type, there may be delicately formed features, clear complexion, and much personal beauty. The chief characteristic of scrofula is the susceptibility of the lymphatic glands and of the bones and joints to grave forms of disease from slight exciting causes. It must not be confused with rachitis, or rickets, with which it has no necessary connection, nor with inherited syphilis. Either persistently or with every slight impairment of health the glands of the neck, groin, abdomen, etc., may become indurated and enlarged. Such swellings may be evanescent or leave permanent indurations. The glands of the neck frequently are so engorged with scrofulous exudative matter that it undergoes cheesy or caseous degeneration—or actually suppurates, producing scrofulous abscess. Scrofula is not, then, a definite specific disease, but a condition of serious perversions of the nutritive qualities of the blood, and resulting affections of the various tissues and organs of the body. Enlarged glands, moist skin diseases, superficial abscesses, and destructive inflammations of the bones and joints are some of its manifestations. Inherited scrofulous taint may remain latent until developed by depressing sickness. Thus measles, a harmless disorder in robust children, is hazardous when struma lurks in the system. The bottle-fed infant and the foundling are more often scrofulous than the nursed, home-reared child. The mucous surfaces are very liable to disease in struma, chronic bronchial catarrh, diarrhœa, and cholera infantum. The relation of scrofula and tuberculosis is disputed. Modern pathologists believe that the bacillus of tubercle is the efficient cause of most of the conditions formerly attributed to struma, the micro-organism lying dormant in the body until from some accidental source of depression a suitable nidus is formed for its development and multiplication; but there are some cases in which neither tubercle nor syphilis can be demonstrated, and for these the term struma may still properly be retained. The treatment of scrofula is hygienic and nutritive—warm clothing, bathing, friction to the skin, pure air, nutritious diet, special articles such as cod-liver oil, and preparations of malt and of phosphates. Iron, iodine, and arsenical preparations act as alteratives to reduce glandular enlargements.

Revised by JOHN ASHHURST, Jr.

Scrophularia'ceæ: See FIGWORTS.

Scruple [from Lat. *scru'pulus* (dimin. of *scru'pus*, a rough, sharp stone), pebble, (as a weight) a scruple]: in apothecaries' weight, one-third of a drachm, 20 grains, the $\frac{1}{288}$th part of the pound troy. The Romans gave the name to the $\frac{1}{288}$th part of any standard unit of measure.

Scudder, HENRY MARTYN, M. D., D. D.: clergyman and missionary; son of Rev. John Scudder; b. at Panditeripo, district of Jaffna, Ceylon, Feb. 5, 1822; went to the U. S. in 1832; graduated at University of City of New York in 1840, and at Union Theological Seminary in 1843; was ordained a Presbyterian clergyman same year, and sailed for Madras as a missionary of the American Board of Commissioners for Foreign Missions. In addition to his missionary work he studied medicine in the medical college of Madras; opened a hospital and dispensary for gratuitous treatment of the poor, and received an honorary M. D. from New York College of Physicians and Surgeons in 1853. He was in Madras from 1844 to 1851, and in the Arcot Mission from 1851 to 1863; returned to the U. S. in 1864; was pastor of a Reformed Dutch church in Jersey City 1865–71; was a Presbyterian pastor in San Francisco; was pastor of the Central Congregational church, in Brooklyn, N. Y., 1871–82; pastor of Plymouth Congregational church, Chicago, Ill., 1883–87, when he joined his son, Dr. Doremus Scudder, in Japan. Returning later he settled first in Chicago, and then in Winchester, Mass., where he died June 4, 1895.

Scudder, HORACE ELISHA: author; b. in Boston, Mass., Oct. 16, 1838; graduated at Williams College 1858; taught in New York till 1861, when he removed to Boston and devoted himself to literary work. He was editor of *The Riverside Magazine* (Cambridge, 1867–71), and became a resident of Cambridge, Mass., 1875. In 1890 he became editor of *The Atlantic Monthly*. He is the author of *Seven Little People and their Friends* (1862); *Dream Children* (1863); *Stories from my Attic* (1869); *The Bodley Books* (1875–87); *The Dwellers in Five-Sisters Court* (1876); *Stories and Romances* (1880); *Life of Noah Webster* (1882); *History of the United States* (1884); *Men and Letters* (1888); etc.

Revised by H. A. BEERS.

Scudder, JOHN, D. D., M. D.: missionary; b. at Freehold, N. J., Sept. 3, 1793; graduated at Princeton 1811; M. D., College of Physicians and Surgeons, New York, 1815; became a physician in New York, where he was house-surgeon to the City Hospital; abandoned an extensive practice to devote himself to missionary work; was a missionary physician of the A. B. C. F. M. in Ceylon 1820–36, after which he was transferred to the Madras mission; spent several years (1842–46) in the U. S., visited the Cape of Good Hope for his health 1854, and died of apoplexy at Wynberg, South Africa, Jan. 13, 1855. Author of several publications on missionary subjects. His labors in the establishment of hospitals and schools in Ceylon and Southern India were very successful. He takes rank with the best of the early missionaries in India. His ten children—eight sons and two daughters—all became missionaries in India; most of them are also physicians. See his *Memoir*, by Rev. J. B. Waterbury (New York, 1856).

Scudder, SAMUEL HUBBARD: naturalist; b. in Boston, Mass., Apr. 13, 1837; graduated at Williams College 1857, and at Lawrence Scientific School of Harvard 1862. He has been a prominent member of the Boston Society of Natural History, holding almost every office, including that of president (1880–87). He was assistant librarian of Harvard College 1879–82; paleontologist of the U. S. geological survey 1886–92; member National Academy of Science since 1877. His publications, which number upward of 620, are mainly upon insects, especially butterflies, Orthoptera, and fossil insects. Among the more important of his works may be enumerated: *Catalogue of N. A. Orthoptera* (1867); *A Century of Orthoptera* (1868–79); *Catalogue of Scientific Serials* (1879); *Butterflies: their Structures, Changes, and Life-histories* (1881); *Nomenclator Zoologicus* (1882); *Butterflies of the Eastern United States* (1888–89); *Tertiary Insects of North America* (1890); *Life of a Butterfly* (1893); *Guide to the Common Butterflies* (1893). He was also one of the founders of *Science*, and its editor 1883–85.

J. S. KINGSLEY.

Scudéry, skü'dā'ree', MADELEINE, de: poet and novelist; b. at Havre, France, June 15, 1607; was educated in Paris; became one of the most conspicuous figures in the literary circle of the Hôtel Rambouillet, and acquired great celebrity

by her romances, *Ibrahim* (1641), *Artamène, ou le Grand Cyrus* (1649), *Clélie* (1656), *Almahide* (1660), etc. After the reunions of the Hôtel Rambouillet had been broken up she formed a salon of her own, frequented by the queen and the princes. D. in Paris, June 2, 1701.

Scu'do [Ital., liter., a shield, hence a coin struck with the image of a heraldic shield < Lat. *scu'tum*, shield]: a coin of Italy, equal to five lire, and nearly equivalent to the U. S. dollar. Many different scudi were struck by the numerous powers which prevailed in Italy, and their values are extremely various.

Sculling: a method of propelling a boat by one oar from the stern. The sculler usually stands, and dipping the oar-blade deeply in the water pushes or pulls the handle from side to side. The blade is inclined at a large angle to the perpendicular, and this angle is changed to the other side of the perpendicular with each stroke.

The principle of sculling is very much the same as that of the screw-propeller or windmill, and the motion very closely simulates that of a fish's tail.

The term is also applied to the rowing of boats in which the oarsman uses a pair of sculls, or short oars, but this use is chiefly confined to shells and racing-boats. A racing-boat rigged for two men, each of whom rowed a pair of oars, would be called a double scull, and the oarsmen scullers. There are also a few racing-boats called centipedes, rigged for four men, each using a pair of oars; but rowing in such a boat is not called sculling. The method of propelling the Venetian gondolas can hardly be classed as either rowing, sculling, or paddling. Here the oarsman stands facing the front of the gondola, pushes his single oar—always on one side of the boat—over a fulcrum, and by a turn of the blade at the end of the stroke also steers the boat. See Rowing.

E. Hitchcock, Jr.

Sculpin [etymology obscure]: any fish belonging to the family *Cottidæ*; distinguished by a rather stout, club-shaped body and large head, the spines with which the head is armed, and a naked or simply rough body; the mouth is quite large. Sculpins are very destructive to other fishes and are a nuisance to the angler. Those commonly found along the Atlantic seaboard of North America are species of the restricted genus *Cottus* (or *Acanthocottus* of Girard). The best known are the *Cottus octodecem-spinosus*, which is the most southerly species, and the *Cottus grœnlandicus*, which is the most common N. of Cape Cod. The name deep-water sculpin, or sea-raven, is applied to the *Hemitripterus acadianus*. On the Pacific coast the name is applied to corresponding species of the same genus. The species are rarely or never used as food except by the Greenlanders and the very poor.

Revised by F. A. Lucas.

Sculpture [viâ O. Fr. from Lat. *sculptu'ra*, carving, sculpture, deriv. of *scul'pere*, *sculp'tum*, carve]: carving, or shaping by means of cutting tools, including incised work or engraving as well as carving in relief or in the solid. By extension, modeling in clay, wax, or other soft material is called sculpture, especially when it is a work of fine art which is described. The art of sculpture includes, then, all kinds of cutting and shaping of solid objects, but the chief use of the term is in naming the fine art described in this article.

Carving may be done with considerable neatness and accuracy without any model or drawing to serve as a guide. Those who have seen an old sailor cutting out a boat in pine-wood will remember how accurately the two sides are made to correspond in curvature and in projection, and how easily the delicate shaping of the bow and the run is made, apparently without special effort. In like manner it is only necessary to have in the mind a clear knowledge of the figure of man or beast one wishes to produce, and some practice, to carve it directly, in soft stone or wood or plaster. It is evident that there will be here no sufficient opportunity for changes and improvements, and that therefore only a certain class of figures can be carved in this way, without previous preparation of the model. Thus the rough and picturesque leafage of an early Gothic capital may well have been carved without a drawing. The sculptor may have shaped the capital roughly, and may then have scratched or chalked upon the stone some guiding lines, then, with a bunch of leaves before him, he may have attacked the stone directly. During the early years of the Gothic revival in England some such way of producing architectural sculpture was preached as the only true way. The workman was encouraged to bring the living plant or a newly cut branch, perhaps to model an experimental spray of leafage or the angle of a capital, and then to work directly upon the solid block of stone. In like manner the wood-carving of barbarous peoples is apparently done directly from the mental image, the shark's tooth or stone knife cutting what the mind suggests, as a schoolboy cuts the edge of his desk or as the Venetian boatmen ornament the gunwales of their large boats with a succession of notches. It is to be observed, however, that the patterns used in such work as that of the Malays, South Sea islanders, and others are traditional. Some are the common property of the tribe, others are handed down from father to son; even the complex patterns become as familiar to the workman as notches and zigzags. Something akin to this familiarity with the form to be reproduced, and consequent ease in bringing it to light from nothing, is to be found in the stories told of some famous sculptors. Of Michelangelo it is related that he would begin upon the block of marble with chisel and mallet, having no model before him and no guide that any one else could see, and work rapidly and furiously, knocking off large chips. Any trained sculptor of large power of imagination of the sort which gives vivid mental pictures to its possessor could do the same, within the limits set by his character and his knowledge, provided he were not wholly unaccustomed to the use of the chisel. It is known that much sculpture was done, in the years before and during Michelangelo's career, in the marble with only a small model as guide. In all refined sculpture of modern times, however, it is customary for the artist himself to make a full-sized model in wet clay, modeling this figure with wooden and iron tools and with the fingers, changing it, reconsidering it, sometimes throwing down the whole model and building it up again. The clay is kept wet throughout the duration of the work, wet cloths being kept swathed around it when the sculptor is away. From the model, when completed, a plaster cast is made; and this is the artist's work, the statue or the bust which the French sculptor sends to the Salon, and which may be honored by a medal or other recompense. It often happens that the sculptor will retouch his work in the plaster cast, in which case that cast becomes in every sense of the word the original work of art. Some works are sent to the Salon first in the plaster, and later in the marble or bronze. At the Paris Exhibition of 1878 the tomb of Gen. Lamoricière was set up in marble, the recumbent statue of the dead man being also in marble, but of the four statues of Virtues which adorned the angles two were in bronze, the others, which there had not been time to complete in the metal, being in plaster.

When the plaster is to be copied in marble it is set up beside the block of marble, and a practiced marble-cutter makes a rough copy, aiding himself by the pointing-machine, which enables him to assure himself of the exactness of every measurement. At this point the practice of sculptors begins to differ. Some begin to work with the chisel themselves at a rather early stage, and before the statue is anything like complete, while other well-known artists never touch the marble. In the case of bronze a statue or a bust is simply cast in a mould made upon the sculptor's clay model or the plaster reproduction of it. A process much used during the Middle Ages and at the time of the Renaissance was making the mould from an original model finished in wax upon a core of a coarser material. The mould was made upon this model in a single piece, its material being applied in coats, the first coats in a semi-liquid state. The liquid bronze being allowed to flow into the mould, and between it and the core, melted the wax and took its place, the mould of course had to be broken to pieces in order to remove the hollow bronze casting. This process, called *à cire perdue*, has been used also in modern times, but more commonly a piece-mould is used which allows of many successive castings being made.

Statues, busts, and groups may also be made of thin plates of metal beaten with hammers. The largest works, such as the colossal *Bavaria* at Munich and the *Liberty* in New York harbor, have been made in this way.

What has been said above applies mainly to sculpture "in the round"—that is to say, finished on all sides, like a statue. For bas-reliefs and similar sculpture see Relief. See also Engraving and Gem for such sculpture as is hollow instead of projecting, concave instead of convex.

The fine art of sculpture is less complex than that of painting, as it deals with form alone. It is also in a sense more simple, because it is more instinctive to make an attempted copy in any soft material or even by cutting in wood or the like than it is to represent the same object by lines and tints upon a flat surface. Drawing and painting involve much greater abstraction and a much more advanced

mental development than rude sculpture. It is not meant that sculpture always precedes drawing; probably the reverse is the case, because the temptation to scratch or otherwise mark on a flat surface, and in doing so to represent a beast or a man, must always have been present. Sculpture may not always precede drawing, but will always be found more nearly truthful to nature than the drawing of the same epoch. The sculptor having form only to consider is concerned at first with two things: The first, to produce an ornamental object, or else to ornament parts of a useful thing, as a paddle or the prow of a canoe; the second, to represent something that he takes an interest in. Another idea often mingles with these two—namely, the production of an object, like an idol or fetish, in which he can embody some notion of worship or which he can use to terrify an enemy. This last motive speedily disappears or becomes of little moment as the skill of the sculptor increases. As he becomes able to deal with form somewhat easily and with results partly satisfying to himself, he finds a pleasure so intense in the production of his work of art and also in the suggestions from nature which he is enabled to embody in it that he forgets all other considerations. Thus in an Assyrian sculptured slab covered with figures in low-relief representing a battle, the triumphal entry of a king, or the same king hunting a lion, it is evident that the sculptor's chief care is for the beauty of his work. His slab was one of many which were to form the dado of a long and narrow gallery; the persons who were to see his bas-relief would never be far away from it, and it was for a point of view 10 or 15 feet away, and for light coming from high in the wall, that he had to plan his work. Therefore his figures were small, or, when large, filled with small details; his relief was kept low, and the outline when the relief quits the background was especially cared for. Under these conditions he labored to produce the most beautiful or striking combinations of lines and masses possible to him; but in doing this he made reference constantly to nature, and indeed found in the study of nature his chief suggestions of beauty and of strength, ferocity, swift and vigorous action, and other things agreeable to look upon. Thus nothing he could imagine would be as fine, let us suppose, as a lion in free action walking or springing; to this beautiful thing he could add human interest by showing the lion struggling with the hunters; and if in so doing he was able to flatter the king who employed him by representing his majesty twice as tall as his attendants and easily victorious over lions by the score, this in no way interfered with his artistic design or its impressiveness. It is true, of course, that religious or patriotic impulses act upon the sculptor as upon other men. Such impulses, however, do not seriously modify the sculptor's work, except in so far as they stimulate the whole man, excite his enthusiasm, raise him above himself as the phrase is, and in doing this they may improve his work or ruin it as man's nature and his surroundings may decree. Thus in the famous group by François Rude on the eastern face of the Arc de l'Étoile and representing the departure for the war of patriotic volunteers, there is no question that Rude was strongly in sympathy with the subject chosen and the enthusiastic love of country which suggested it. As a sculptor, however, he was concerned chiefly with the beauty and vigor of his composition and the harmonizing of the numerous and varied masses which make it up, and at the same time with the full expression of the different figures, here of youthful agility, there of manly strength in its maturity, and in the crowning figure of womanly forms carried to superhuman massiveness and force. Patriotism and hostility to the foes of France must have acted upon Rude as a powerful stimulus throughout his life, but it is only in this indirect way that those passions can be said to have dictated the design for *Le Départ*.

History.—The earliest sculpture of which the date can be fixed approximately is that of the Egyptian buildings of the early dynasties, and the few statues of the same epoch which have been discovered. These are dated by different authorities at from 4500 to 3500 B. C. The merit of these, both artistically and in the representation of natural forms and expression of face, is very great, so that we find Egyptian fine art already in an advanced stage of development at that early age. The sculptures from Mesopotamia of a date almost as remote are indeed far inferior in merit to the Egyptian, but are still those of an advanced civilization. There is no doubt that further investigations in the region about the Euphrates will reveal a continuous series of civilizations, vying with one another in their fine arts as in other respects. That of which we know the most is the Assyrian sculpture. (See ASSYRIAN ART.) There was also sculpture produced among the mountainous states of Asia Minor which has been studied with some success since about 1880; this is of peculiar importance because of the influence of its later productions over the early art of Greece. (For the more developed art of Greece, see GRECIAN ARCHITECTURE; also ARCHITECTURE, CHRYSELEPHANTINE STATUES, and PARTHENON.) The dates of Greek sculpture are nearly as follows: During the years from 600 to 480 B. C. the earliest works which can properly be called Grecian were produced, such as the metopes of Selinus now in the Museum of Palermo, the *Apollo of Tenea* at Munich, the *Apollo of Thera* at Athens, the seated figures from Branchidæ (Miletus) in the British Museum, the frieze of the Temple of Assos partly in the Louvre, and the pediment sculptures of the Temple of Ægina, now in Munich. These are arranged here in the order of their increasing refinement. The two fine statues at Naples called *Harmodius* and *Aristogiton* are thought to be copies or duplicates of statues put up in Athens about 500 B. C. The remarkable statues found in Athens on the Acropolis in 1882 and 1886, and distinguished by their well-preserved painting, may be of the years from 500 to the Persian invasion in 492. The Persian wars following this year and lasting till 477 may probably have checked the growth of fine art in Greece, while preparing for a rapid and splendid development with peace. When Athens became the chief city in Greece and the head of a confederation of states, the epoch of her greatest and noblest fine art was soon to begin. The years from 460 to 430 B. C. are marked by the sculptures of the Temple of Zeus at Olympia, of the Parthenon at Athens, of the Temple at Bassæ (Phigaleia), of the Temple of Athena Nike on the Acropolis, and in part of the Erechtheum. The chief sculptors of the best time of Grecian art, with the dates of their highest achievement approximately given, are Phidias, 440; Myron, 440; Cresilas, 440; Polyclitus, 430; Scopas, 420; Cephisodotus, 370; Praxiteles, 360. From that time until the third century A. D. the history of Greek sculpture is mainly that of an art serving states or powers not Greek; the merit and importance of the work done varies very greatly, according to the opportunity offered by the new masters of the Mediterranean world, such as the Kings of Pergamum, then Alexander the Great and his successors, and finally the Roman dominion. A great deal of noble sculpture was produced in every brief epoch, if not in every year, down to the death of Marcus Aurelius in 180 A. D. See ROMAN ARCHÆOLOGY.

It must be remembered that sculpture was commonly painted in bright and varied colors among all the peoples of antiquity. Egyptians, Assyrians, Greeks, and the people of the Græco-Roman empire all agreed in this. See POLYCHROMY.

During the Middle Ages sculpture had less purely sculpturesque character than generally in classical antiquity—that is to say, the artists had less sense of the beauty and expressiveness of pure form, as in the human body. They knew much less about the body, partly because of the custom of wearing very full and ample clothing, and no longer bathing and exercising in public as the ancients had done; religion, moreover, taught the unworthiness of the flesh as nothing in Greek or Roman life had asserted it. On the other hand, the decorative and building instinct was very strong throughout the Middle Ages. The Byzantine artists had no sculpture beyond that of capitals and similar architectural members and rude bas-reliefs of sacred subject: their decoration was chiefly in color on flat surfaces. The Western nations in the years following the establishment of comparatively peaceful communities showed a strong taste for figure-sculpture as used in the decoration of architecture. This was rude enough in the eleventh century, but grew rapidly in refinement. The statues in the porches and the "royal galleries" in such cathedrals as Chartres in the twelfth century, Bourges, Paris, and Chartres again in the thirteenth century, are the highest development known to us of sculpture, whose chief aim is decoration, the climax of excellence being reached in the porches of Rheims cathedral (1250, and the following years). This art was pursued with almost equal success in England, Spain, and parts of Germany. In Italy the mediæval sculpture is abundant and beautiful; it keeps something of the ancient grace and also some of the ancient knowledge of the human form. For the development of sculpture in Italy at the close of the Middle Ages, see RENAISSANCE, MICHELANGELO, and the names of other sculptors of the epoch. In France and the north generally sculpture passed from the style of the Middle Ages

into a richer and more varied but still decorative style, having less of the purely sculpturesque beauty of Italian work and a fantastic and overwrought character of its own. Thus the famous groups in the abbey of Solesmes near Angers were not begun until Donatello, Verrocchio, Mino da Fiesole, and Luca della Robbia had all done their work and had been dead for ten or twenty years, and yet this French sculpture, although consisting of full statuary and large groups of figures in the round, is mediæval in almost every respect. There were Renaissance sculptors in France, such as Jean Goujon, but their work is not epoch-making in the sense that the Italian Renaissance sculpture is so. It follows from this that modern sculpture is found in France and elsewhere in the north fully developed, nearly as we know it to-day, in the time of Henry IV. and Louis XIII., with such masters as Simon Guillain (d. 1679), Pierre Franqueville or de Francheville (d. 1630), Michel and François Anguier, and Pierre Puget (d. 1694). These men inherited from Michelangelo, in a sense, and not from the earlier Renaissance. They were followed by the men of the Louis XIV. epoch: François Girardon (d. 1715), Antoine Coysevox (d. 1720), Nicolas Coustou (d. 1733) and Guillaume Coustou (d. 1746), Jean Baptiste Lemoyne (d. 1778), and Jean Baptiste Pigalle (d. 1785). The sculptors of the beginning of the nineteenth century were rather cosmopolitan in life and work; thus Augustin Pajou (d. 1809), Claude Michel Clodion (d. 1814), Antonio Canova (d. 1822), John Flaxman (d. 1826), Jean Antoine Houdon (d. 1828), and Bertel Thorwaldsen (d. 1844) were Italians, Frenchmen, or Danes, but all worked under a common Roman influence. The sculpture of the years since 1830 has been characterized, especially in France, by a very remarkable increase in energy and purpose. The skill and knowledge of many of the men whose work has been done between 1830 and 1890 is worthy to be compared with that of the men of antiquity; and if there is no school as strong in artistic charm as that of the Italian Renaissance, there are individual men worthy to be named with the great Italians, and others who are equally efficient in other ways of work. There are many different tendencies visible in nineteenth century sculpture, and it is too soon to judge them fairly. Jacques Pradier (d. 1852), David d'Angers (d. 1855), François Rude (d. 1855), Jean Baptiste Carpeaux (d. 1875), Antoine Etex (d. 1888), and, of men living in 1895, Paul Dubois, Henri M. A. Chapu, Antonin Mercié, Emmanuel Frémiet, and finally Auguste Rodin and Jules Dalou are all sculptors whose abilities and achievements would grace any epoch. These are all men of the great Paris art-world, but not all of the same school. Nearly all modern sculpture is concentrated in Paris, and the different influences at work there show themselves in strong contrasts. Of English sculpture of the nineteenth century Thomas Woolner and Sir J. Edgar Boehm are to be mentioned, and one or two admirable works have been produced by a painter, Sir Frederic Leighton. In the U. S., of men living in 1895, the names of John Q. A. Ward and Augustus St. Gaudens should especially be named. See FINE ARTS.

RUSSELL STURGIS.

Scup, or **Scuppaug**: See PORGY.

Scurvy [for form cf. *scurf*, scab, *scurfy*, *scurvy*, scabby; for meaning cf. Late Lat. *scorbu'tus*, scurvy. Cf. Dutch *scheurbuik*]: a diseased state of the blood, induced chiefly by prolonged privation of fresh vegetable and animal food. Although not exclusively a sailor's malady, its ravages have been most disastrous at sea, devastating, previous to the nineteenth century, the navies and merchant marine of all nations. Pizarro's squadron included 2,700 men, of whom but 100 survived. Ships were often lost adrift at sea, the crew unable to work and perishing. Anson's English fleet in 1742 in nine months lost 626 out of 961 men. The chief cause of this pest of the marine was the exclusive diet—salt meat and hard, dry bread, with impure and deficient drinking-water—upon which sailors subsisted during prolonged voyages. Exposure to cold or to tropical heat, fatigue, and the unsanitary and foul condition of ships contributed to the development of scurvy. As early as 1617 Wodall recorded the virtues of lemon-juice in curing this disease, and in isolated cases its use and a vegetable diet saved the crews so treated; but not until the latter half of the eighteenth century were improved ship hygiene and vegetable diet at sea enforced. Thus only thirty years after Anson's fearful loss Capt. Cook sailed on a three years' voyage around the world, losing but one man by disease. Parry in three polar expeditions of a year and a half and two years' duration lost only seven men out of 334. Modern improvements in sailing ships and the use of steam at sea by shortening voyages have tended to lessen sickness among sailors. The improved hygiene of ships, the supply of fresh meat and vegetables prescribed by law for sailors, and the modern methods of keeping such articles hermetically sealed for long voyages, have rendered scurvy almost unknown at sea, although it occurs occasionally on land, in garrisons and prisons, and in communities suffering from starvation. All of the symptoms of scurvy are directly connected with the impoverished, impure state of the blood. All parts of the body are correspondingly ill nourished. The face is cachectic and sunken, the body emaciated, the limbs are feeble and seem unduly heavy. The gums become dark, bloody, relaxed, and spongy. There is an early tendency for the vitiated blood to escape from its vessels—an occurrence favored both by its thinned consistency and by the changed nutrition of the capillary walls. At first mulberry-colored purple spots of variable size appear on the legs, later on the body. Later, larger purple spots or diffused patches appear upon a tough, indurated, leathery base, due to effusion of blood in quantity beneath the true skin or between superficial muscles, infiltrating and coagulating in the minute interspaces of the connective tissue. Such patches are painful to touch; they may become the site of bloody blebs or of ulcers. Bloody serum often transudes into the pleural cavities, embarrassing the respiration; also into the pericardium, peritonæum, and the cavities of the joints. "Bloody flux," or dysentery, is frequent; also vomiting of blood and nosebleed. Death occurs from exhaustion. Critical cases may rapidly change for the better, and mild cases quickly recover, when put upon supporting and vegetable diet. Onions, cabbage, radishes, horse-radish, "scurvy-grass" or spoon-wort, water-cresses—the entire class of the *Cruciferæ*—are especially efficacious; all the vegetable acids, lemons, limes, oranges, cherries, currants, apples, are valuable. Sauerkraut is extolled by the Germans as combining vegetable food and acids. Animal broths, tonics, and regimen are essential adjuvants to this treatment. It has become known that young infants improperly fed develop a form of acute scurvy which was formerly mistaken for an acute form of rickets. In this there are usually hæmorrhages under the periosteum of the bones, disturbances of the stomach, and general wasting and weakness.

Revised by W. PEPPER.

Scurvy-grass: a cruciferous plant, *Cochlearia officinalis*, abundant upon many seashores (but not on those of the U. S.), and also found on mountain ranges, and sometimes cultivated as a salad-plant. It has the pungent qualities of horseradish, and is of high rank as an antiscorbutic. The scurvy-grass occasionally cultivated for salad in the U. S. is mostly *Barbarea præcox*, the early winter-cress, a European cruciferous plant sparingly naturalized in the U. S.

Revised by CHARLES E. BESSEY.

Scutari, skoo'tăă-rĕĕ (Turk. *Uscudar*; Gr. Χρυσόπολις): the largest and most distinctively Oriental of the suburbs of Constantinople; situated on several hills on the Asiatic side of the Bosphorus, directly E. of the Golden Horn. Here the pagan emperor Licinius suffered his final defeat by Constantine (323). It contains many mosques, tekiehs (dervish convents), several palaces, and immense barracks. The vast cypress-shaded cemeteries are the most striking feature of the city. Mussulmans dying on the other side of the strait desire to be brought here for burial. The hospital, memorable for the devoted labors of Florence Nightingale, still exists, and near it is the beautiful British cemetery wherein are interred 8,000 nameless victims of the Crimean war. In Scutari is the admirable American College for Girls, where a first-class education is given. Pop. 75,000. See CONSTANTINOPLE.

E. A. GROSVENOR.

Scutari (Turk. *Uscodra*, or *Iskenderieh*): chief town of the vilayet of Scodra in Albania; on the southern extremity of the Lake of Scutari, 12 miles from the Adriatic; in lat. 42° N. (see map of Turkey, ref. 3–B). A natural fortress, it was the stronghold of Gentius, last King of Illyricum, who surrendered here to the prætor Anicius (168 B. C.), whereupon Illyricum became a Roman province. In 1477 during eight months it withstood a siege by 80,000 Ottomans, commanded by Sultan Mohammed II. in person, but in the subsequent treaty between Venice and the Porte it was ceded to the latter; in consequence 600 persons, the sole survivors of the siege, abandoned their homes. It is the center of trade-distribution through Albania, but its business activity is greatly checked by the lack of roads in the surrounding country. Imports are woven goods, building tim-

ber, metals, drugs, paper, and earthenware; exports (in value only one-third of the imports) raw stuffs, dyewoods, and rags. Pop. 36,000, of whom 27,500 are Mussulmans.

E. A. Grosvenor.

Scutching: See Flax.

Scutibranchia'ta [Mod. Lat.; Lat. *scu'tum*, shield + *bran'chiæ*, gills]: an obsolete term for those molluscs now included under the *Zygobranchia*. See Gasteropoda.

Scyelite: See Peridotite.

Scylax, sī'laks (Gr. Σκύλαξ): Greek geographer of Caryanda in Caria, who, by command of Darius I., made a voyage of discovery from the Indus through the Indian Ocean to the Red Sea (Herodotus, iv., 44). The *Periplus*, which bears the name of Scylax and describes a voyage along the coast of Europe, Asia, and Africa, is a much later performance, and has been assigned to the middle of the fourth century B. C. It was edited by Müller (*Geographi Græci Minores*, vol. i., pp. 15–96). See Bunbury, *History of Ancient Geography* (vol. i., p. 384, *seq.*). B. L. G.

Scylla, or **Scilla**, sil'lă (Gr. τὸ Σκύλλαιον ἄκρον; Ital. *Sciglio*): a high and steep promontory on the Italian side of the Strait of Messina. In ancient mythology it was the home of the sea-monster Scylla, who, along with the whirlpool Charybdis, threatened destruction to all mariners.

J. R. S. S.

Scylli'idæ [Mod. Lat., named from *Scyllium*, the typical genus, in form dimin. of Gr. Σκύλλα, Scylla; cf. σκύλιον, dogfish, and σκύλλειν, rend, tear]: a family of sharks distinguished by the position of their dorsal fins and their habit of laying eggs like those of the rays. It includes the dogfishes. The body is more elongated than is the case with the sharks generally. The *Scylliidæ* are inhabitants entirely of the seas of the Old World and Australia. They are among the few sharks which lay eggs invested in parchment-like cases, like those of the rays. Revised by F. A. Lucas.

Scym'nidæ [Mod. Lat., named from *Scymnus*, the typical genus, from Gr. σκύμνος, cub, whelp]: a family of sharks distinguished by the absence of the anal fins and presence of unarmed dorsals. It includes the Greenland sharks.

Revised by F. A. Lucas.

Scymnus, sim'nŭs (Gr. Σκύμνος): Greek geographer, to whom has been attributed an outline of the geography of the ancient world composed in iambic trimeters. The authorship of this περιήγησις, as it is called, is doubtful, as the original Scymnus wrote in prose, and the time is uncertain, the first or second century B. C. It was edited by Müller (*Geographi Græci Minores*, vol. i., pp. 196–237). See Bunbury, *History of Ancient Geography* (vol. ii., 71). B. L. G.

Scyphomedu'sæ [Gr. σκύφος, cup + *Medusa*, a fabled monster]: a group of cœlenterates belonging to the class Scyphozoa (*q. v.*).

Scyphoph'ori [Mod. Lat.; Gr. σκύφος, cup + φέρειν, bear]: an order of fishes established by Prof. Cope, and distinguished by the following characters: The skeleton is completely ossified; the basis cranii simple; the parietals narrow, and distinct from each other as well as the supraoccipital; the pterygoid is very peculiar, being enlarged and funnel-shaped, and excavated by a bowl-like chamber (whence the name), which expands laterally and is covered by a lid-like bone; no symplectic exists; the jaws are well developed, but the intermaxillaries coalesce, at least in the old, into a single bone, and the maxillaries are lateral; opercular apparatus complete, but with the interoperculum and suboperculum reduced in size; scapular arch with the several coracoid elements represented; the brain has over the cerebellum a peculiar plicated organ; the air-bladder is simple, and communicates by a duct with the intestinal canal. The order is related to the more generalized form of *Teleocephali*, as well as to the *Nematognathi*. It is represented by but two known families, which are peculiar to the rivers of Africa; these are the *Mormyridæ* and *Gymnarchidæ*.

Theodore Gill.

Scyphozo'a [Gr. σκύφος, cup + ζῷον, animal]: one of the great divisions or classes of the Cœlenterata (*q. v.*), including the sea-anemones, coral-polyps, and the acraspedote jellyfishes. The group is differentiated from the other class (*Hydrozoa*) by the fact that there is an ectodermal œsophagus formed by the inpushing of the external skin through the mouth. As in all *Cœlenterata*, there is no distinction between the digestive cavity and body-cavity, but the common enteric cavity is complicated by folds of the outer wall (septa) which increase greatly the amount of digestive surface. On these septa are borne thread-like gastral or mesenterial filaments which play an important part in digestion. The sexes are usually separate and the genital products (eggs and spermatozoa) arise from the entoderm. Two subclasses are recognized, the *Scyphomedusæ* and the *Anthozoa*. The *Scyphomedusæ* (except the lucernarians) are free-swimming solitary forms commonly known as jellyfishes, in which the body is umbrella-shaped or disk-like, the mouth being on the extremity of a longer or shorter proboscis, while the supporting layer (mesogloea) which lies between the ectoderm and entoderm of all *Cœlenterata* is developed into a thick gelatinous mass which makes up the bulk of the body. In the *Anthozoa* (often called *Actinozoa*) are included sessile, solitary, or colonial (compound) forms commonly called sea-anemones, coral-polyps, and the like. In these the body retains a more simple condition. It is more or less columnar and the free end or oral disk is surrounded by a circle of tentacles, the number varying between wide limits (see below). In the center of the oral disk is the slit-like mouth, no proboscis being present. From the mouth the ectodermal œsophagus extends into the body, opening below into the large digestive chamber. In many forms the two ends of the mouth differ, one being for the taking in of water, while from the other flows out the water already used, carrying with it the indigestible particles taken in with the food. The digestive cavity is partially divided by the septa (already noticed), which are folds of the lining walls which project inward from the wall of the body like the spokes of a wheel from the rim toward the hub. The arrangement of these septa varies greatly, but in all cases there are at either one or both ends of the body (corresponding to the longer axis of the mouth) septa which differ from the rest and are consequently known as directives. The supporting layer is weakly developed, never attaining the thickness presented in the *Scyphomedusæ*. The *Anthozoa* are divided into orders chiefly upon the number and arrangement of the septa. In the Octocorallia (*q. v.*) the septa are eight, and there are usually eight feathery tentacles surrounding the oral disk. In the Tetracorallia (*q. v.*), a group of fossil forms occurring in the Palæozoic rocks, the septa are very numerous, but are always in multiples of four. In the Hexacorallia (*q. v.*) the tentacles are always in multiples of six, while the septa, except in a few instances—e. g. *Antipathus*, with two—follow the same law. J. S. Kingsley.

Scyros: See Skyros.

Scythe [M. Eng. *sithe* < O. Eng. *sigðe*: Icel. *sigðr*: Germ. *sense* < O. H. Germ. *segansa* is from same root; cf. Lat. *seca're*, cut]: a long, curved blade, sharp on the concave edge, used in cutting grass. It is attached, for use, to a curved handle, called a snath. Shorter and stronger scythes are used for cutting bushes, etc. The introduction of mowing-machines has to a great extent superseded the use of scythes in haymaking, but where the former can not be employed scythes are still indispensable.

Scyth'ia: the ancient name for the vast regions which extend N., E., and S. of the Caspian Sea and the Sea of Aral. It was not so much used as a geographical term, for the boundaries of these regions were entirely undefined; it was rather a general term by which the Romans denoted a swarm of savage tribes living there, of whom they knew very little.

Scythop'olis: the *Beth-shean* of Josh. xvii. 11, the *Beth-shan* of 1 Sam. xxxi. 10, now called *Beisan*, the most important city of the ancient Decapolis (*q. v.*), and the only one W. of the Jordan, about 4 miles from that river, and nearly 14 miles S. of the Sea of Galilee. It was nearly as well watered as Damascus, four perennial streams running through it. It was a place of great strength, its acropolis rising 300 feet above the plain. The ruins, which are 3 miles in circuit, surpass all others in Western Palestine. Its classic name, *Scythopolis*, is of disputed derivation, but the old conjecture that there was there a remnant of the Scythians, who invaded Palestine on their way to Egypt (650 B. C.), is the most probable. Scythopolis was the seat of a bishopric in the fourth century A. D. The modern village, of some fifty houses, contains a colony of Egyptians established there by Ibrahim Pasha in 1848. Revised by S. M. Jackson.

Sea: See Ocean and Physiography.

Sea-anemones: See Hexacorallia and Actiniidæ.

Sea-bass: a serranoid fish (*Centropristis atrarius*) common on the Atlantic coast of the U. S. See Fisheries.

Sea-bear: a fur-seal of either of the genera *Callotaria* and *Arctocephalus*, especially the northern species. See OTARIIDÆ.

Seabury, SAMUEL, D. D.: bishop; b. at Groton, Conn., Nov. 30, 1729; son of clergyman of same name; graduated at Yale College 1748; studied medicine and theology in Scotland; was ordained a deacon and priest of the Church of England at London 1753; was in charge of churches at New Brunswick, N. J., at Jamaica, Long Island, 1756–66, and at Westchester, N. Y., 1766–75; was imprisoned at New Haven as the supposed author of some Tory pamphlets, but soon released; resided in New York during most of the Revolutionary war; was at one time chaplain of a loyalist regiment; went to England 1784; was consecrated Bishop of Connecticut by three Scottish prelates at Aberdeen Nov. 14, 1784, being the first American bishop; took part in revising the Prayer-book and framing a constitution for the American Church 1789; published two volumes of sermons (1791) and a number of single sermons; exercised the duties of his episcopal office at New London, Conn., until his death at that place Feb. 25, 1796. A posthumous volume of *Sermons* was published 1798.

Seabury, SAMUEL, D. D.: clergyman and author; son of the Rev. Charles Seabury, and grandson of Bishop Seabury; b. at New London, Conn., June 9, 1801; was ordained in the Protestant Episcopal Church 1826; was for several years a missionary at Huntington, Oyster Bay, and Hallett's Cove (now Astoria), Long Island; was editor of *The Churchman* at New York 1831–49; rector of the Church of the Annunciation 1838–68, and Professor of Biblical Learning in the General Theological Seminary from June, 1862, to his death in New York, Oct. 10, 1872. Author of *The Continuity of the Church of England in the Sixteenth Century* (1853); *Discourses on the Supremacy and Obligation of Conscience* (1860); *American Slavery Justified* (1861); *Theory and Use of the Church Calendar* (1872); and a posthumous volume of *Discourses on the Holy Spirit* (1874), edited by his son, WILLIAM JONES SEABURY, D. D., clergyman and author, who was born in New York Jan. 25, 1837; graduated at Columbia College, New York, 1856; admitted to the bar 1858, but entered the General Theological Seminary 1866; has been rector of the Church of the Annunciation, New York, since 1868, and has been Professor of Ecclesiastical Polity in the General Theological Seminary since 1873. He is the author of *Suggestions in Aid of Devotion and Godliness* (1878) and *An Introduction to the Study of Ecclesiastical Polity* (1894). Revised by W. S. PERRY.

Sea-cow: See MANATEE and SIRENIA.

Sea-cucumber: See HOLOTHURIANS.

Sea-duck: See DUCK.

Sea-eagle: See EAGLE.

Sea-egg: a sea-urchin. See ECHINOIDEA.

Sea-elephant: See ELEPHANT SEAL.

Sea-fan: See GORGONIA.

Seaford: town; Sussex co., Del.; on the Nanticoke river, at the head of navigation by small vessels, and the Phila., Wil. and Balt. Railroad; 33 miles E. by N. of Cambridge, Md., 84 miles S. of Wilmington (for location, see map of Delaware, ref. 7–N). It is in an agricultural region, and contains numerous oyster-packing houses, two national banks with combined capital of $100,000, and a weekly newspaper. Pop. (1880) 1,542; (1890) 1,462; (1900) 1,724.

Seaforth: town of Huron County, Ontario, Canada; on Buffalo and Goderich Branch of the Grand Trunk Railway; 21 miles S. E. of Goderich (see map of Ontario, ref. 4–B). It ships annually 1,000,000 bush. of grain, and is underlaid with a stratum of pure rock-salt, over 100 feet thick at a depth of 1,100 feet. It has a large trade, productive salt-wells, active manufactures, and two weekly papers. Pop. (1891) 2,641.

Sea-horse: See HIPPOCAMPUS.

Sea Islands: littoral band of islands of South Carolina, especially those from Winyah Bay to the mouth of the Savannah. Their fertility is extraordinary, their cotton long-stapled and celebrated, and their rice product large. They are low, and especially subject to the overflows by the storm-waves of hurricanes. Those of 1893 and 1894 destroyed the crops generally, and caused thousands of deaths. The Negroes show a strong tendency to collect on these islands for permanent residence. M. W. H.

Sea-kale: the *Crambe maritima*, a perennial cruciferous herb; a native of European seacoasts; much cultivated in England as a potherb. It requires a generous soil, and its large leaves and sprouts are unfit for eating until blanched.

Seal [from O. Fr. *sëel* > Fr. *sceau*: Ital. *sigillo*: Span. *sello* < Lat. *sigil'lum*, dimin. of *signum*, sign, mark, stamp]: strictly, at the common law, a piece of wax or other tenacious substance which has been affixed to the paper or parchment of an instrument in writing, and stamped with an impression for the purpose of legally executing or authenticating the instrument. The use of these seals becoming inconvenient, the name is by extension applied also to the substitutes used for it, such as an impression made in the paper or parchment of the instrument itself, or a scroll or flourish of the pen placed after the signature, or the letters L. S. The instrument by which the impression on the wax or other material is made is also called a seal. The use of the seal as a device for authenticating important instruments arose from the fact that in early times few could affix a written signature to the instruments made by them, and in place of such a signature they therefore used, with or without a mark or cross, seals with some heraldic or other device worked in relief to impress the wax. The use of the seal became especially associated with deeds and state papers because these then constituted the most important instruments which people had occasion formally to authenticate. In using a seal it is not necessary that it should be affixed by the person whose seal it is intended to be, but he may adopt as his seal one affixed by another; and so one seal may suffice for a number of signers of an instrument. The necessity for the use of a seal and the determination as to the kind of seal necessary in general depends upon the laws of the place where the contract is made; but in the case of deeds always upon the law of the State in which the land is situated.

Effect of Seal.—The common law attributed a very high, but very arbitrary and technical, efficacy to the seal upon instruments of a private nature. A seal was essential to a valid conveyance of a freehold estate in land; and as no contract is obligatory without a consideration, it established a conclusive presumption that there had been some valuable consideration. In some of the U. S. the common-law rule as to presumption of consideration was more or less abandoned, and in many States it is provided by statute that a seal on an executory contract shall be only *prima-facie* evidence of a sufficient consideration.

Statutory Regulation of Seals.—In most of the U. S. the use of the seal is regulated by statutes, extending the application of the term, and doing away entirely in many cases with its use on private instruments, or with any distinction between such instruments when sealed and unsealed. The word "seal" or the letters L. S. may be used instead of a seal in Connecticut and New York. The scroll may be used in place of a seal in Arkansas, California, Florida, Idaho, Illinois, Maryland, Michigan, New Mexico, North Carolina, Oregon, Pennsylvania, South Carolina, Virginia, and West Virginia; and in Minnesota, New Jersey, Wisconsin, and Wyoming any flourish or device intended for a seal may be used. The distinction between sealed and unsealed private instruments (except of corporations) has been abolished in Arizona, California, Colorado, Indiana, Indian Territory, Iowa, Mississippi, Missouri, Montana, Nebraska, Nevada, North Dakota, Ohio, Oklahoma, South Dakota, Tennessee, and Utah; so that in these States and Territories the presence or absence of a seal does not affect the validity of the instrument. In Alabama an instrument purporting on its face to be a sealed instrument is taken to be sealed.

Judicial Recognition of Seals.—The public, or great, seals of all independent nations are universally recognized by the governments and tribunals of other civilized countries, so that public records, statutes, etc., when authenticated by their means are accepted as correct without further proof. The seals of notaries public are also regarded as proving themselves, especially in Europe, where the NOTARY (*q. v.*) is an officer of greater dignity than in the U. S. The seals of the superior courts and of many administrative officers also receive judicial recognition, and require no proof in the territorial jurisdiction to which they belong; but in other jurisdictions they must be proved unless they are privileged by comity or statutory provision.

See *American Law Review*, 638; *History and Use of Seals in England*, in vol. xviii. of *Archæologia* (London); Blackstone's *Commentaries*. F. STURGES ALLEN.

Seal [M. Eng. *sele* < O. Eng. *seolh* : O. H. Germ. *selah* : Icel. *selr*]: a pinniped mammal of either of the families *Phocidæ* or *Otariidæ*. The name is applied more particularly to the members of the family *Phocidæ*, the eared seals being termed fur seals or sea-bears and sea-lions. With the exception of a species (*Phoca sibirica*) inhabiting Lake Baikal, seals are marine, but some find their way into the lakes of Newfoundland, and they ascend rivers for considerable distances, a few having been taken even in Lakes Champlain and Ontario. They are more or less gregarious in habits, especially during the breeding season, when they are found in herds of thousands or hundreds of thousands on the ice-floes. As a rule, the female brings forth but one young, and this is covered with a soft woolly coat, which is shed in two or three weeks. Seals feed principally on fish, but also eat cuttlefish, crustaceans, and molluscs. They are capable of remaining beneath the water for five or ten minutes, or, according to some observers, even fifteen or twenty minutes, but if this be true, it is certainly exceptional. Those species which winter in the ice keep a hole open to which they come to breathe, a habit of which advantage is taken by hunters, who either wait by the holes and spear the animal as it emerges or else set a net over the hole.

Four genera of seals (*Stenorhynchus*, *Lobodon*, *Ommatophoca*, and *Leptonyx*), each with a single species, are peculiar to Antarctic seas, but nearly all species and individuals occur in the northern hemisphere, and for the most part in the frigid and colder portions of the temperate zone. The most familiar of the seals is the harbor seal (*Phoca vitulina*), a species common to both the eastern and western hemispheres, ranging from New York to Spain, along the northern shores of Europe and Asia, and down the Pacific coast of the U. S. to California. It attains a length of 5 or 6 feet; the general color is yellowish gray above, varied with markings of dark brown or blackish, lighter below, but it is subject to considerable variation. The Caspian seal (*Phoca caspica*) resembles the harbor seal, and is considered a descendant of that species, having entered the Caspian Sea when it was a branch of the Arctic Ocean, and become modified by isolation. The harbor seal is found on the coast in small bands. The largest of the seals (excepting the Elephant Seal and Sea-leopard, *qq. v.*) are the bearded seal (*Erignathus barbatus*) and the gray seal (*Halichœrus grypus*), each of which attains a length of 8 or 9 feet, although they are said to grow even larger. The gray seal is found only in the North Atlantic and the Baltic, while the bearded seal is circumpolar. Both are less gregarious than the other species. The gray seal, as its name implies, is free from markings, while the bearded seal is blotched with brown or blackish. The netsick, or ringed seal (*Phoca fœtida*), is a species resembling the harbor seal, but is smaller, and has light markings in the form of rings surrounding oblong dark patches. This species is prized by the Eskimo, as it winters in the Arctic regions and forms an important article of food.

The curious hooded or, more correctly, bladder-nosed seal (*Cystophora cristata*) attains a length of 7 or 8 feet, and derives its name from the fact that the males possess the power of inflating the skin about the nose. It is usually incorrectly figured with the hood on top of the head. It is a northern species, and is not found in herds. See Allen, *History of North American Pinnipeds* (1880); Elliott, *Seal Islands of Alaska* (1881); *Fishery Industries of the United States*, Quarto Fishery Report (1884–87). See also Harp-seal, Monk-seal, Otariidæ, Phocidæ, Seal-fisheries, and Sea-lion. F. A. Lucas.

Sea-lavender: See Marsh-rosemary.

Sea Laws: See the Appendix.

Sealchraig: See Selkirk, Alexander.

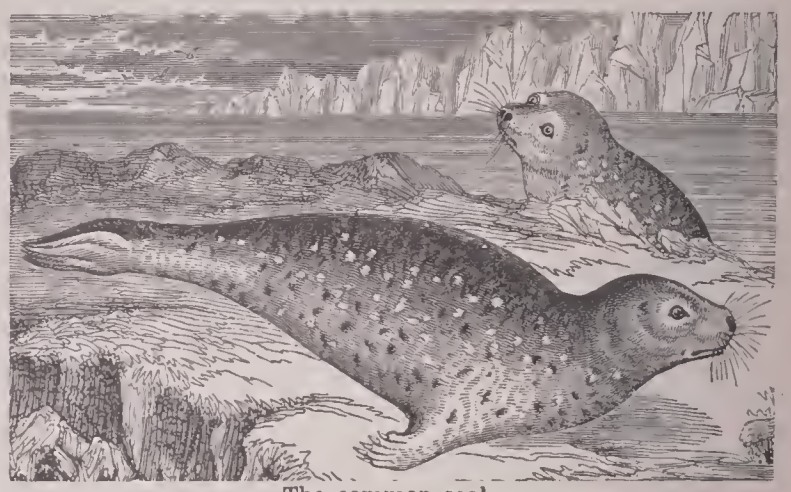
Seal-engraving: See Gem.

Sea-leopard: an Antarctic seal (*Stenorhynchus leptonyx*) named from its spotted coat of gray and white. Aside from the sea-elephant it is the largest southern hair-seal. It attains a length of 10 feet, and the crowns of the molars are divided by deep notches into three portions. F. A. L.

Sea Letter: See the Appendix.

Seal-fisheries: industries which consist in the capturing of seals for commercial purposes, and which may be said to have arisen toward the end of the eighteenth century; though the walrus, a near relative of the seal, had been systematically pursued for at least 200 years before, comparatively few hair or fur seals appear to have been taken prior to 1790. In the present condition of the seal-fisheries it is often found advisable to take different kinds of seals on the same voyage, or to combine the seal-fishing with the whale-fishing, especially in the Antarctic fisheries.

The principal seat of the hair-seal fishery is off the coasts of Newfoundland and Labrador, the value of the seals taken there exceeding that of the catch elsewhere. Still large numbers of seals are taken in the Gulf of St. Lawrence,



The common seal.

near Nova Zembla and Jan Mayen islands, in the White and Caspian Seas, and on Kerguelen and Heard islands in the South Pacific, as well as at other points in the Antarctic Ocean. The harp-seal (*Phoca grœnlandica*) is, commercially, the most important of the hair-seals, but the hooded seal, or bladder-nose (*Cystophora cristata*), the square flipper (*Erignathus barbatus*), and the Caspian seal (*Phoca caspica*) are all taken in considerable numbers. The southern sea-elephant (*Macrorhinus proboscideus*) in times gone by has furnished an enormous amount of oil. The California sea-elephant (*M. angustirostris*) and the Caribbean seal (*Monachus tropicalis*) have been practically exterminated. Within the last few years some of the large southern seals (*Stenorhynchus*, *Lobodon*, *Leptonyx*) have been taken, but there can hardly be said to be a regular fishery for them, and it is not probable that their capture would long prove remunerative. The most important part of the Newfoundland seal-fishery is carried on by steamers, and these are also employed in the Nova Zembla and other northern fisheries, having practically superseded sailing craft where the seals are taken on the ice-floes at some distance from land. Many seals are still taken near shore by nets or by shooting. Between twenty and thirty steamers are engaged in the Newfoundland fisheries, which also employ not far from 5,000 men, although only for a short time, as the season is from Mar. 10 to May 1. In the most flourishing days of the seal-fishery 8,000 to 10,000 men were engaged. In 1892 the Newfoundland sealers took 390,174 seals, the value of skins and oil being $865,784, but in 1893 the catch was only 129,061 seals. The annual product of the Norwegian fishery is about $300,000. The seals are taken on the floe-ice which drifts down from the north, and the major part are the newly born young, which have never left the ice and are excessively fat. They are killed with clubs, and heaped up on the ice until a pause in the slaughter will admit of their being skinned. The pelt, with the attached blubber, weighs from 20 to 40 lb. Sealskin leather is well known; the oil is used for tanning and lubricating purposes, and for making soap. It varies much in quality, according to the care used in its preparation, but the best is limpid and almost devoid of taste or odor. The sea-elephant is taken chiefly on Kerguelen and Heard islands and the Crozets, but some are killed on Macquarie island by the New Zealand sealers, and other localities are visited from time to time with more or less success, much depending on the length of time they have been left undisturbed. New London, Conn., is the principal port from which the sea-elephant and southern fur-seal fishery is prosecuted, the two being generally carried on by the same vessel. The vessels employed are stout schooners of 75 to 150 tons, well provided with boats, and it is customary to land parties of men on the islands, and leave them to kill the animals and try out the oil, or, in the case of the fur-seals, to salt down the skins. Or, again, as at Kerguelen and Heard islands, the vessels may be anchored in the best harbor obtainable, while the greater part of the crew live on shore. The Antarctic seal-fisheries are very arduous, for the climate is severe and gales are frequent, while at the same time a successful voyage is by no means a certainty.

The fur-seals all belong to the family *Otariidæ*, and the most valuable species is *Caltotaria ursina* of the North Pacific. *Arctocephalus australis* is the most important southern species, but *A. gazella*, *A. pusillus*, and *A. forsteri* are all taken. At present 1,000 to 1,500 skins is a fair season's catch, whereas 50,000, 60,000, or even 100,000 skins were formerly taken by a single vessel. The Pribilof and Commander islands in Bering Sea are the chief seats of the northern fur-seal fishery; in the south the South Shetlands and various small islands in the vicinity of Cape Horn, South Georgia, the South Orkneys, the Crozets, and Lobos islands, near the mouth of the La Plata, are also visited. The last-mentioned locality is under the control of the Argentine Republic, and the killing of seals is there regulated by law. At the Commander and Pribilof islands, whence the main supply of fur-seal skins comes, the number of seals that may be taken annually is fixed by law, and none but the young males are killed. With these restrictions the fur-seals might be preserved indefinitely, but unfortunately the value of the skins has led to the pursuit of the animals at sea, where they are shot from small boats or speared. Owing to the fact that dead seals sink very quickly, about seven are killed for every one secured. By an agreement between Great Britain and the U. S. the use of firearms is prohibited. (See Bering Sea Controversy.) The catch at the Pribilofs has fallen from 100,000 to 7,500, or in 1893, 16,000, while the pelagic sealers took not far from 50,000 skins. See Allen, *History of North American Pinnipeds* (Washington, 1880); *Fisheries and Fishery Industries of the United States* (Washington, 1887); *Fur Seal and other Fisheries of Alaska* (Washington, 1889). F. A. Lucas.

Sealing-wax: See Lac.

Sea-lion: any one of several species of large seals of the family *Otariidæ*. Sea-lions are characterized by the development of harsh hair without under-fur, and the color is yellowish brown in the mature, but in the young reddish brown. Two species occur on the Pacific coast of North America, and are found together in the Bay of San Francisco. One (*Eumetopias stetteri*) is the largest of the family, and attains a length of 11 to 13 feet, while the other (*Zalophus californianus*) is the smallest, and is only 7 to 8 feet long. The zalophus is the ordinary sea-lion of the menageries and zoölogical gardens. It has a slender, dog-like head and a "honking bark or howl," while the eumetopias has a thick, mastiff-like muzzle and a deep bass growl and prolonged steady roar. Other species are *Otaria jubata* of South America, *Arctocephalus hookeri* of the Auckland islands, and *A. tobatus* of the Australian seas. The walrus is sometimes called sea-lion. Revised by F. A. Lucas.

Seal Islands: See Lobos Islands.

Sealkote: See Sialkot.

Sealsfield, Charles (psendonym of Karl Postel): novelist; b. at Poppitz, Moravia, Mar. 3, 1793; entered a monastery and was ordained a priest, but fled in 1822 to Switzerland and thence to the U. S.; edited in 1829 the *Courrier des États-Unis* (New York); after 1832 resided in Switzerland, although he took occasional trips to the U. S. D. at Soleure, Switzerland, May 26, 1864. Under the pseudonym of *Charles Siddons* he published in 1828 *Die Vereinigten Staaten von Nordamerika*, and a few years later he created a sensation in German literature by a series of descriptive novels, the most important of which are *Der Legitime und die Republikaner* (1833); *Der Virey und die Aristokraten* (1835); *Lebensbilder aus beiden Hemisphären* (1835–37); *Deutsch-amerikanische Wahlverwandtschaften* (1838–42); *Das Kajütenbuch* (1840); and *Süden und Norden* (1842–43). Some of these novels were also published in English. J. G.

Seaman: literally, a person who is engaged in the navigation of a vessel on the high seas. This term now, however, has acquired in legal literature the broader signification of any person (usually excepting the master, chief officers, and pilot) employed or aiding in the navigation of vessels, ships, barges, etc., either upon the high seas or upon inland waters. In Great Britain, for the construction of the statutes now regulating merchant shipping, the term seaman is defined to mean "every person (except masters, pilots, and apprentices duly indentured and registered) employed or engaged in any capacity on board any ship." It was formerly required by law in Great Britain that a British ship must have for its officers and crew only British subjects (except in certain emergencies), but now this is not necessary. In the U. S. the statutes require that the master of a vessel must be a citizen of the U. S. in order that the vessel may enjoy the benefits and privileges of a vessel of that country.

Experience has shown that seamen are a class of men who need more protection at the hands of the law than ordinary persons, largely because they are more under the control of others when employed. The regulations affording this protection differ in different countries, but the general intent of them all is to do away with disputes between master and seamen as to the terms of the contract of hiring; to interest the seaman in the success of the attempted voyage, by making their earnings depend upon its termination; and to secure obedience to orders.

Shipping of Seamen.—The U. S. statutes provide for the appointment of shipping-commissioners for ports of entry and of ocean navigation, whose general duties are to facilitate and superintend the engagement and discharge of seamen, and to arbitrate in certain disputes between a seaman and the master or owner of a vessel; and at other ports the duties of a shipping-commissioner are imposed upon the collector of customs. In Great Britain similar officers are provided—the superintendents of mercantile marine offices. In general, the master of every seagoing ship must enter into a formal written or printed contract (the *shipping-articles*) with each seaman of his crew, and these articles must be signed before the proper shipping-officer. They must state the nature and duration and port of termination of the voyage, the number and description of the crew and their respective employments, the amount of wages each seaman is to receive, the capacity in which he is to serve, and the time at which he is to begin work on board; a scale of provisions to be furnished; regulations as to conduct and as to fines, short allowance of provisions, or other lawful punishments for misconduct; and any stipulation as to advance or allotment of wages. In the U. S. the master of every vessel of 50 tons burden or upward plying between States not adjoining must enter into a written contract, which, however, need not be signed before a shipping-commissioner. The statutes making these written contracts obligatory, however, do not make void verbal contracts in the absence of written ones.

Wages of Seamen.—The seaman is entitled to wages and provisions from the time he begins work, or from the date agreed upon for the beginning of work, whichever first happens. In case of loss of vessel wages are due only to the date of loss, and proof that a seaman has not duly exerted himself to save the vessel, cargo, and stores will bar his claim. The right to wages does not depend upon the earning of freight, and becomes a lien upon the vessel and freight, and upon the proceeds of them, in the nature of a preferred claim over bottomry or respondentia bonds. Where freight might have been earned that was not, seamen have a right of action *in personam* against the master or owner of a vessel, and this right is not barred by a proceeding *in rem* against the vessel. A seaman can not forfeit or waive by agreement his lien upon the ship, nor any remedy for the recovery of wages, except by agreement for allotment or advance. A stipulation to abandon the right to wages in case of loss of ship, or any right in the nature of salvage, is wholly inoperative; and any assignment other than advance or allotment made prior to the accruing of wages or salvage is equally void. Wages can not be insured by seamen, nor are they subject to attachment in the courts. Seamen may forfeit their wages, either wholly or in part, by any of the following offenses, viz.: desertion, absence without leave, neglecting and refusing without reasonable cause to join the vessel, willful disobedience or continued willful neglect of duty, willfully damaging the vessel, or embezzling or willfully damaging any of the stores or cargo, and by any act of smuggling whereby loss or damage is occasioned to the master or owner. But upon the commission of an offense for which it is intended to prosecute or enforce a forfeiture, an entry of the offense must be made in the official log-book and signed by the master and by the mate or one of the crew, and the reply of the offender, if still in the vessel, must likewise be entered and signed; which entries must be produced or proved in any subsequent legal proceedings.

Miscellaneous Provisions.—Various other provisions are made by statute regulating the rights and duties of seamen, insuring the seaworthiness of the vessel, a proper supply of provisions and medicines, their return from foreign ports when there discharged, extra wages in case of improper discharge; imposing upon consuls in foreign ports the duty of providing subsistence and a passage to a port in the U. S. for destitute seamen of the U. S.; and providing for

the establishment of marine hospitals and relief funds by collections from the wages of seamen, etc. Seamen must submit to the usual punishments lawful and agreed upon in the shipping articles, such as short allowance, being put in irons, etc.; but flogging has fallen into disuse, and in the U. S. has been abolished by statute.

For a full treatment of the rights and duties of seamen, see the statutes; Maude and Pollock's *Compendium of the Law of Merchant Shipping* (London, 1881); Abbott's *Law of Merchant Shipping* (London, 1892); Kay's *Law of Shipmaster and Seamen* (London, 1875); Parson's *Law of Shipping* (Boston, 1869); Desty's *Revised Statutes of the United States relating to Commerce, Navigation, and Shipping.* See also COURTS for the Admiralty Courts.

F. STURGES ALLEN.

Sea-mouse: a popular name for marine annelids of the genus *Aphrodite*, remarkable for the beautiful colors produced by the hairs of the animal.

Sea of Cortes: See CALIFORNIA, GULF OF.

Sea of Sodom, or **Sea of the Plain**: See DEAD SEA.

Sea-otter: See OTTER.

Sea-pie: See OYSTER-CATCHER.

Sea-raven: See SCULPIN.

Search: See INTERNATIONAL LAW (*Summary*).

Search and Seizure: the examination and taking into custody of one's person or property. The fourth amendment of the U. S. Constitution provides that "the right of the people to be secure in their persons, houses, papers, and effects against unreasonable searches and seizures shall not be violated, and no warrants shall issue but upon probable cause, supported by oath or affirmation, and particularly describing the place to be searched and the persons or things to be seized." A similar provision exists in each State constitution. It is declaratory only of common-law principles, which were clearly announced in *Wilkes* vs. *Wood* (19 *State Trials* 1153, A. D. 1763), *Leach* vs. *Money* (*ibid.* 1001, A. D. 1765), and *Entick* vs. *Carrington* (*ibid.* 1030, A. D. 1765). The first two cases decided that a general warrant to seize some person or papers not named was illegal, and the third declared a warrant to seize the papers of a person named to be equally illegal. Lord Camden's judgment in the last case is celebrated for its learning and ability, and is regarded "as one of the permanent monuments of the British Constitution."

Some searches and seizures were permitted by the common law, and do not fall within the constitutional inhibition. They may be resorted to for the recovery of stolen goods, or in the case of excisable or dutiable articles, or in the case of things whose possession or sale is forbidden by law, such as burglars' tools, gambling apparatus, intoxicating liquors, and others, or for the purpose of levying an attachment or execution. Even in such cases, however, the law does not authorize the use of general search warrants, but requires the magistrate to have satisfactory evidence upon oath that a case of the kind mentioned probably exists, and to have a particular description of the place to be searched, and of the persons or things to be seized. The warrant must also name the place and the person or thing to be searched and seized. If an officer attempts to arrest a person under a general warrant, or under one which does not truly name or sufficiently identify him, he may resist the officer, and if the latter makes the arrest, he is liable for false imprisonment. (*West* vs. *Cabell*, 153 U. S. 78.) In some of the States statutes authorize officers to seize intoxicating liquors without a warrant, in the first instance, but the officers are required to obtain promptly a warrant therefor, or they become liable as trespassers. *Weston* vs. *Carr*, 71 Me. 356.

Searches and seizures which are resorted to not for the purpose of capturing stolen property, or that which is under the ban of positive law, or of levying legal process, are deemed unreasonable. Accordingly, a statute providing for the issuing of warrants by judges of insolvency on the complaint of an assignee to search for property of the debtor has been declared unconstitutional. (*Robinson* vs. *Richards*, 79 Mass. 454.) The U. S. Supreme Court held a statute to be unconstitutional which authorized a court, in revenue cases, on motion of the Government's attorney, to require the defendant or claimant to produce in court his private books, invoices, and papers, or else the allegations of the attorney should be taken as confessed. (*Boyd* vs. *United States*, 116 U. S. 616.) The provision was deemed tantamount to a compulsory production of a man's private papers, and to effect the sole object and purpose of search and seizure; hence it was declared to be within the scope of the fourth amendment. The language of Lord Camden in *Entick* vs. *Carrington* was regarded as expressing the true doctrine on the subject of searches and seizures, and as furnishing the true criteria of the reasonable and unreasonable character of such seizures. It was said that the principles laid down in that opinion affect the very essence of constitutional liberty and security. They reach further than the concrete form of the case then before the court; they apply to all invasions on the part of the Government and its employees of the sanctity of a man's home and the privacies of life. It is not the breaking of his doors and the rummaging of his drawers, but the invasion of his indefeasible right of personal security, personal liberty, and private property, where that right has never been forfeited, that constitutes the essence of the offense.

FRANCIS M. BURDICK.

Search-light: See the Appendix.

Searcy: town; capital of White co., Ark.; on the Little Red river, and the Searcy and West Point Railroad; 55 miles N. E. of Little Rock, the State capital (for location, see map of Arkansas, ref. 3–D). It is an important shipping-point for cotton and fruit; has several alum, chalybeate, and sulphur springs, which have made it popular as a health resort; and contains Searcy College, for males (Methodist Episcopal, South), Galloway Female College, Searcy Female Institute, a public school, a State bank with capital of $30,000, and a daily, a monthly, and three weekly periodicals. Pop. (1880) 840; (1890) 1,203; (1900) 1,995.

EDITOR OF "CITIZEN."

Searles, WILLIAM HENRY: civil engineer; b. in Cincinnati, O., June 4, 1837; graduated at the Rensselaer Polytechnic Institute in 1860, where later he was Professor of Topography and Road-engineering for three years. He has been locating and constructing engineer on many railways, and is the author of *Field-engineering* (1879) and *The Railroad Spiral* (1882).

Sea-robin: See GURNARD.

Sears, BARNAS, D. D., LL. D.: theologian and educator; b. at Sandisfield, Mass., Nov. 19, 1802; graduated at Brown University 1825, and at Newton Theological Seminary 1829; was pastor of a Baptist church at Hartford, Conn., 1830–32; was afterward Professor in the Literary and Theological Institution at Hamilton, N. Y. (now Colgate University); studied theology at German universities 1833–36; was professor in Newton Seminary 1836–48, acting as president during the later years; succeeded Horace Mann as secretary of the Massachusetts board of education 1848–55; was president of Brown University 1855–67, and after that time general agent of the Peabody Educational Fund. He was several years editor of the Baptist *Christian Review* (1838, *seq.*), a regular contributor to *Bibliotheca Sacra*, and author (with Edwards and Felton) of *Classical Studies* (1843), *The Ciceronian* (1844), and *The Life of Luther* (1850); edited Nöhden's *German Grammar* (1842), *Select Writings of Luther* (1846), and Roget's *Thesaurus* (1854), and published many addresses, educational reports, and miscellaneous essays. During his stay in Europe he baptized in the Elbe, near Hamburg, by night and stealthily, in order to avoid legal prosecution and police persecution, I. G. Oncken and six others, who formed the first German Baptist church in communion with the Baptists of England and the U. S. D. at Saratoga Springs, N. Y., July 6, 1880.

Revised by C. H. THURBER.

Searsport: town; Waldo co., Me.; on Penobscot Bay; 6 miles E. N. E. of Belfast, the county-seat, 27 miles S. W. of Bangor (for location, see map of Maine, ref. 9–E). It is principally engaged in ice-gathering, ship-building, hay-shipping, and the lumber-trade, and contains saw and grist mills, spool-mill, poultry-farms, the Sears Public Library (opened in 1872), a national bank with capital of $50,000, and a savings-bank. Pop. (1890) 1,693; (1900) 1,349.

Rev. ROBERT G. HARBUTT.

Sea-serpent: a gigantic marine animal, said to have been seen in various localities, but never captured, and regarded by most zoölogists as purely mythical. The earliest references to the sea-serpent are to be found in Norse literature, where frequent mention is made of the Sö-Orin. In 1555 the creature was described by Olaus Magnus in his work *Historia Gentium Septentrionalium*, where its length is set down as 200 feet and girth 20 feet. In 1734 the Rev. Paul

Egede gave a detailed description of a sea-serpent which he saw during a voyage from Norway to Greenland, and in 1746, as related by Bishop Pontoppidan, another was seen by Capt. Lawrence de Ferry, of Bergen, Norway, who made affidavit to the truth of his story. From that time onward the so-called sea-serpent has been reported from various localities, but most often in northern waters, and particularly on the coasts of Norway, Scotland, and New England. Many of these accounts are of a very circumstantial nature and are given by people of unquestioned veracity. Perhaps the most noteworthy is that given by Capt. Peter M'Quhae, of H. M. S. Dædalus, who reported that on Aug. 6, 1849, in lat. 24° 44′ S., lon. 9° 22′ E., he and several of his ship's company saw an object which "was discovered to be an enormous serpent, with head and shoulders kept about four feet constantly above the surface of the sea, and as near as we could approximate . . . there was at least sixty feet of the animal *à fleur de l'eau*. . . . The diameter of the serpent was about fifteen or sixteen inches behind the head, which was, without any doubt, that of a snake. . . . It had no fins, but something like the mane of a horse, or rather a bunch of seaweed, washed about its back." Prof. Owen suggested that the animal seen might have been a stray sea-elephant (*Macrorhinus*), but this Capt. M'Quhae emphatically denied. While there is great discrepancy among the various accounts of the sea-serpent in regard to length, proportions, and general appearance of the creature, yet a certain number of them agree in the following particulars: The length is placed at about 60 feet, the color is given as dark above and light below, the creature is said to have moved steadily with its head and neck above the water, and there were appendages back of the head. These, including the animal seen by Capt. M'Quhae, are explained on the theory that one of the great cuttlefishes known to inhabit the depths of the sea has been seen at the surface with the tail projecting above it, this being taken for the head, as the squid moves tail first by means of a current of water expelled from the siphon. The long arms, dragging along near the surface, would represent the body of the sea-serpent. Basking sharks, schools of porpoises, floating logs, kelp, and seals have been considered the basis for other sea-serpents.

A few scientific men are inclined to believe that there is some huge marine animal which has actually been seen, but not yet captured, even going so far as to suppose the existence of some reptile, like the *Plesiosaurus*, or like one of the immense marine reptiles whose remains occur in the Cretaceous. Oudemans considers that the creature known as the sea-serpent is a huge pinniped, with long neck and longer tail, to which the name of *Megophias megophias* (Rafinesque, Oudemans) belongs. The large majority of zoölogists, however, deny the existence of the sea-serpent *in toto*, and it is to be noted that no naturalist has ever had a view of the creature, and that no one of its bones even has ever come to light.

See *The Great Sea-serpent*, by A. C. Oudemans (London, 1892). This is a monographic work containing a very full bibliography of the literature on the subject, and accounts of the various appearances of the sea-serpent. Also *The Romance of Natural History*, by Gosse (1860); *Sea Monsters Unmasked*, by Henry Lee (1883); *Facts and Fiction of Zoölogy*, by Andrew Wilson. F. A. Lucas.

Seashore (in law): By the Roman or civil law the sea was, like the air and running water, common to all, and consequently not susceptible of private ownership either by an individual or by the state. This principle applied equally to the bed and shore as to the waters of the sea. The common law, however, took a different view. Owing to the splendid development of England's sea power and her confident assertion of civil as well as political jurisdiction over the "four seas" (meaning thereby the Atlantic Ocean, the Irish Sea, the German Ocean, and the British Channel), it became the accepted doctrine of English jurists in the seventeenth century that the bed of the ocean was the property of the crown so far as the royal jurisdiction extended. When this jurisdiction was cut down by modern international law to the three-mile limit the assumed property rights of the crown were reduced to the same dimensions. It is, however, a mooted question whether the property rights of the state are coextensive with this jurisdiction or whether they are bounded by low-water mark on the shore, the latter view having lately come to prevail in Great Britain, while the former has usually been taken in the U. S. *Regina* vs. *Keyn*, 2 Exch. Div. 63; Gould on *Waters*, §§ 1–16.

The divergence between the common and the civil law is more marked, however, as regards the seashore itself and the arms and inlets of the sea within the territorial limits of the state. Where by the Roman law it was expressly provided that the seashore and all rivers and harbors were common to all, and that the public use of the seashore as of the sea itself was part of the law of nations, the common law in the U. S. as well as in Great Britain has always regarded the seashore and the beds of rivers and arms of the sea as subject to private property. This property in the seashore is by the common-law rule vested in the state, but it may by charter or by special grant be conferred upon a municipal corporation or a subject. Thus, for example, the city of New York became vested by the Dongan charter (A. D. 1686) with the fee simple of all the tideway on the circuit of Manhattan Island. The common-law rule is generally followed in the U. S., but in several States (e. g. Massachusetts and Maine), the property of the littoral proprietor extends to low-water mark. In the U. S., moreover, it is the several States and not the Federal Government in which the title to the seashore is vested. It is laid down in the *Institutes* of Justinian (book ii., tit. i., 3) that the seashore extends to the limit of the highest tide in time of storm or winter; but by the common law the seashore is the strip included between ordinary high and low water mark.

The right of private property in the sea, whether it be limited to the shore or be coextensive with the jurisdiction of the state, whether it be vested in an individual or in the state, is always subject to certain public rights of user and enjoyment. The principal of these rights are those of navigation and of fishing, the taking of shellfish either from deep water or from the shore being included under the latter. There is, however, no right to take sand, gravel, or shells, nor to use the shore as a highway, nor to frequent it for the purpose of bathing. There seems to be no distinction between public and private ownership of the shore so far as the exercise of these public rights is concerned, and the state can not, by grant of the shore to an individual, diminish or in anywise affect those rights.

The rights of littoral proprietors as such in the shore differ from those of the public only in the fact that it affords them a means of access to their own lands. This right of access is a valuable property right, and is protected as such by the common law. In New York and New Jersey, however (and perhaps in a few other States), it has been decided that littoral proprietors have no remedy for an infringement of this right of access to navigable waters. Of course, where the littoral proprietor is also the owner of the foreshore his property rights therein are absolute, except only as they are limited by the public rights of user above referred to. It follows from what has been said that a littoral proprietor who does not own the shore is not entitled to build wharves or piers except by the consent of the state, and that such proprietor who does own the shore can not build out beyond low-water mark without such permission; nor can he even under the authority of the state build so as to interfere with navigation. In the former case his act is a *purpresture* or trespass on public property; in the latter a public nuisance, which is not justified by pleading the license of the state. The littoral proprietor, whether owner of the shore or not, is under the doctrine of accretion entitled to the increase of his land by the gradual recession of the sea. If the retreat of the sea be sudden, however, or so rapid as to be perceptible in its progress, the land gained will belong to the state.

The law governing the seashore, as above set forth, is a part of the law of public waters. So much of that law as relates particularly to navigable rivers has been treated under the head of Rivers. See also Lakes. The literature of the subject is extensive and full of curious learning. See especially Hale, *De Jure Maris*; Selden's *Mare Clausum*; Hall on the *Seashore*; Angell on *Tidewaters*; and Gould on *Waters*. George W. Kirchwey.

Seasickness: a nervous affection attended with nausea and convulsive vomiting, produced by the oscillations of a ship at sea. Its origin and nature are still very imperfectly known. It may attack the strong and cautious, while the debilitated and incautious go free. It may attack in calm weather and on smooth waters, while a storm and a rough sea fail to produce it. It may pass away after the lapse of a few hours, or last during a long voyage. Seasickness is probably due to circulatory disturbances in the nerve-centers, possibly to a large extent induced by irregular visual

impressions due to the rocking. In many persons a few mild doses of calomel before the voyage prevent the occurrence of seasickness. In others a little bromide of potash, soda-water, or saline draughts suffice. Persons who are specially liable sometimes escape entirely by preserving a horizontal position during most of the voyage. W. P.

Seaside-grape: a small polygonaceous tree (*Coccoloba uvifera*) of Florida and the West Indies, producing the extract called Jamaica kino. (See KINO.) It has clusters of purple edible fruit, and a beautiful hard wood, which yields a red dye.

Sea-squirt: any one of the ASCIDIA (*q. v.*).

Sea-swallow: See GURNARD.

Seattle, sē-at'l: city; capital of King co., Wash.; on Puget Sound, and the Gt. Northern, the N. Pac., the Columbia and Puget S., and the Seattle, Lake Shore and East. railways; 28 miles N. of Tacoma (for location, see map of Washington, ref. 3–D). It lies on the east side of Admiralty Inlet, between Elliot Bay (salt water) and Lake Washington (fresh water). The contour of the city is hilly, with valleys running N. and S. The steep rise of the hills from the water of the sound presents a striking view, especially when approached in the evening. This is enhanced by two snow-capped ranges, the Olympics on the W. and the Cascades on the S. E., and by Mt. Rainier, rising in the south to a height of 14,444 feet. The city has seven public parks—the City, Denny, Kinnear (each partially improved), Madrona, Leschi, Ravenna, and Woodland—some of which afford scenery of rare natural beauty. The business districts are covered with handsome and substantial buildings, nearly all erected since the great fire of 1889.

Climate.—The summers are cool and pleasant; the rainy season is broken by much good weather; the annual range of temperature is from 10° to 88°; the rainfall in 1893 was 45 inches. A peculiar feature of the climate is that the rainy season is more healthful than the dry season. The death-rate is about 8 in 1,000. Ocean storms spend their force on the Olympic Mountains before reaching the city.

Public Buildings.—The county court-house occupies a prominent site overlooking the city; the county almshouse and hospital is a fire-proof structure which cost over $80,000. The Roman Catholic Church maintains Providence Hospital and the House of the Good Shepherd, a reformatory for girls. There is an efficient board of associated charities. The Public Library (founded in 1872) is supported by a percentage of the criminal fines, and has spacious rooms and a large patronage. Terms of the U. S. circuit and district courts are held here, and a U. S. land-office, U. S. custom-house, U. S. weather bureau, and the board of U. S. inspectors of steam-vessels for Washington and Alaska are located here.

Churches and Schools.—Seattle contains 12 Methodist Episcopal churches, 9 Baptist, 5 Congregational, 5 Presbyterian, 5 Lutheran, 4 Protestant Episcopal, 3 Roman Catholic, 3 Disciples, 3 German Evangelical, 3 Methodist Protestant, 2 Jewish, and one each Advent, Free Methodist, Reformed Presbyterian, and Unitarian, besides a Salvation Army barrack, and 17 missions. The public-school system has a large endowment of State lands. There are 16 public-school buildings (which cost, with land, $673,000), with (1893) 134 teachers and 6,424 pupils; 2 parochial schools, several private kindergartens, and girls' schools. The State University occupies a fine site on 341 acres of school land within the city limits, and has about 500 students and a valuable library, practically public. There are also a Baptist university, Seattle Female College, College of the Immaculate Conception, and the Academy of Holy Names. The Workmen's Guild supports a library. In 1894 there were 3 daily, 16 weekly, a semi-monthly, and ten monthly periodicals.

Finances and Banking.—In 1894 the city receipts were $553,630; expenditures, $591,000; the bonded debt was $3,540.000; the assessed property valuation, $32,752,153; tax-rate, 12·5 mills. There were 7 national, 3 savings, and 5 private banks.

Business Interests.—The manufactories number 331, with $4,758,283 capital invested and $10,203,007 value of product, and include sawmills, a flour-mill, breweries, extensive drain-tile and brick works, foundries, boiler-works and machine-shops, sash and door factories, furniture factories, bookbinderies, tanneries, manufactories of tinware, shoes, crackers, soap, and ice, creosoting works, ship-building yards, etc. There is a large business in the wholesale shipments of fresh fish. There are 91 miles of street-railways, of which 22 miles are cable road and 69 miles electric. These lines are also used for freight. The cable lines run over the highest hills, which are the choice residence districts. Every portion of the city is easily accessible. The commercial advantages of Seattle are remarkable. By water there is regular steamship connection with the Orient, with San Francisco, and Alaska. The railway connections are superior to those of any point on the Pacific coast, four transcontinental lines competing for business, two of which have their terminals in the city. Lumber, grain, and coal are shipped to all parts of the world. The city is the center of trade for all the numerous small steamers, called the mosquito fleet, plying to the ports of Puget Sound, which has about 1,300 miles of coast-line. An immense business in cedar shingles and lumber has been developed, and shipments by rail extend to the Atlantic coast. A company has been formed for the utilization of Snoqualmie Falls by electrical transmission of power. Large sums have been invested in a steel plant. An appropriation has been secured from the U. S. Government to begin the construction of a canal connecting Puget Sound through Lake Union with Lake Washington. The lake is about 25 miles in length, and does not freeze in winter. Vessels scour their bottoms in fresh water and avoid the expense of docking. The lake is surrounded with valuable deposits of coal and iron, and with fine bodies of timber. By the canal a landlocked harbor would be formed of great value to the Government in connection with the dry dock at PORT ORCHARD (*q. v.*). A second company has entered into a contract with the State providing for a second canal S. of the city.

History.—Seattle, named from an Indian chief, was founded in 1852. It remained a village until 1880. An important episode in the early history was the protection of the Chinese by a vigilance league. The city early became the central commercial point for the Puget Sound region. On June 6, 1889, a conflagration destroyed property valued at $15,000,000, but one brick building remaining in the business district. Seattle was the first large city to free its streets of horse-cars. Pop. (1880) 3,533; (1890) 42,837; (1900) 80,671. WALLACE NUTTING.

Sea-unicorn: See NARWHAL.

Sea-urchin: See ECHINOIDEA and PALEONTOLOGY.

Seaver, EDWIN PLINY: See the Appendix.

Seaweeds: the popular name for the plants which grow in the sea, often extended so as to include all aquatic plants, whether growing in salt or fresh waters. They are also known as ALGÆ (*q. v.*), sea-mosses, and sea-ferns (although they are neither mosses nor ferns). In this wide sense seaweeds belong to no less than six different classes of the vegetable kingdom, viz.: (1) *Schizophyceæ*, the fission algæ, mostly microscopic and usually blue-green or smoky green, inhabiting fresh and salt waters; (2) *Chlorophyceæ*, the green algæ, mostly microscopic, green (sometimes obscured by brown coloring-matter), inhabiting fresh and salt waters; (3) *Phæophyceæ*, the brown algæ, including FUCOIDS and KELP (*qq. v.*), mostly of large size, green (but obscured by brown coloring-matter), inhabiting salt waters; (4) *Coleochæteæ*, the simple fruit-tangles, microscopic, green, inhabiting fresh waters; (5) *Rhodophyceæ*, including one order (*Florideæ*), the RED SEAWEEDS (*q. v.*), usually of considerable size, green (obscured by red coloring-matter), inhabiting salt waters; (6) *Charophyceæ*, the STONEWORTS (*q. v.*), mostly large plants, green, inhabiting fresh waters. These plants do not constitute, therefore, a single natural group, although usually so treated. CHARLES E. BESSEY.

Seawell, MOLLY ELLIOTT: See the Appendix.

Sea-wolf: See WOLF-FISH.

Sebaceous Glands: See HISTOLOGY (*The Skin and its Appendages*).

Sebac'ic (also called **Sebic** and **Pyroleic**) **Acid** [*sebacic* is from Lat. *se'bum*, tallow; *pyroleic* is from Gr. *πῦρ*, fire + Eng. *oleine*]: a compound with the empirical formula $C_{10}H_{18}O_4$, formed during the destructive distillation of all fatty bodies which contain oleic acid or olein. Nitric acid forms it also when acting upon fatty bodies, together with oxalic acid and other lower homologues of the same series, or those having the general empirical formula $C_nH_{2n-2}O_4$, a series of which *malonic*, *succinic*, and *suberic* acids are members. Sebacic acid is most readily obtained by fusing together castor oil and caustic potash, 2 parts of oil being slowly mixed with one part of potash, fused with a little water, and heated until the mass is faintly yellow. After boiling

the mass with water and adding hydrochloric acid while hot, sebacic acid crystallizes on cooling in needles. It resembles benzoic acid in appearance, tastes acid, reddens litmus, melts at 127°, and sublimes above this. It is slightly soluble in cold, very soluble in hot water and in alcohol. Its salts, called *sebates*, are bibasic, like oxalates and succinates. Neither sebacic acid nor sebates have obtained as yet any practical application. Revised by Ira Remsen.

Sebal'dus: a saint of the Roman Catholic Church, and the patron of the city of Nuremberg, in Bavaria; was the son of a Danish king; began his studies in Paris when only fifteen years old; married a daughter of King Dagobert, but was released from his marriage-vows the day after the wedding had taken place; spent ten years in the practice of the severest asceticism; was by Gregory II. sent into Germany to preach the gospel, and finally settled in Nuremberg, where he died in 801, or, according to some writers, in 901. The magnificent Church of St. Sebaldus still preserves his memory, and in 1425 Pope Martin V. canonized him on account of the marvels which had been wrought by himself while alive and by his relics after his death. Aug. 19 is his day of commemoration, and is still celebrated in Nuremberg.

Sebaste: See Samaria.

Sebastian, Saint: b. at Narbonne in Gaul about 255; educated at Milan; was a captain in the imperial guard when, under Diocletian, he was seized as a zealous Christian, bound to a tree, and used by the Mauritanian archers as a target. He did not die, however, but having been brought to a Christian home and cured, he was seized a second time, trampled to death, and thrown into a sewer, about the year 287. His body was recognized by the Christians and buried in the Catacombs. Pope Damascus (366–384) built a church over his tomb, relics of him were sent to every corner of Christendom as very powerful against the plague, numerous churches were consecrated to him, and he was generally chosen as patron by associations of archers or riflemen. His feast is celebrated in the Roman Catholic Church Jan. 20, and in the Greek Church Dec. 18. Roman Catholic Church historians ascribe much importance to the *Acta Sancti Sabastiani*, which have been ascribed to St. Ambrose. By Christian art he is generally represented as tied to a tree and pierced by an arrow. Numerous legends, pious fictions, and poems have clustered around his name.

Sebastian: King of Portugal, known as Dom Sebastian; b. in Lisbon in 1554; succeeded his grandfather, John III., in 1557; headed an expedition which captured Tangier, Morocco, in 1574; made another expedition into Africa in 1578, and took part in a civil war supporting the claims of Muley Mohammed to the throne of Morocco against his uncle, Muley Malek. On Aug. 4 he fought the battle of Alcazar, in which he lost his life and a great part of his army. As the king had no immediate heir, Portugal was soon annexed by Philip II. of Spain, but the masses of the Portuguese people refused to believe in the death of Dom Sebastian, and a series of pretenders appeared at intervals for many years, and received some popular support. One of them made a great sensation at Venice, Florence, and Naples twenty years later, was taken prisoner, and according to some accounts hanged at San Lucar, in Spain, about 1600. The belief in the future return of Dom Sebastian continued to exist among the ignorant and superstitious for many years, and gave rise to a considerable literature of poems and romances. See d'Antas, *Les faux Don Sébastien* (Paris, 1865). F. M. C.

Sebastopol: See Sevastopol.

Sebes'ten-plum: the fruit of *Cordia myxa* and *C. latifolia*, Asiatic trees of the family *Borraginaceæ*. The fruit is edible, and was once employed in European medicine. The wood is soft, light, and readily takes fire on friction. It was used by the old Egyptians for mummy-cases. The genus *Cordia* is an extensive and interesting one. Florida has two species, and there are two others in Southern Texas. Revised by L. H. Bailey.

Sebic Acid: See Sebacic Acid.

Secanderabad' (properly *Sikanderabad*, Alexander's town): town; in the Nizam's Dominions, India; 5 miles N. E. of Haidarabad (see map of S. India, ref. 4–E). It is a British military cantonment. European troops were first stationed here in 1803. Pop. (1891) about 75,000.

Secchi, sek'kĕe, Angelo: astronomer; b. at Reggio, Lombardy, Italy, July 29, 1818; entered the order of the Jesuits in 1833; studied mathematics, physics, and astronomy; went to the U. S. in 1848, and taught mathematics at the college of Georgetown, D.C.; was appointed director of the observatory of Rome in 1849, and devoted himself to researches in meteorology and spectrum analysis. Besides about 300 papers he wrote, among other works, *Le Soleil* (Paris, 1870), which has been translated into the principal European languages. On the expulsion of the Jesuits from Italy in 1870, Secchi retained his office. D. in Rome, Feb. 26, 1878.

Secession [from Lat. *seces'sio*, deriv. of *sece'dere*, withdraw; *se-*, aside + *ce'dere*, go]: any withdrawal from a political or religious organization. The word has acquired lasting notoriety by being used to describe what was claimed to be the right of a State included under the Constitution of the U. S. to withdraw from the Union and set up an independent government. The way was prepared for broaching and exercising this so-called right by the theory of Nullification (*q. v.*) advanced by South Carolina and some of the people in other States. The tariff law of 1828 was declared by South Carolina to be "null, void, and no law," and duties on imports were forbidden to be paid after a certain day within its jurisdiction. Gen. Jackson, then President, felt that such a power lodged in a State would be a deathblow to the Union and altogether unconstitutional. His energetic opposition and the message on nullification in 1833 put a stop to this political heresy for the time, but only postponed the day of final test. The doctrine was that every State has a right to interpret the Constitution for itself, whatever be the decision of the Supreme Court on the subject, and, so interpreting, to retire from the Union. Hence there is no right to force it to return. This is really a plan to couch under the term *nullification* the extreme act which denies that the "Constitution, and the laws of the United States which shall be made in pursuance thereof . . . shall be the supreme law of the land," and that "the judicial power of the United States shall extend to controversies to which the United States shall be a party," and that the judges in every State are bound thereby. (Art. III., § 2; Art. IV., § 2.) The doctrine assumed practical form after the election of President Lincoln in 1860, when it was claimed on the part of many of the people in the South that the triumph of the Republican party meant the adoption of a policy of such interference with the domestic institution of slavery as to make it impossible for the Southern States any longer to secure and enjoy their constitutional rights within the Union. They accordingly attempted to withdraw from the Union by passing ordinances of secession and resisting the enforcement of U. S. law. For an account of the war, and of events connected with it, see the articles on Confederate States, Democratic Party, Republican Party, Hartford Convention, Foote's Resolution, and Nullification.
Revised by C. K. Adams.

Secession Church of Ireland: See Presbyterian Church (*Some of the Existing Presbyterian Churches*).

Seck'endorf: the name of a family of German nobility, which can be traced back to the middle of the thirteenth century, and still flourishes in various branches. Several of its members have become celebrated in German literature and history: (1) Veit Ludwig von Seckendorf, statesman and author; b. near Erlangen, Dec. 20, 1626; studied law and history at the University of Strassburg; held various important positions in the service of the Duke of Gotha, the Duke of Saxony-Zeitz, and the Elector of Brandenburg. D. at Halle, Dec. 18, 1692. He was the author of *Der deutsche Fürstenstaat* (1655) and *Commentarius historicus et apologeticus de Lutheranismo* (1692), in their time very famous books.—(2) Friedrich Heinrich, Count von Seckendorf, soldier and diplomatist; a nephew of the preceding; b. at Königsberg, Franconia, July 5, 1673; studied law at Jena, Leipzig, and Leyden; served in the Austrian army against the Turks on the Danube, and in the war of the Spanish Succession took part in the negotiations at The Hague, which resulted in the Peace of Utrecht (1713), and held an important command in the Saxon-Polish army against the Swedes. As Austrian ambassador to several German courts he worked to secure the recognition of the Pragmatic Sanction. In the war of the Polish succession he commanded a force of 30,000 men, and defeated the French at Klausen (1735). After the death of Prince Eugene (1736) he was made commander-in-chief of the Austrian army against the Turks, but was defeated, recalled, accused of treason, imprisoned in the fortress of Gratz, and liberated only after much difficulty. He then entered the service of

Charles II. of Bavaria, who, after the death of Charles VI., laid claim to parts of the Austrian heritage, in spite of the Pragmatic Sanction, and was elected emperor under the name of Charles VII.; commanded his army with success; expelled the Austrians from Bavaria, and succeeded in negotiating a tolerable peace for his son in 1745. After this time he lived quietly on his estate, Meuselwitz, near Altenburg, in the Saxon duchies, but in 1758 he was imprisoned by Frederick II. for six months, and forced to pay a heavy fine. D. at Meuselwitz, Nov. 23, 1763.—In the nineteenth century several members have acquired a name as poets: (3) Leo (1773–1809); (4) Karl Siegmund (1744–85), translator of Camoëns; (5) Christian Adolf (1767–1833); (6) Gustav Anton (1775–1823), known also in the U.S. as a lecturer under the name of Patrik Peale. F. M. Colby.

Second Advent: the visible reappearance of our Lord in the world since his ascension to heaven. More exactly, inasmuch as he revisited the world visibly to call the apostle Paul, the second advent denotes a return visible to all the world, or to the whole Church, or to an elect first-fruits of the Church. The first and the third opinion represent two schools of Christian belief. Beyond question, our Saviour himself promised to return visibly. Even assuming (Matt. xxiv., Mark xiii., Luke xxi.) to give his promise intermixed with later interpretations, the unmistakable foundation is a word of his own, which, moreover, is implied throughout the four Gospels, including John (see John v. 25, 28; vi. 39, 40; xiv. 3, 18), and throughout the Epistles of Paul, Peter, John, James, and Jude. The Revelation is full of it. Indeed, next to the Messiahship of Jesus, it has well been called the first Christian doctrine.

In the Gospels our Saviour seems to identify his coming with the fall of Jerusalem. When an evolving event includes many stages, even though widely apart in time, prophecy very commonly blends these in one, inasmuch as the subsequent stages are only an explication and amplification of the first. As has been truly said, prophecies of fundamental import have a springing and germinant fulfillment in every age. The prophecies of the first advent show the same blending of imperfect fulfillments, in which God came near to his people with the consummate fulfillment, in which God, though unrecognized, was with his people. Even so, as the fall of Jerusalem released Christ in his Church from the threatening constraint of Judaism and set him and her free for their victorious course in the world, it was a true and indeed visible return of Christ, with which he therefore fuses every fuller accomplishment of his promised return, even to the consummate fulfillment at the end. He himself, as incarnate, denies of himself any other than a restricted knowledge of times and seasons, which implies a restricted knowledge of specific phases of evolution in the Parousia, or second advent. Only two things are distinct: One, that everything which he foretells shall, in a real sense, come to pass in that generation; secondly, that his coming may be, in its absolute and final sense, long delayed, giving occasion to despondency in some of his people and to licentious security in others. This fusion of different stages of the Parousia is the more obvious, as Christ's visible return is only the highest, coercive evidence of his spiritual return, sight being used as the most convincing and most spiritual bodily sense.

The Revelation alone of the New Testament books describes the second advent as separated by an earthly reign of 1,000 years from the last judgment and reconstitution of all things. Accordingly, since A. D. 200 until of late, this opinion has never had much currency in the Church. It seems to be regaining ground. C. C. Starbuck.

Secondary Era: a division of geologic time co-ordinate with Primary, Tertiary, and Quaternary eras. A synonym in more general use is Mesozoic Era (*q. v.*).

Secondary Schools: See Schools.

Secretary: in the U. S., the name of the officer of the cabinet, the respective heads of the executive departments of State, War, Navy, the Treasury, the Interior, and Agriculture. For an account of their duties, see the articles on these departments.

Secretary-bird: a bird of prey (*Gypogeranus serpentarius*), which owes its popular name to a crest of feathers at the back of the head which suggests a pen tucked behind the ear of a scribe. On account of anatomical peculiarities the bird is placed in a distinct family (*Gypogeranidæ*). The secretary-bird is readily distinguished from all other birds of prey by the disproportionate length of its legs, for while the body is smaller than that of a golden eagle, the legs are 2 feet long. The toes are short, nails blunt; the general color is grayish blue, with blackish markings on wings, tail, and under side. The bird feeds on rats and snakes, even on the venomous species, grasping them with its long legs and using its outstretched wing as a shield on which to receive the fangs of its prey. It is found throughout Southern Africa, W. of lat. 15°, and in Cape Colony is protected by law. F. A. Lucas.

Secret, Discipline of the: an English equivalent of Arcani Disciplina (*q. v.*).

Secretion [from Lat. *secre'tio*, a setting apart, separating, deriv. of *secer'nere*, separate; *se-*, apart + *cer'nere*, distinguish, separate]: one of the chief physiological processes of the body; the separation of certain elements of the blood, and their elaboration to form special fluids, termed secretions and excretions. Both of these products contribute to the health and nutrition of the body, the secretion performing some positive function, as aiding digestion; the excretion subserving the same purpose negatively by freeing the system of effete matter, the *débris* of cell and tissue, which if detained in the blood develops disease. The function of the perspiratory and sebaceous glands is secretory, so far as they preserve the moisture and delicacy of the skin, but is chiefly excretory, eliminating water and various effete matters from the system, and hence is classed as an excretion. Bile is variously defined as a secretion, an excretion, and as both, its constituents being effete substances deleterious to health if not promptly excreted, yet performing an important part in the process of intestinal digestion.

Secretion is performed in several ways. The simplest form is seen in the serous shut sacs which invest the lungs, heart, and intestines—the pleuræ, pericardium, and peritoneum. These are lubricated by a fluid which filters directly through the flat endothelial lining cells from the blood-vessels beneath; so also are produced the synovial fluids on the inner smooth surfaces of the joints. A more typical secretory structure is the *tubule*, a cylindrical recess or tube at right angles to the surface, lined with secreting cells. Secreting surfaces, as the mucous lining of the bronchial tubes, stomach, and bowels, have many hundreds or thousands of such tubules to the square inch. An isolated group of tubules ramifying from a single central duct constitutes a simple gland; a number of such groups having a common duct is a compound gland; the larger glands, composed of an extensively divided tubular system with corresponding lobules, are termed racemose glands—that is, in structure resembling a cluster of berries. Such complicated glandular structures serve merely to multiply secreting surface within a limited space; the functional action is much the same whether performed on the free surface, in the tubule and follicle, or by the multiple gland. Secretion is the product of cell-activity. The cell derives its material from the blood, its stimulus to action from the nervous system, and it elaborates a peculiar fluid, in each instance predetermined by the inherent function of the gland or organ of which it is an integral part. Secreted fluids are homogeneous, consisting chiefly of water with variable quantities of salts and fatty matter, and in each case a distinguishing component, as pepsin in gastric juice and mucin in mucus.

Revised by W. Pepper.

Secular Clergy: See Clergy.

Secular Games [translation of Lat. *ludi sæculares* (also known as *ludi Terentini*); *ludi*, plur. of *lu'dus*, game + *sæcula'res*, plur. of *sæcula'ris* (whence Eng. *secular*), of a century, deriv. of *sæ'culum*, century]: games celebrated in ancient Rome in honor of the infernal deities Dis and Proserpina. The festival seems to have been of Etruscan origin, and to have been connected with a belief in the existence in the life of the state of great periods whose beginning and end were marked by special portents from the gods. Such a period was supposed to be equal to the longest human life, and was variously computed at 100 and 110 years. Owing to the different modes of reckoning, the games were not held at regular intervals. The first well-attested instance of their celebration at Rome was in 249 B. C. Secular games were again held in 146 B. C., and under the empire in 17 B. C., and in 47, 88, 147, 204, 248, and 262 A. D. An inscription has recently been discovered giving an account of the celebration of the games under Augustus in 17 B. C.; it was for this occasion that Horace wrote his *Carmen sæculare*.

G. L. Hendrickson.

Secularism [deriv. of *sec'ular*, from Lat. *sæcula'ris*, deriv. of *sæculum*, race, generation, age, the times, the world]: an ethical and social movement organized in England in 1844. Its most prominent leader during its earlier stages was George Jacob Holyoake, who for several years was president of the London Secular Society. He was succeeded in 1858 by Charles Bradlaugh, who, when the Secularists formed a national society, became its president and remained so for more than twenty years. Under his direction the movement became more aggressively anti-theological than it had been under Holyoake. His pseudonym, *Iconoclast*, expressed the temper of the man and of the movement as inspired by him. The idea of Holyoake is better embodied by the societies for ethical culture than by the secular societies. That idea was that ethical and social good is "the chief end of man," and that this end is not helped, but rather hindered, by theological and especially supernaturalist considerations relating to God and a future life. Belief in these was no bar to admission to the societies, but practically those attracted were intellectually agnostics, and tended to be dogmatic atheists under the Bradlaugh *régime*. In other particulars there was change as time went on. The political elements became more strongly marked, the social and industrial less so. As an earnest apostle of co-operation, Holyoake always insisted on that as the method of social regeneration, but being equally a disciple of Thomas Paine politically and of Robert Owen socially, the tendencies of his societies to become democratic and republican clubs were unmistakable. Under Bradlaugh this tendency became more evident. The National Society of Secularists has made a declaration of principles, which makes its objects clear, and the means and methods by which they are to be attained. It declares the promotion of human improvement and happiness to be the highest duty; that theological teachings are obstructive of the same; that every individual should be well placed and instructed and usefully employed for his own and the general good; that civil liberty and religious liberty are necessary, and that every Secularist is bound to actively attack all barriers to equal freedom of thought and utterance for all upon political and theological subjects. Much of the energy of Bradlaugh and of the society under his direction was in the spirit of this final clause. The same declaration of principles sets forth the objects of its political and social agitation: Secular education; disestablishment and disendowment of the state Church; improvement of the condition of agricultural laborers; such change in the land laws as will give the laborer an interest in the soil; abolition of the House of Lords and substitution of a national senate with life-members; investigation of the causes of poverty and plans for its amelioration. On several of these lines the national society and its local branches have done excellent service. The opposition to the state Church has been more economical than theological.

Secularism must be distinguished from agnosticism, which is merely an intellectual temper that does not admit of either theological affirmation or denial, while secularism, though involving this temper largely, is nothing if not practical. Compared with the ethical culture of Dr. Felix Adler and his school, that is the more subjective, this the more objective; that insisting that good character and right conduct are central to all effective social reform, secularism looking to the social reform, the improvement of circumstances, for the development of character. Secularism has been called by an English clergyman of the Established Church "the religion of doubt." "It does not," he says, "necessarily clash with other religions; it does not deny the existence of God or even the truth of Christianity; but it does not profess to believe in one or the other." This, however, is more secularism in the abstract, and as it was in the original hope and dream of Holyoake, than as it has been practically in the course of its development. It has "clashed with other religions" in a very lively fashion. If the temper of Holyoake could have dominated it always it might perhaps have done better service. That it has done good service in many ways is not denied by those to whom its agnostic and atheistic elements are most deplorable.

JOHN W. CHADWICK.

Secularization: the process of converting objects from a religious or spiritual to a common or secular use, and of removing matters from a purely ecclesiastical control to the civil jurisdiction. During the epoch when the Church had attained its highest degree of power its interference with secular matters extended in every direction, but was most distinctly exhibited in connection with certain special subjects, the control of which it has ever struggled to retain. Vast quantities of lands had gradually accumulated in the hands of the religious houses, and all the most valuable estates of Europe were likely to fall into their ownership. From the time of Constantine the Church had jurisdiction over certain subjects of the utmost consequence to society, the most important of which were marriage, divorce, and the succession of decedents' estates. Education in all its grades and departments was intrusted exclusively to the Church. The progress of secularization has nearly destroyed these spiritual interferences with civil affairs in many countries of Europe and America, and has greatly narrowed their extent in all the others. The first impulse of this grand movement was naturally directed against the threatened monopoly of land. At an early day statutes were passed in England and on the Continent prohibiting the acquisition of lands by religious corporations; and this policy has continued to the present day. (For a description of these enactments, their design and effect, see the article MORTMAIN.) In addition to this system of restraint, the accumulated possessions of the ecclesiastics and the spiritual houses have sometimes been seized by the civil authorities and appropriated to secular uses. The most remarkable instances of such enforced changes occurred in England under Henry VIII., in Scotland at the Reformation, and in France during the Revolution. The Italian and the Mexican Governments have, in the nineteenth century, pursued a similar policy. The nineteenth century also has seen important alterations in the law of matrimony. In Great Britain, France, Italy, Prussia, Austria, and several other European states, marriage has been made wholly a civil contract and status, divorce is regulated by statute, and both are placed under the jurisdiction of the ordinary tribunals. The same steps had before been taken in reference to successions. So far as education is public or is supported at the public expense, the course of modern legislation in Great Britain, France, Italy, and Germany favors a control by the state, and not by the Church. It is in the U. S., however, that the theory of secularization has had the fullest scope, and has been worked out most thoroughly and consistently. The fundamental conception of the state contained in the organic law confines the Church to functions purely spiritual and religious; the Church itself, as a spiritual society, has no legal existence, and is not recognized by the law, and all the separate congregations or parishes are in all respects civil and lay corporations. Marriage, divorce, and all other relations, domestic or social, successions and all other matters connected with property, are of course under the exclusive dominion of the civil government. A few traces are still left of ecclesiastical influence and privilege, but are the objects of frequent attacks. The removal of all distinctively religious instruction from the common schools, with the consequent secularizing of the public educational system, and the repeal of all laws which exempt ecclesiastical property from taxation are strongly advocated.

Revised by F. M. COLBY.

Secun'dus, JOHANNES (*Jan Nicolai Everaerts*): poet; b. at The Hague, Nov. 14, 1511; studied law at Bruges, but devoted himself chiefly to poetry, painting, and sculpture. In 1533 he went to Spain and became secretary to Cardinal Tavera, Archbishop of Toledo. On his return to the Netherlands he was employed as secretary by the Bishop of Utrecht, in which city he died Sept. 24, 1536. His best-known work is *Basia* (Utrecht, 1539), consisting of amatory poems. His *Opera Poetica* was published by his brother (Paris, 1541).

Secundus, PUBLIUS POMPONIUS: a Roman poet who flourished in the reigns of Tiberius, Caligula, and Claudius. He was an intimate friend of Sejanus; and when the favorite fell he was thrown into prison, in 31 A. D., and not released until the accession of Caligula in 37. In 44 he was consul, and in 50 he was sent by Claudius as legate to Germany, where he defeated the Chatti and obtained the honor of triumphal ornaments. It was by his tragedies that Secundus acquired the most celebrity. Tacitus speaks of them in the highest terms, and so does Quintilian. The elder Pliny, who was an intimate friend of his, wrote his *Life* in two books. The few fragments of the works of Secundus which have been preserved hardly suffice to give an idea of his style.

Securities: See the Appendix.

Seda'lia: city; capital of Pettis co., Mo.; on the Mo., Kan. and Tex. and the Mo. Pac. railways; 95 miles E. of Kansas City, 188 miles W. of St. Louis (for location, see map

of Missouri, ref. 4–F). It was laid out by Gen. G. R. Smith from a part of his farm in 1861, was a U. S. military post during the war of 1861–65, and for several years was the west terminus of the Mo. Pac. Railway. Gen. Nathaniel Lyon and Gen. John C. Frémont fitted out military expeditions here in 1861, and for a few days in 1864 the city was held by Confederate troops. The city has an elevation of 986 feet above sea-level, and is in an agricultural, coal-mining, and limestone region, which has also beds of emery and potter's clay, and indications of iron, lead, and zinc. Sedalia contains 23 churches, 13 public schools, a high-school building that cost $40,000, George R. Smith College, public library with over 10,000 volumes, court-house (erected in 1884, cost $115,000), new U. S. Government building, 3 national banks with combined capital of $300,000, 2 State banks with capital of $350,000, 10 building and loan associations, and 3 daily, 7 weekly, and 2 monthly periodicals. The locomotive-shops of the Mo. Pac. Railway and the general offices and car-shops of the Mo., Kan. and Tex. Railway are located here. There are also flour-mills, iron-foundry, woolen-mills, machine-shop, agricultural-implement works, brewery, grain elevator, and carriage and broom factories. Pop. (1880) 9,561; (1890) 14,068; (1900) 15,231. THOMAS SEDDON.

Sedan, Fr. pron. *se-dañ'*: town; in the department of Ardennes, France; on the Meuse; 64 miles by rail N. E. of Rheims (see map of France, ref. 2–H). It contains an arsenal and several magazines, and was at one time a place of great military importance. It has manufactures of cloth and other kinds of woolen fabrics. Metal-working is also carried on. The Protestants had here a flourishing academy, which was closed by the revocation of the Edict of Nantes in 1685. On Sept. 2, 1870, Napoleon III. and his whole army of 86,000 men surrendered here to the King of Prussia. Pop. (1896) 20,163.

Sedan-chair: a portable vehicle differing from the litter and the palanquin in that the traveler is carried in a sitting posture by two men. The sedan-chair took its name from Sedan in France, where it was invented, but it had long been employed in Eastern countries, notably in India and China. It was first seen in England in 1581.

Sedatives [from Lat. *seda're*, *seda'tus*, make sit, settle, compose, calm]: a term somewhat loosely employed in medical parlance to designate agents which are soothing or actually anæsthetic over the sensory function, or which in relation to various motor functions tend to diminish activity. Aconite, hemlock, and chloroform are thus called sedative—the first, because it lessens the force and frequency of the heart's beats; the second, because it paralyzes the voluntary muscular system; and the third, because it is a general paralyzer of the cerebro-spinal functions. From these examples it is obvious enough that there is no group of allied agents to which the general term sedative can apply; and where used in relation to special paralyzing power the latter term is far more accurate and expressive.

Sedge Family: the *Cyperaceæ*; a group of grass-like, monocotyledonous, herbaceous plants, numbering 2,500 to

FIG. 1.—A sedge (*Carex umbellata*) reduced, with enlarged perigynium and bract at left, and pistil and transverse section at right.

3,000 species. Their stems are usually solid and three-angled, and their leaves three-ranked, with closed sheaths. The flowers are greatly reduced from the lily type, having three stamens (rarely more) and a one-celled ovary with two or three carpels, which contains a single basifixed, anatropous ovule, the latter developing into a free seed. The perianth is wanting, or at most rudimentary, and the plants are often monœcious or diœcious.

FIG. 2.—Papyrus (*Cyperus papyrus*).

Sedges are common in all parts of the globe and are particularly abundant upon low and wet lands. They are usually not so nutritious as the grasses, but constitute a large proportion of the coarse hay which is cut from wet meadows. The largest genera of the family are *Cyperus* (containing from 400 to 500 species), *Fimbristylis* (200), *Scirpus* (200), *Rhynchospora* (150), *Scleria* (100), and *Carex* (500). See the articles CAREX, CYPERUS, and PAPYRUS. CHARLES E. BESSEY.

Sedgemoor: a wild region of Somersetshire, England, extending S. E. from Bridgewater. On July 6, 1685, the Duke of Monmouth, son of Charles II. of England by Lucy Walters, was defeated here by the army of James II. under the Earl of Faversham. The duke was taken prisoner, and executed July 15, 1685. See Macaulay's *History of England*.

Sedgwick, ADAM, LL. D., F. R. S.: geologist; b. at Dent, Yorkshire, England, in Jan., 1786; graduated at Cambridge 1808; became fellow of Trinity College 1810; took orders in the Church of England 1817; was appointed Woodwardian Professor of Geology at Cambridge 1818; chosen fellow of the Royal Society 1819; became proctor of the university 1827; president of the Geological Society of London 1829–31; received the Copley medal of the Royal Society 1863. D. at Cambridge, Jan. 27, 1873. His geological studies covered wide areas in continental Europe as well as Great Britain, but the older sedimentary rocks of England and Wales were his special field. In classifying these he first announced the Cambrian as a system below the Silurian; and a question as to the position of the line separating the two systems occasioned a long controversy with Murchison, involving much bitterness and personal feeling. He was an active opponent of the doctrine of evolution. His works consist chiefly of reviews, lectures, addresses, and memoirs, scattered through the publications of learned societies, the most important separate essays being a *Discourse on the Studies of the University of Cambridge* (1834; enlarged ed. 1850) and a *Synopsis of the Classification of the Palæozoic Rocks* (1855). See CAMBRIAN PERIOD, and consult Geikie's *Memoirs of Sir R. Murchison* (1874) and Hunt's *Chemical and Geological Essays* (1875).

Sedgwick, CATHARINE MARIA: author; daughter of Judge Theodore Sedgwick; b. at Stockbridge, Mass., Dec. 28, 1789; undertook after her father's death (in 1813) the management of a private school for the education of young ladies, and continued in that employment fifty years. She published her first work of fiction, *A New England Tale*, in 1822, the success of which decided her to continue the career of authorship; brought out *Redwood* (2 vols., 1824), which was reprinted in England, translated into French, Italian, German, and Swedish, and compared favorably with the novels of Cooper, to whom, indeed, it was attributed in the French version; and was the author of other popular works, including *The Traveller* (1825); *Hope Leslie, or Early*

Times in Massachusetts (2 vols., 1827), reputed her best work; *Clarence, a Tale of our Own Times* (1830); *The Linwoods* (1835); *The Poor Rich Man and the Rich Poor Man* (1836); *Live and Let Live* (1837); *Means and Ends, or Self-Training* (1838); *Stories for Young Persons* (1840); *Letters from Abroad to Kindred at Home* (1841); *Morals and Manners* (1846); *Facts and Fancies* (1848); *Married or Single?* (1857); and *Letters to My Pupils* (1862). D. near Roxbury, Mass., July 31, 1867. See her *Life and Letters*, by Mary E. Dewey (New York, 1871).

Sedgwick, John: soldier; b. at Cornwall, Conn., Sept. 13, 1813; graduated at the U. S. Military Academy in July, 1837; served as first lieutenant in the war with Mexico, winning the brevets of captain and major for gallantry; was successively promoted major, lieutenant-colonel, and colonel of cavalry, and in Aug., 1861, was commissioned brigadier-general U. S. volunteers. He distinguished himself in the battles of Fair Oaks (May 31), Savage Station (June 29), and Glendale (June 30). Appointed major-general of volunteers, to date from July 4, 1862, he commanded a division at Antietam, where he was severely wounded three times and disabled until December, when he was placed in command of the Ninth Corps. Transferred to the command of the Sixth Corps Feb., 1863, he occupied Fredericksburg May 3, and stormed Marye's Heights in the rear of the town. His advance to join the main army at Chancellorsville was checked at Salem Heights on the afternoon of May 4, and only by great skill and hard fighting was he able to hold his ground during the next day, withdrawing after dark across the Rappahannock. In the Pennsylvania campaign of 1863 the Sixth Corps formed the right wing of the army following the movements of Lee, and on the evening of June 30 encamped at Manchester, upward of 35 miles from Gettysburg. The events of July 1 demanded the hasty concentration of the army, and before 2 P. M. of July 2 Sedgwick reached the field with his corps, having made the march of 35 miles in twenty hours. The corps was at once engaged, as also in the third day's fight and pursuit of the enemy, July 5. At the battle of Rappahannock Station (Nov. 7), he commanded the right wing of the army, composed of the Fifth and Sixth Corps, as in the "Mine Run move" (Nov. 26–Dec. 3). Continuing in command of the Sixth Corps, he was conspicuous in the battle of the Wilderness (May 5–6, 1864), as in the battle of Spottsylvania (May 9), where he was killed by a bullet from a sharpshooter while directing the placing of some artillery. A monument wrought of cannon captured by the Sixth Corps was erected to his memory at West Point in 1868.

Sedgwick, Robert: soldier; b. in England about 1590; an early settler at Charlestown, Mass.; had been a member of the Artillery Company in London: aided in founding the Ancient and Honorable Artillery Company 1638; was its captain 1640; became colonel of the Middlesex regiment 1643, and commander of all the militia of Massachusetts 1652; went to England; was employed by Cromwell to expel the French from Penobscot 1654; took part in the West India expedition 1655; was appointed one of the commissioners to govern Jamaica, and in 1656 was made major-general. D. in Jamaica, May 24, 1656. With John Winthrop, Jr., he established the first iron-works in New England 1643–44.

Sedgwick, Theodore: law writer; b. at Albany, N. Y., Jan. 27, 1811; graduated at Columbia College 1829, and (like his father and grandfather before him, both named Theodore) took up the study of law, being admitted to the bar May, 1833; was *attaché* to the U. S. legation at Paris 1833–34, under the U. S. minister, Edward Livingston; practiced law in New York 1835–50; was president of the New York Crystal Palace Association 1852; and became U. S. district attorney Jan., 1858. He was offered the mission to Holland in 1857, and twice offered the office of Assistant Secretary of State, but declined both. D. at Stockbridge, Mass., Dec. 8, 1859. Besides numerous legal and political articles contributed to periodicals, he edited the political writings of William Leggett (2 vols., New York, 1840); wrote a *Memoir* of his great-grandfather, Gov. William Livingston (1833); *Treatise on the Rules which govern the Interpretation and Application of Statutory and Constitutional Law* (1857; 2d ed. 1874); a *Treatise on the Measure of Damages* (1847; 8th ed. 1891), which last work is an enduring monument to his legal learning and sound judgment.

F. Sturges Allen.

Sedimentary Rocks: See Geology and Rocks.

Seduction [from Lat. *seduc'tio*, deriv. of *sedu'cere*, *seduc'tum*, lead astray, seduce; *se-*, aside + *du'cere*, lead]: the enticement of a servant from the master to the latter's legal damage. At present it is applied chiefly to the enticement of a female servant to unlawful sexual intercourse with the seducer. In contemplation of law this wrong is not against the relation of parent and child, although the plaintiff is ordinarily the father of the seduced person, but against the relation of master and servant. Accordingly, a parent can not maintain an action for the seduction of his daughter, unless he can show, in Great Britain, that she was in his actual service, or, in the U. S., that he had the legal right to such service. Having established this fact, however, he is allowed to recover as damages, not only the pecuniary loss he has sustained as master, but such compensation as the jury may give for injury to the plaintiff's feelings, and such amount as they may award for the punishment of the defendant. In returning the damages in a particular case, the jury has a right to take into account the social and pecuniary condition of the parties, and the conduct of the seducer and seduced.

As the wrong in question is against the relation of master and servant, a recovery can not be had unless legal damage to the master is proved. Such damage exists whenever the seduction of the daughter is accompanied by loss of service, as where the daughter was enticed to remain away from home nine days with her seducer (*Evans* vs. *Walton*, Law Reports, 2 Common Pleas 615), or where loss of service follows as the proximate result of the wrong, as in cases of pregnancy, sexual disease, or the infliction of bodily injury. If loss of health is caused by mental suffering produced by abandonment on the part of a seducer, or shame consequent on exposure, it is considered too remote to amount to legal damage. *Abrahams* vs. *Kidney*, 104 Mass. 222.

While the action for the seduction of a daughter is generally brought by the father, it may be brought by the mother in case she sustains the legal relation of master to the child, as it may be by any other person who occupies that relation. In the absence of statute, the seduced female can not bring an action for this wrong, as it was inflicted with her consent, although the consent might have been obtained by fraudulent promises. *Hood* vs. *Sudderth*, 111 N. C. 215 *contra*.

In most of the U. S. the seduction of a woman of previous chaste character is a statutory crime. Many of the statutes require that the seduction shall be accomplished under promise of marriage. Some limit the offense to unmarried females, and provide that no conviction shall be had upon the uncorroborated testimony of the seduced person. The subsequent intermarriage of the parties is often made a bar to a criminal prosecution.

Francis M. Burdick.

Sedu'lius: a Christian poet of the fifth century, who was at the height of his fame in the reign of Theodosius II. and Valentinian III. (425–450). He composed in epic verse a biblical narrative in five books, entitled *Paschale carmen*, book i. being occupied with the miracles of the Old Testament, books ii.–v. with events from the Gospels, treated with greater freedom and originality than the same subject by Juvencus. The work is dedicated to a presbyter, Macedonius, at whose request the writer made a prose version of the work, also extant in five books, *Paschale opus*. Sedulius also wrote an alphabetical hymn, *Abecedarius*, in honor of Christ, in iambic dimeters, in which there is a marked attention to accent and rhyme, and an elegiac poem in which each pentameter ends in the same words with which the preceding hexameter begins (*Epanalepsis*). The best edition is by J. Huemer (Vienna, 1885). See Manitius, *Geschichte der christ-latein. Poesie*, pp. 303–312 (Stuttgart, 1891).

M. Warren.

Sedum: a genus of crassulaceous plants, mostly perennial, and natives of northern temperate and cold regions. The flowers have a four or five lobed calyx, four or five petals, twice as many stamens, and four or five ovaries, each with a small scale at the base. The stems and leaves are fleshy and succulent, and the flowers are cymose and usually white, yellow, or pink. Many of the species are very persistent of life, flowering even from cut stems, as the orpine, live-forever, or live-long (*Sedum telephium*), with purple flowers, and somewhat used as a diuretic. The English wall-pepper (*S. acre*), with yellow flowers, cultivated in the U. S., is known there as golden-moss or love-entangle, and is cathartic and emetic. The name stonecrop is given because of the rocky habitat of many.

See, Horace: naval engineer and architect; b. in Philadelphia, Pa., July 19, 1835. He was educated at the Academy of the Protestant Episcopal Church and the Gregory Academy; became, after entering business life, interested in steamship construction. From 1887 to 1889 he was the superintending engineer of the works of William Cramp & Sons, at Philadelphia, and introduced many improvements into the design and manufacture of the steam-engine. He had much to do with the introduction of triple-expansion engines into the vessels of the U. S. navy. He designed engines for the cruisers Yorktown, Concord, Bennington, Philadelphia, Newark, and Vesuvius, and for several well-known yachts and important merchant vessels. The cylindrical face-plate, if it may be so called, has been one of those by which it has been possible to produce perfect surfaces in main bearings and crank-shaft journals, so that heating, heretofore considered a natural consequence following the trial of a new engine, has been eliminated. He has been president of the American Society of Mechanical Engineers; is fellow of the American Association for the Advancement of Science; and a member of the British Institution of Naval Architects, and of other societies.

Seed-lac: See Lac.

Seeds [O. Eng. *sēd* : Germ. *saat* : Icel. *sāð* : Goth. *-sep̄s* in *manasēp̄s*, seed of men, the world; cf. Lat. *se'rere*, *sa'tum*, sow, Gr. *ἱέναι*, throw; Indo-Europ. root *sē-*, throw]: the immediate result of sexual propagation in phanerogamous plants, being the ovules after fertilization and the consequent formation of the embryo, which is the germ of a new individual. A seed consists of the embryo; of the matured coats of the Ovule (*q. v.*), commonly two, of which the outer, and generally the firmer, is technically called the *testa*, the inner, *tegmen*; and often of a stock of nourishing matter accumulated around or accompanying the embryo. The latter was named *albumen*, from a mainly fanciful analogy; the seed being likened to an egg, the albumen was supposed to answer to its white (albumen) and the embryo to its yolk. Seeds, such as those of peas, beans, and almonds, which have no albumen—that is, no stock of nourishment outside of the embryo—have always a strong and well-developed embryo, abundantly supplied with the same or similar matter stored in its own tissues. The general structure of the seed depending upon that of the ovule, the same terms are mostly applicable to it and to its modifications and parts (such as *anatropous*, *orthotropous*, *rhaphe*, *chalaza*, etc.); but the closed orifice through which impregnation was effected is called the *micropyle*; the scar left by separation from the seed-stalk or placenta is the *hilum*; the accessory and usually partial external covering, which is sometimes developed by a growth from the micropyle or the apex of the seed-stalk, is an *arillus* or *aril*. The mace of nutmeg and the pulpy covering of *Euonymus* seeds are familiar examples. A *caruncle* and a *strophiole* are nearly similar appendages at the base or hilum, not developed into a covering. Other appendages to certain seeds are the *coma*, or tuft of downy hairs at the summit, as in milkweed, or the base, as in willow, also the wing, as in trumpet-creeper; these and various other appendages aid in the dispersion of seeds. The albumen of the seed, when distinctively present, may differ greatly in abundance, consistence, and nature; as from farinaceous or flowery in wheat to cartilaginous or horny as in coffee, or to the texture and appearance of ivory in the vegetable-ivory nuts. In many cases, as in those just referred to, it forms much the larger part of the kernel of the seed; in others the embryo is so minute as to be with difficulty discerned anteceedent to germination; while sometimes the embryo is the more conspicuous, and the albumen is reduced to a thin layer. When copious, the albumen generally envelops the embryo, but sometimes the latter enfolds the former, as in mallows, or is coiled around it, as in four-o'-clock and chickweeds. The embryo and its parts are described in other articles. (See Germination, Cotyledon, and Embryology.) Its most important structural characteristic is the number of cotyledons or seed-leaves—one in monocotyledonous or endogenous plants; two in the dicotyledonous or exogenous.

There are many conflicting accounts as to the duration of vitality in seeds. The story of grain found buried with Egyptian mummies having germinated after being exhumed is generally discredited. All recent attempts under proper observation and due precautions have failed. The appearance of plants new to the station upon the soil brought to the surface from excavations can usually be otherwise explained when they appear to involve a high antiquity, although there is no doubt that buried seeds have germinated after a lapse of fifty or more years. The best-authenticated case, pointing to a much longer preservation of vitality under such conditions, is that of the growth of raspberry-seeds found in the abdominal portion of a skeleton exhumed from a Roman tomb near Dorchester, England; but it is one not beyond doubt and uncertainty. One or two series of experiments, conducted by the sowing of seeds of known age, and also by the annual sowing from a stock of a considerable variety of seeds of the same age, indicate a rapid extinction of vitality under ordinary conditions. Out of 338 species, representing 74 families of plants, only 94 kinds grew after 3 years, only 57 after 4 to 8 years, only 16 from 8 to 21 years, 5 from 25 to 27 years, 3 to 43 years. In ordinary cases, leguminous seeds have longest preserved germinating power, in some very well-authenticated instances up to seventy or perhaps a hundred years. Nearly uniform temperature, darkness, and either dryness or burial beyond atmospheric influences, most favor the prolongation of vitality. See also Food. Revised by Charles E. Bessey.

See'land: the largest and most important of the Danish islands; between the Cattegat and the Baltic, and between the Sound which separates it from Sweden and the Great Belt which separates it from the island of Funen. Area, 2,713 sq. miles, or with neighboring islands administratively dependent, 2,909 sq. miles. The ground is low and undulating, dotted with small lakes and studded with forests of oak and beech, but nowhere rising more than 200 feet above the sea. The soil is very fertile and well cultivated. Pop. (1890) in the administrative limits, 722,000.

Seeley, Levi: See the Appendix.

Seeley, Sir John Robert, M. A.: educator and author; b. in London, England, in 1834; graduated at Cambridge 1857; became fellow of Christ's College 1858; Professor of Latin in University College, London, 1863; succeeded Charles Kingsley as Professor of Modern History at Cambridge Oct. 9, 1869. Author of *Ecce Homo, or the Life and Work of Jesus Christ* (London, 1865), which rapidly passed through many editions and elicited many replies; *Roman Imperialism* (1869); *Lectures and Essays* (1870); and editor of *Livy, with Introduction, Historical Examination, and Notes* (1871); wrote *Life and Times of Stein* (3 vols., 1879); *Expansion of England* (1883); *Natural Religion* (1882); *A Short History of Napoleon I.* (1886); *Goethe Reviewed after Sixty Years* (1893); *Growth of British Policy* (1895). D. at Cambridge, Jan. 13, 1895. Revised by S. M. Jackson.

Seelye, see'lē̆e, Julius Hawley, S. T. D., LL. D.: educator; b. at Bethel, Conn., Sept. 14, 1824; graduated at Amherst College 1849; studied theology at the Auburn Seminary, and also in Germany; was pastor of the First Reformed Dutch church, Schenectady, N. Y., 1853–58, then became Professor of Mental and Moral Philosophy in Amherst College. In 1872 he visited India, where he spent three months, largely occupied in lecturing to educated and English-speaking Hindus on the truths of Christianity. Some of these lectures were published in Bombay (1873) by request of their auditors, and also at Boston (1874), under the title *The Way, the Truth, and the Life*. He also published a volume on *Christian Missions* (New York, 1875), an elementary text-book on *Duty* (1891), besides various sermons, addresses, and articles in quarterly reviews, and translated Schwegler's *History of Philosophy* (New York, 1856). He aided in the revision of Hickok's *Psychology* (1882). In 1874 he was elected to Congress by a spontaneous movement of the people of his district, and without having received a nomination from any political party. In 1876 he was elected president of Amherst College, retaining his professorship. He resigned both offices in 1890. D. at Amherst, Mass., May 12, 1895. Revised by G. P. Fisher.

Seelye, Laurenus Clark, D. D.: educator; brother of Julius H. Seelye; b. at Bethel, Conn., Sept. 20, 1837: graduated at Union College 1857; studied at Andover Theological Seminary 1857–59, at Berlin and Heidelberg Universities 1860–62; traveled in Europe, Egypt, and Palestine; was pastor of the North Congregational church at Springfield, Mass., 1863–65; was Professor of English Literature and Oratory at Amherst College 1865–74; organized and became in 1874 first president of Smith College for young women, at Northampton, Mass.; author of various contributions to reviews, including articles on collegiate education and on Celtic literature.

Seeman, zā′măăn, Berthold, Ph. D.: botanist; b. at Hanover, Germany, Feb. 28, 1825; educated at the lyceum of that city; studied at Kew, England, 1844–46; was naturalist on board H. M. S. Herald on an exploring expedition around the world 1846–47; made three Arctic voyages; explored the Fiji islands and parts of North and South America 1860–62; editor of *Bonplandia* 1853–62, and of *Journal of Botany, British and Foreign*, 1863–71; published *A Narrative of the Voyage of the Herald* (1853); *Popular History of Palms* (1855); *The Botany of the Voyage of the Herald* (1857); *Flora Vitensis* (1865); and other scientific works. D. at the Javali mine, Nicaragua, Oct. 10, 1871. Revised by Charles E. Bessey.

Seetzen, zāt′sen, Ulrich Jasper: Orientalist and traveler; b. at Jever, Oldenburg, Germany, Jan. 30, 1767; was educated at the University of Göttingen; became a friend of Blumenbach and Humboldt; under the patronage of the Dukes of Saxe-Gotha undertook an extensive exploration of Mussulman Africa and Asia; reached Constantinople in 1802; studied Arabic fifteen months at Aleppo (1803–04); disguised as a beggar, made valuable scientific researches in Syria and Palestine, especially in the Lebanon and the regions E. of the Dead Sea (1804–06); in Egypt made a vast collection of MSS. and other objects for the Museum of Gotha, and explored Upper Egypt (1807–08); professed Islam, and as a pilgrim visited Mecca and Medina (1809); reached Mocha, whence his last letter was written on Nov. 17, 1810. Setting out for Muscat (1811), his property was seized under accusation that he was a magician. Nothing certain is known of his subsequent history, but he is believed to have been poisoned (1811) by command of the Imam of Sanaa. His diary and maps, recovered in 1815, were published at Berlin (3 vols., 1854–55). E. A. G.

Segende Nah: See Hakim-Ben-Allah.

Seggars: See Kilns (*Pottery Kilns*).

Segmental Organs: a name formerly given the excretory organs (*nephridia*) of annelids, from the fact that there is typically a pair to a segment.

Segmentation: See Embryology.

Segner's Wheel: See Barker's Mill.

Sego′via: capital of the province of Segovia, Spain; on the Eresma; at the foot of the Sierra de Guadarrama; 32 miles N. N. W. of Madrid (see map of Spain, ref. 14–E). It is surrounded by old walls surmounted by round towers. Its streets are narrow and crooked, but many of its buildings are magnificent. The aqueduct which carries the waters of the Rio Frio into the city is 2,921 feet long and rests on 170 arches, some of which are 102 feet high. It is built of granite blocks, without cement or mortar, and is the grandest specimen of Roman architecture in Spain. The cathedral is a fine specimen of Gothic architecture. There are some manufactures of cloth, paper, and pottery. Pop. (1887) 14,339. The province of Segovia is part of Old Castile, and most of it is plateau; area, 2,714 sq. miles; pop. (1887) 154,443.

Seguin, sā-geen′: town; capital of Guadalupe co., Tex.; on the Guadalupe river, and the S. Pac. R. R.; 35 miles E. of San Antonio (for location, see map of Texas, ref. 5–H). It is in an agricultural and lumbering region; has mills, a bank, and three weekly newspapers. Pop. (1890) 1,716; (1900) 2,421.

Seguin, Arthur E. S., etc. See the Appendix.

Seguin, sā′gwin, Fr. pron. *se-gaăn′*, Édouard, M. D.: physician; b. at Clamecy, Nièvre, France, Jan. 20, 1812; educated at the colleges of Auxerre and St. Louis in Paris, and studied medicine and surgery under Itard, and was subsequently associated with Esquirol; undertook, soon after receiving his medical degree, the training of a few idiot children. Devoting himself with great assiduity to the study of their psychological condition, he at length comprehended the nature of their infirmity so clearly that he was able to produce most remarkable results by his system. In his first experiments Esquirol was associated with him, and their names appear together on the title-page of his first pamphlet on the subject of idiot-training in 1839. In 1844 a commission from the Academy of Sciences of Paris declared that up to the time when he began his labors (1837) idiots could not be educated or cured by any means previously known or practiced, but that he had solved the problem. He published in 1846 *Traitement morale, Hygiène et Éducation des Idiots et des autres Enfants arriérés*. After the Revolution of 1848 Dr. Seguin migrated to the U.S.; visited the school for idiotic children in South Boston and the institution for feeble-minded youth at Barre, Mass., both in large measure the outgrowths of his labors in Paris; went to Albany, where Dr. Wilbur was just organizing the experimental school which has culminated since in the New York State Idiot Asylum at Syracuse, and rendered him invaluable assistance in that organization; in 1851 settled in Portsmouth, O., in the practice of his profession. In 1854–57 he was at Syracuse teaching and training idiot children, aiding in the establishment of new institutions in Connecticut, Ohio, and Pennsylvania, and for a time was at the head of the Pennsylvania institution. In 1859 he settled in practice at Mt. Vernon, N. Y., whence he removed to New York in 1863. In 1879 he established in New York the Seguin Physiological School for feeble-minded children, which still exists. In 1866 he published *Idiocy, and its Treatment by the Physiological Methods*. He was a commissioner at the Vienna Exposition in 1873 from the bureau of education. Among his published works are *Conseils à M. O. sur l'Éducation de son Enfant Idiot* (Paris, 1839); *Théorie et Pratique de l'Éducation des Idiots* (2 parts, Paris, 1842); *Hygiène et Éducation des Idiots* (Paris, 1843); *Images graduées à l'Usage des Enfants arriérés et Idiots* (Paris, 1846); *F. R. Perière, premier Instituteur des Sourds et Muets en France* (Paris, 1847); *Historical Notice of the Origin and Progress of the Treatment of Idiots* (translated by J. S. Newberry, M. D., 1852); *Medical Thermometry and Human Temperature* (1876). He was also inventor of the physiological thermometer. D. in New York, Oct. 28, 1880.
Revised by S. T. Armstrong.

Ségur, sā′gür′: a family of the French nobility, many of whose members have been prominent in war, literature, and politics. The most distinguished are: (1) Louis Philippe, Count de Ségur; b. in Paris, Dec. 10, 1753; received a military education, and served in America under Rochambeau; was appointed in 1783 ambassador to St. Petersburg, where he gained the favor of Catherine II., and concluded an important commercial treaty between Russia and France in 1787; retired from the public service on the overthrow of the monarchy during the Reign of Terror, and devoted himself to literary work; was recalled to service by Napoleon; became a peer during the first Restoration. D. in Paris, Aug. 27, 1830. His principal works are *Théâtre de l'Hermitage* (1798), originally written for the private stage of Catherine II.; *Contes, Fables, Chansons et Vers* (1801); *Tableau historique et politique de l'Europe de 1786–96* (1800); *Mémoires, ou Souvenirs et Anecdotes* (1825). His *Œuvres complètes* were published in 33 vols. in Paris (1824–30).—(2) His son, Paul Philippe, b. in Paris, Nov. 4, 1780; entered the army in 1799; became a member of the staff in 1802; governor of the imperial pages in 1804; and brigadier-general and aide-de-camp to Napoleon during the Russian campaign; after the second Restoration he retired to private life. He was made a peer by Louis Philippe. In 1824 he published *Histoire de Napoléon et de la Grande Armée pendant l'Année 1812*, which made a great sensation, and has been often republished. He also wrote *Histoire de Russie* (1829) and *Histoire de Charles VIII.* (1835; translated into English, Philadelphia, 1842). D. in Paris, Feb. 25, 1873.

Seidl, zīd′l, Anton H.: conductor; b. in Budapest, Hungary, May 6, 1850, and educated there, and at Leipzig and Bayreuth under Richter and Wagner. He assisted Wagner in making the first score of the *Nibelungen* tetralogy, and in 1876 was the chief stage-director at the first production of the *Nibelungen* drama in Bayreuth, and from that time till 1885 was well known in Europe as a Wagner conductor. From 1879 till 1882 he was conductor at the Leipzig Opera-house. In 1885 he married the opera-singer Fräulein Kraus, and in September of that year was called to New York to conduct the German opera, succeeding Dr. Leopold Damrosch. On the departure of Theodore Thomas for Chicago in 1891, Seidl was elected conductor of the Philharmonic Society. He was also a fine pianist, an accomplished *littérateur*, and a deep student of Shakspeare. D. in New York, Mar. 28, 1898. D. E. Hervey.

Seidlitz Powders: See Potassium (*Medicinal Uses of Potassium Compounds*).

Seigniorage: See Coinage.

Seine, Fr. pron. sān (the *Sequana* of Cæsar): a river of France, which rises in the department of Côte-d'Or at an elevation of 1,545 feet above the level of the sea, flows in a

northwestern direction, passes through Paris, where it is from 400 to 600 feet wide, and enters the English Channel at Havre by an estuary 7 miles wide. Its entire length is 482 miles, of which about 350 below Troyes are navigable by barges, and 40 from Rouen to Havre (to which the term *Seine maritime* is applied) by vessels of 200 to 300 tons. It receives from the left the Yonne, the Essonne, and the Eure, and from the right the Aube, Marne, and Oise. By canals it communicates with the Loire, Saône, Rhine, Rhône, Meuse, and Scheldt. Though surpassed in some respects by the Loire, Saône, and Garonne, yet with the hills and valleys, forests and meadows, numerous villages, populous towns, and famous cities which line its banks it is one of the finest rivers in Europe.

Seine: department of France; completely inclosed within Seine-et-Oise; area, 185 sq. miles. It is the smallest but the most densely peopled and wealthiest department of France, comprising Paris and the suburban villages of Boulogne, Clichy, Puteaux, etc. The ground is undulating and traversed by the Seine and the Marne. The soil is not naturally fertile, but it has been made very productive by the skill of the farmers and gardeners. Immense quantities of vegetables, mushrooms, melons, peaches, and strawberries are raised for the markets of Paris. Beautiful forests, as those of Boulogne, Vincennes, St.-Cloud, and Meudon, cover a large part of the surface between the cities, and rich quarries of building-stone and gypsum are found. Pop. (1896) 3,340,514.

Seine-et-Marne, -ā-maarn′: department of France, adjoining Seine-et-Oise on the W.; area, 2,214 sq. miles. The ground is slightly undulating and the soil very fertile. Extensive forests, yielding excellent timber, are found, among which is that of Fontainebleau. Large crops of wheat, vegetables, and fruits are raised; the wine of the department is mediocre, though it produces one of the most celebrated kinds of table-grapes, the Chasselas de Fontainebleau. On the pastures and meadows numerous cattle are reared, and immense quantities of cheese, the so-called fromage de Brie, are sent to the Paris markets. The manufacturing industry of the department is not of great importance. Pop. (1896) 359,044. Capital, Melun.

Seine-et-Oise, -ā-waaz′: department of France. Area, 2,163 sq. miles. In the southern part the ground is almost flat; in the northern, hilly and covered with forests. The soil is generally not fertile, but, being well manured and excellently cultivated, yields large crops of fruits and vegetables for the capital. Different branches of manufactures are pursued with great success. Several fine varieties of stone and clay are found, and the porcelain manufactures of Sèvres have acquired a worldwide reputation. Pop. (1896) 669,098. Capital, Versailles.

Seine-Inférieure, -ăn′fā′ri-ör′: department of France, bordering on the English Channel. Area, 2,330 sq. miles. The ground is generally composed of plains, watered by numerous small streams, and broken only in the southwestern part by ranges of low hills. The soil is fertile and well-cultivated. Forests abound; large crops of grain, hemp, flax, hops, and fruits are raised, and sheep, cattle, and horses are extensively reared. Manufactures, and especially fisheries and commerce, form important sources of wealth. Large quantities of cheese, butter, and cider are made. Poultry, chickens, turkeys, ducks, and geese are raised, and enormous quantities of eggs are exported to England. Pop. (1896) 837,824. Capital, Rouen.

Seines: See Fisheries.

Seip, sīp, Theodore Lorenzo, D. D.: educator: b. at Easton, Pa., June 25, 1842; graduated at Pennsylvania College, Gettysburg, Pa., and Theological Seminary, Philadelphia. He has been connected with Muhlenberg College, Allentown, Pa., since its organization in 1867, first as principal of the academic department, and successively as Professor of the Latin and Greek Languages, becoming president in 1886. H. E. J.

Sei'sin [from O. Fr. *seisine, saisine*, deriv. of *seisir, saisir*, seize: Ital. *sagire*; of Teuton. origin; cf. O. H. Germ. *sazjan*, set]: in law, possession of a freehold estate. The term originally signified any possession, whether of real or personal property, but it became appropriated at an early period to describe the possession of a freehold tenant of lands. If such freeholder surrenders the actual physical possession to another who lays no claim to the freehold (as a tenant for years), he does not thereby lose his seisin. The tenant's possession is referred to the landlord's seisin, and constitutes a part of it. (See Property.) But if actual possession of the land be taken, rightfully or wrongfully, by one who intends thereby to hold the freehold, the act is a *disseisin* of the owner and operates to transfer the freehold to the "disseisor." (For this extraordinary consequence of a disseisin, see Limitation of Actions.) In the same way every one who has a vested future estate of freehold, whether in reversion or remainder, is seised of such estate so long as the present or particular estate upon which the future estate is limited continues to be vested in possession. If the particular tenant is disseised, however, every future estate which depends upon his estate is divested by the same act. See Landlord and Tenant and Remainder.

The expression "livery of seisin," which described the ancient process of conveyance of freehold interests, known as feoffment, is only the archaic equivalent for the phrase delivery of possession. See Feoffment, Freehold, and Grant. George W. Kirchwey.

Seis'mograph: an instrument recording graphically the motions of a point on the earth's surface during an earthquake. Instruments for the automatic record of earthquakes are classed according to special function—as (1) seismoscopes, which merely detect and record the fact of an earth tremor, with or without indication of its time; (2) seismometers, which measure also the maximum force of the shock, either with or without indication of its direction; and (3) seismographs, which record the number, succession, direction, amplitude, and period of successive oscillations. Most seismoscopes are devices involving a delicately adjusted trigger whose small movement permits a weight to fall, causes an alarm to sound, or stops a clock. In seismometers a heavy liquid is agitated or made to spill from a vessel, or a movable solid is thrown down or displaced. In the construction of seismographs the primary endeavor is to give astatic suspension to a heavy body, that is, to suspend it in such way that when its position is disturbed through a small distance no force will be developed tending to restore its original position; or what is the same thing, so that if its support be moved the motion will not be communicated to the body. This ideal result has never been accomplished, but close approximations have been obtained by various devices. The complementary part of the apparatus consists in systems of levers, etc., connecting the body astatically suspended with various fixed points, or surfaces moved by clockwork, in such way as to secure a graphic record of the relative motions in various directions. The more elaborate machines record motion in the vertical direction and in two horizontal directions. See Earthquakes, and consult the *Transactions* of the Seismological Society of Japan. G. K. Gilbert.

Seismology [Gr. σεισμός, earthquake + λόγος, discourse, reason]: See Earthquakes.

Seismometer and **Seismoscope**: See Seismograph.

Seiss, sees, Joseph Augustus, D. D., LL. D., L. H. D.: author and preacher; b. near Emmittsburg, Md., Mar. 18, 1823; student in Pennsylvania College, Gettysburg, Pa.; ordained to the Lutheran ministry 1844; pastor in Virginia 1842–47, Cumberland, Md., 1847–52, Baltimore 1852–58, Philadelphia since 1858. He is a preacher of extraordinary power. His literary career began with *Lectures on the Epistles to the Hebrews* (1846), and has continued until his books and pamphlets number considerably over 100. His *Gospel in Leviticus* was republished in England, and his *Lectures on the Apocalypse* has been translated and published in Germany and Holland. He has been editor of *The Prophetic Times* and *The Lutheran*. He is one of the founders of the General Council, of which, as well as of the ministerium of Pennsylvania, he has been president. He has been president also of the board of trustees of the Philadelphia Seminary almost ever since its foundation, and a member of the committee that prepared *The Church Book* and *The Common Service*. H. E. Jacobs.

Seistan, sās-tawn′, or **Sistan**: district divided between Persia and Afghanistan, Central Asia; between lat. 30° and 32° N. and lon. 60° and 62° E., bordering W. on the Persian provinces of Khorassan and Kirman. The surface forms an extensive depression, toward which the surrounding table-lands slope gently. The soil consists either of quicksand or of a stiff clay covered with coarse grass and tamarisk-bushes, and uncultivable except along the rivers, which from the surrounding highlands gather in the middle of the

depression and form the large but shallow lagoon of Hamun. The land is mostly a desert, but camels and sheep thrive here. Large ruins show, however, that Seistan once must have been well peopled and wealthy; it was probably ruined by Timur at the end of the fourteenth century.

Seizure: See SEARCH AND SEIZURE.

Seja'nus, ÆLIUS: the prime minister of Tiberius; a native of Vulsinii, in Etruria. See TIBERIUS.

Sela'chii [from Gr. *σέλαχος*, a fish having cartilage instead of bones, shark]: the class of ichthyoid vertebrates containing the sharks, rays, and chimæras; the ELASMOBRANCHIATES (*q. v.*).

Selachos'tomi [from Gr. *σέλαχος*, a shark or other cartilaginous fish + *στόμα*, mouth]: an order of fishes forming, with the *Chondrostii* (sturgeons), the sub-class *Chondroganoidea* (see FISHES), in which the skeleton is cartilaginous. They differ from the sturgeons in the obsolescence of the maxillary and interspercle, and the presence of numerous minute teeth disappearing with age. The skin also is naked, or with minute stellate ossifications; the air-bladder cellular: the stomach cæcal and the pyloric cæca form a broad leaf-like organ; the dorsal and anal fins approximate the caudal, which is heterocercal, with fulcra on its upper surface. There is only one family, the *Polyodontidæ*, including the PADDLE-FISH (*q. v.*) and *Psephurus gladius* of Chinese rivers. These have the snout produced into a long flat blade-like process, which overhangs the wide mouth, and is used in stirring up the bottom for the minute organisms which form their food.

Selaginella'ceæ: See FERNWORTS.

Selah [Heb.]: a musical term occurring in the Bible (seventy-one times in the Psalter, three times in Hab., chap. iii.), supposed to indicate a pause in the singing or a change of instrument; LXX., *διάψαλμα*. It may perhaps be derived from a verb (Ps. lxviii. 5), meaning "to sing loudly" (*Jüd. Lit. Blatt.*, 1894, xix., p. 74). Cassel connects it with the Greek *ψάλλε* (*Sendschr. über die Probebibel*, 1885, p. 96); Dalman with *σέλις* (*Theol. Lit. Zeit.*, 1892, xxi., col. 518). See also J. Bachmann, *Alttest. Unters.* (Berlin, 1894, p. 41); Muss-Arnold, *Johns Hopkins Univ. Circulars*, No. 81. R. G.

Selangor': one of the states of the Malay Peninsula, protected by Great Britain. It lies between the parallels 2° 45′ N. and 3° 50′ N., and extends from the west coast to the central watershed. Area about 3,000 sq. miles. It is mostly a low flat plain, is drained by four large rivers, is hot and wet, but not unhealthful. The most important production is tin, of which the state contains many mines, some of which have been worked from very ancient times. Pop. (1891) 81,592. M. W. H.

Selborne, BARON: See PALMER, ROUNDELL.

Selden, JOHN: jurist, legal antiquarian, and Orientalist; b. at Salvington, near Worthing, Sussex, England, Dec. 16, 1584; studied at Chichester free grammar school; at Hart Hall, Oxford, 1598–1601; at Clifford's Inn 1601–04; and afterward at the Inner Temple, where he was called to the bar. He acquired great fame for his classical, Oriental, and political attainments; and became intimate with Camden, Usher, Sir Robert Cotton, Sir Henry Spelman, Ben Jonson, and other celebrities. At an early age he began his prolific literary career by writing, probably in 1606 or 1607, the *Analecton Anglo-Britannicon* (not published until 1615; new ed. 1653), giving an account of the civil administration of Great Britain prior to the Norman conquest; issued his *Jani Anglorum Facies Altera* (1610; Eng. trans. 1682); furnished learned notes and illustrations to Drayton's *Poly-Olbion* (1613); published an elaborate treatise on *Titles of Honor* (1614; 3d ed. 1672), a work still of the highest authority; and *De Diis Syris Syntagmata duo* (1617), a work on Syrian mythology as illustrative of the Old Testament, which supplied Milton with some material for his *Paradise Lost*.

He was for some years an earnest and effective champion of the popular party in the long struggle with the crown, and in 1618 he published a *History of Tithes*, in which he denied the divine right to tithes; was cited before the court of high commissions (Dec., 1618), and compelled to sign a withdrawal; was imprisoned five weeks in the custody of the sheriff of London (1621) for having advised the House of Commons to resist King James's claim that their privileges were derived from royal grants; was elected member of Parliament for Lancaster 1623; conducted the prosecution of the Duke of Buckingham in 1625, and again in 1628; defended Sir Edward Hampden before the court of king's bench for refusing to pay a forced loan 1627; opposed the royal prerogative on the question of tonnage and ship-money, and aided in drawing up the celebrated Petition of Right 1628, for which conduct he was imprisoned in the Tower Jan., 1629; was transferred to the king's bench prison in September, and remained there until 1634, when he was allowed to go at large on bail. During his imprisonment he continued his antiquarian and legal studies; published in 1635, shortly after his release, his most celebrated work, *Mare Clausum* (written sixteen or seventeen years before), defending the sovereignty of England over the "narrow seas," in reply to the claims of Holland to the right of fishing on the coasts of England, as advocated by Grotius in his *Mare Liberum*, the work being dedicated to King Charles, whose good will he seems to have gained; sat in the Long Parliament (1640) for the University of Oxford; favored the exclusion of the bishops from the Upper House, and aided in drawing up the articles of impeachment against Laud, but was subsequently considered a moderate supporter of the royal side, though condemning the excesses of both parties; was a lay member of the Westminster Assembly of Divines; took the Covenant, and was appointed by Parliament chief keeper of the rolls and records in the Tower 1643; was one of the twelve commoners appointed commissioners of the admiralty 1645; received from Parliament a grant of £5,000 in recompense for his losses and as a reward for his services to the state 1647; was one of the university visitors 1647, and influential in Parliament in protecting the endowments of university chairs; remained in Parliament after the death of the king, though taking little part in its proceedings. D. in London, Nov. 30, 1654, and was buried in the Temple church. Among his many works were *Marmora Arundeliana* (1628), a catalogue of the marbles brought from Greece by the Earl of Arundel; *De Jure Naturali et Gentium, juxta Disciplinam Hebræorum* (1640); a discourse concerning the rights and privileges of the subjects (1642); an edition of Fleta's celebrated *Commentary on English Law* (1647); *De Synedriis et Præfecturis Juridicis veterum Hebræorum* (3 books, 1650–55); and an edition of *Eutychius* (1656). His *Table Talk*, an amusing miscellany, was published in 1689 by Rev. Richard Milward, who had been his amanuensis, and by Samuel Weller Singer (London, 1847; 3d ed. 1860). His works were edited, with a memoir, by David Wilkins (3 vols. folio, 1726). See *Temple Bar*, vol. xli., p. 478, and Aikin, *Lives of John Selden and Bishop Usher*. Revised by F. STURGES ALLEN.

Selenates: See SELENIC ACID.

Sele'ne [= Lat. = Gr. *Σελήνη*, liter., Moon]: in Grecian mythology, the moon-goddess, daughter of Hyperion and Theia, sister of Helius and Eos. She was also called Phœbe, as the sister of Phœbus, the sun-god, and in later times she was identified with Artemis. Like Helius she drives across the heavens in a chariot bringing light to men. Her chariot is drawn by white horses, mules, or cows, which latter bore in the shape of their horns the symbol of Selene, the crescent moon. J. R. S. S.

Selen'ic Acid [*selenic* is from Mod. Lat. *sele'nium*. See SELENIUM]: an acid which is very interesting from its analogies with sulphuric acid and the parallelism of the compounds of the two, and has the composition H_2SeO_4. Mitscherlich discovered it in 1827. The anhydrous oxide, SeO_3, is as yet unknown. It is best prepared from selenious oxide by the method of Wohlwill, which consists in forming a selenite of copper, converting this into selenate by the action of chlorine, which gives a mixture of cupric chloride and cupric selenate. The former is dissolved out from the latter by alcohol, and the cupric selenate suspended in water and decomposed by sulphuretted hydrogen. The filtered selenic acid is concentrated by evaporation. The most concentrated liquid acid obtainable boils at 280°. In this state it still contains a little water. It resembles oil of vitriol in many respects, and, like this, dissolves zinc when diluted, with evolution of hydrogen; but it nevertheless has the extraordinary power of oxidizing and decomposing hydrochloric acid when boiled with it, chlorine being evolved and the selenic acid reduced to SeO_2. The selenates are bibasic, like the sulphates, and have a remarkable analogy with the latter, there being biselenates like the bisulphates, and selenic alums similar to common alums; and the corresponding salts of the two acids resemble each other even in solubility, the lead, barium, and strontium selenates being insoluble, like the sulphates. Nitric acid does not act

on them, but with hydrochloric acid they evolve chlorine, forming selenious acid and chlorides.

Revised by Ira Remsen.

Sele'nious Oxide: the only oxide of selenium known. It is a solid white substance obtained by combustion of selenium in oxygen, or by evaporating selenious acid to dryness. Its formula is SeO_2. It sublimes, without fusing, below redness, condensing in crystals, and is very deliquescent. Its compound with water, selenious acid (H_2SeO_3), is a strong acid, which decomposes, with heat, the chlorides and nitrates, and forms neutral salts with bases, being exceptional, nevertheless, in being decomposed by heat, as above intimated. The selenites are bibasic, and large numbers have been prepared and investigated, but for these the chemical text-books must be referred to.

Sel'enite [from Lat. *sele'nites* = Gr. σεληνίτης (sc. λίθος, stone), deriv. of σελήνη, moon. So called from its luster]: a mineralogical name for gypsum. Dana believes that the σεληνίτης of Dioscorides was probably really crystallized gypsum, but not the *selenitis* of Pliny. Discoveries in molecular structure indicate two distinct varieties of the species selenite or gypsum—allotropic modifications, as they may be called—one having density, when homogeneous, = 2·313 (Mohs found 2·31, and Kenngott, as the mean of 15, found 2·317), and the other = 2·337 (Filhol found 2·331).

Sele'nium [Mod. Lat., from Gr. σελήνη, moon. So called from its chemical analogy to *tellu'rium* (from Lat. *tellus*, earth), being as it were a companion to it]: a chemical element discovered by Berzelius in 1817. Sulphur, selenium, tellurium, and oxygen form Berzelius's natural amphigen group of elements, which are certainly separated widely from the halogen group in many respects, though fluorine apparently forms a connecting link, having many affiliations with both groups. Selenium must be considered one of the rarer elements, though several native mineral compounds of it are known. The mineral *clausthalite* is selenide of lead, *zorgite* a double selenide of lead and copper, these being the principal sources of commercial selenium, and somewhat common in the mines of the Hartz Mountains, at Tilkerode, Clausthal, and Zorge, also at Glasbach in Thuringia. *Lehrbachite* is a selenide of lead and mercury from the Hartz; *berzelianite*, a selenide of copper from the same, and from Skrikerum in Småland, Sweden; *eucairite*, a copper and silver selenide, also from Skrikerum, and found in several Chilian localities; *naumannite*, a silver-lead selenide from the Hartz. There is a silver selenide in crystals at Tasco in Mexico (del Rio); *tiemannite*, a mercuric selenide, from the Hartz; and a few others less known. Certain iron pyrites, as at Fahlun in Sweden, contain selenium; and when these are used for making sulphuric acid, a seleniferous deposit forms in the leaden chambers, in which, indeed, the element was first discovered by Berzelius. Selenium is obtained principally from the dust that accumulates in the flues of sulphuric-acid works, and of roasting-furnaces where iron pyrites containing selenium are used. The relative quantity of selenium in the pyrites is very small, but the product of its combustion is a solid that is much less volatile than the gases given off in the burning of the pyrites, so that this product accumulates in the flues. In order to obtain the selenium from the dust, this is treated with an oxidizing agent, either nitric acid or a nitrate, and the selenium thus all converted into the dioxide, SeO_2, or into a salt of selenic acid, H_2SeO_4. Both of these oxides are easily reduced by sulphurous acid, the element selenium being precipitated.

There are at least two modifications of selenium which correspond to those of Sulphur (*q. v.*). One is slightly soluble in carbon disulphide, the other is not. The soluble form is obtained by reducing selenious acid by means of sulphurous acid, or other reducing agent. The insoluble variety is obtained by melting selenium and rapidly cooling it. The soluble form is crystalline, the insoluble form is amorphous.

Selenium does not kindle easily, like sulphur, but when heated strongly will burn in the air; and selenides will burn before the blowpipe. A characteristic odor accompanies this combustion, compared by some to that of horse-radish, by which the presence of selenium in a mineral can be detected by those who know the odor.

Compounds.—Selenietted hydrogen, corresponding to sulphuretted hydrogen, is one of the most interesting of these. It is a permanent gas, which may be formed by the action of an acid on selenide of potassium, or by heating selenium in a current of dry hydrogen to its vaporizing-point. At a higher temperature dissociation again occurs. It is very poisonous, producing catarrhal disease when inhaled, and destroying the sense of smell. It does not liquefy at — 15° C.

The electrical conductivity of selenium is influenced to a remarkable degree by heat and light. Amorphous selenium does not conduct electricity, but the crystallized does so, and the conductivity increases rapidly with a rise in temperature. According to the latest investigations, however, amorphous selenium conducts electricity when heated to 165° or 175° C., and higher. Revised by Ira Remsen.

Seleucia, sel-yoo'sĕe-ăă, or **Seleuceia** (Gr. Σελευκεία) sel-yŏo-see'ăă: the name of several cities founded mostly by Seleucus I., Nicator. 1. A city on the Tigris. In the time of Titus it had a population of 600,000; it was partially burned in 116 A. D. by Trajan, and was destroyed in 162 A. D. by L. Verus.—2. Seleucia Pieria in Syria, near the mouth of the Orontes.—3. Seleucia on the river Belus in Syria.—4. Seleucia in Northern Palestine.—5. Seleucia Sidera discovered by G. Hirschfeld in the plain of Isparta in Pisidia.—6. Seleucia in Pamphylia near the mouth of the Eurymedon.—7. Seleucia on the Calycadnus in Cilicia Tracheia, the scene of the drowning of Barbarossa. J. R. S. Sterrett.

Seleu'cidæ: one of the five great dynasties of ancient Persia before the Mohammedan conquest. After the death of Alexander the Great (B. C. 323) the vast empire, including Iran, that had been brought under his command, fell apart, and Syria became one of the recognized ruling powers under Seleucus Nicator (ruled B. C. 312–281), who had been one of Alexander's generals. This vigorous commander became the founder of the kingdom of the Seleucidæ. He was succeeded by his son Antiochus I., Soter (B. C. 280–261), and the latter in his turn by a son, Antiochus II., Theos (B. C. 261–246). Under the first Seleucids the Greek sovereignty over Persia was preserved intact for nearly seventy years; its unity, however, was broken about B. C. 256 by the revolt of Bactria, and in B. C. 250 by the rebellion and rise of Parthia as an independent power under Arsaces. The Seleucid supremacy itself may be said to have ceased in Iran about B. C. 150, at the time of the Parthian monarch Mithradates the Great. It had lasted less than two centuries, and as a factor in Persian political history its existence was even less than a hundred years in duration. A. V. Williams Jackson.

Seleu'cus (in Gr. Σέλευκος): the name of several rulers of antiquity. 1. Seleucus I., Nicator, one of the generals of Alexander the Great, b. in 365 B. C. In 321 B. C. he became governor of Babylonia and in 317 of Susiana. He was forced by Antigonus in 315 to flee to Ptolemy in Egypt. In 312 he was victorious over Antigonus and regained control of Babylonia, Susiana, and Media. This year (312 B. C.) was the beginning of the Seleucid era. Henceforth his arms were uniformly successful, and he advanced into India farther even than did Alexander, thus gaining the title of *Nicator*. He was the first of all the successors of Alexander to assume the title of king. In the battle of the kings at Ipsus in 301 he chiefly was instrumental in causing the defeat of Antigonus, and he thus added Armenia, Southern Asia Minor, and Syria to his kingdom. He then allied himself to Demetrius Poliorcetes, whose daughter Stratonice he married, but he soon became involved in a war with Demetrius, and, having taken him prisoner, held him in captivity until his death in 283. His war with Lysimachus ended in 282 with the addition of Asia Minor to his empire, which thus extended from the western seaboard of Asia Minor to India, and was divided into seventy-two satrapies. His aim, contrary to that of Alexander, was to Hellenize the Orient, and he was successful to a degree, but the removal of his capital from Seleucia on the Tigris to Antioch on the Orontes tended to estrange the two elements. In 281, in addition to the surrender of his wife Stratonice, he gave the whole of Asia to his son Antiochus, and himself undertook the conquest of Macedonia, but was murdered by Ptolemy Ceraunus in 281 B. C. before he could accomplish his object. —2. Seleucus II., Callinicus, the great-grandson of Seleucus I., reigned 246–226 B. C. He could not withstand Ptolemy Euergetes, King of Egypt, who to avenge the murder of his sister Berenice advanced victoriously against Seleucus as far as Susa, and in 239 added Palestine, Phœnicia, and Cœle Syria to Egypt. Antiochus Hierax, the younger brother of Seleucus, declared himself King of Asia Minor, but was subdued. The Parthians then revolted, and in 238 were victorious over Seleucus, thus founding the Parthian kingdom. Attalus, too, sought for a slice of the crumbling empire, and in 226 defeated Seleucus, who in fleeing from the battle was

thrown from his horse and killed.—3. SELEUCUS III., SOTER, reigned from 226 to 222 B. C., and was assassinated when engaged in a war with Attalus.—4. SELEUCUS IV., PHILOPATOR, reigned from 187 to 176 B. C., tributary to the Romans.—5. SELEUCUS V. reigned 125–123 B. C.; was murdered by his mother Cleopatra.—6. SELEUCUS VI. reigned 95–93 B. C.; died at Mopsuestia, shortly after which Tigranes absorbed the remains of the Seleucid empire. J. R. S. STERRETT.

Self-consciousness: consciousness of self as a person, the highest form of consciousness. The notion of self, like other notions, is a gradual growth. The vague feeling of the ego which the first affective experiences afford, the feeling of modification in consciousness as the background or theater of presentation, and the recurrence of this feeling again and again in connection with objects new and old—and added to this the mass of more constant organic and vital sensation—all this is the beginning of the sense of personality or self. Its attributes of permanence, identity, and activity become more prominent with the development of will in connection with muscular effort, and with the establishment of the relation of subject and object, which is finally a fundamental fact. By reflection is meant the turning in of the mind to itself as its own object. By the result of reflection is meant, therefore, the knowledge which the mind has of its own operations, recognized as its own. It is an advance on the simple awareness of consciousness, in which there is no reference to self, as different from its object. In reflection this reference has distinct place, and the self is discovered through the act of attentive inspection, as having and exercising the characteristics of mind.

Idea of Self.—Through reflection, therefore, the idea of self is attained, and assumes its important place in the mental world. Round the self as a center the intellectual life plays. To it all possible forms of experience are referred. It brings coherence into the circuit of consciousness by giving it a center of reference and a circumference of limitation to the individual. The genesis of the sense or idea of self is one of the most interesting chapters in the mental growth of the child. One of the most remarkable tendencies of the very young child in its responses to its environment is the tendency to recognize differences of personality. It responds to what is called suggestions of personality. As early as the second month it distinguishes its mother's or nurse's touch in the dark. It learns characteristic methods of holding, taking up, patting, kissing, etc., and adapts itself by a marvelous accuracy of protestation or acquiescence to these personal variations. Its associations of personality acquire such importance that for a long time its happiness or misery depends upon the presence of certain kinds of "personality suggestion." It is quite a different thing from the child's behavior toward things which are not persons. Things become, with some few exceptions which are involved in the direct gratification of appetite, more and more unimportant; things get subordinated to regular treatment or reaction. But persons are constantly more important, as uncertain and dominating agencies of pleasure and pain. Movement by persons and its effects on the infant seem to be the most important factor in this peculiar influence; later the voice stands for a person's presence, and at last the face and its expressions equal the person in all his attributes.

Probably this distinction between persons and things, between agencies and objects, is the child's very first step away from what has been called a "projective" consciousness. The sense of uncertainty or lack of confidence grows stronger and stronger in its dealings with persons—an uncertainty contingent upon the moods, emotions, *nuances* of expression, and shades of treatment of the persons around it. A person stands for a group of experiences quite unstable in its prophetic as it is in its historical meaning. This, assuming it to be first in order of development, may be called the projective stage in the growth of the personal consciousness, which is so important an element in social emotion.

Further observation of children shows that the instrument of transition from such a projective to a subjective sense of personality is the child's active bodily self, and the method of it is the principle of imitation. As a matter of fact, accommodation by actual muscular imitation does not arise in most children until about the seventh month, so utterly organic is the child before this, and so great is the impetus of its inherited instincts and tendencies. But when the organism is ripe, by reason of cerebral development, for the enlargement of its active range by new accommodations, then he begins to be dissatisfied with projects, with contemplation, and so starts on his career of imitation. And of course he imitates persons. Persons have become, by all his business with them and theirs with him, his interesting objects, the source of his weal or woe, his uncertain factors. And, further, persons are bodies which move. And among these bodies which move, which have certain projective attributes, as already described, a very peculiar and interesting one is his own body. It has connected with it certain intimate features which all others lack. Besides the inspection of hand and foot, by touch and sight, he has experiences in his consciousness which are in all cases connected with this body—strains, stresses, resistances, pains, etc.—an inner felt series matching the outer presented series. But it is only when there arises a new kind of experience called effort—a set opposition to strain, stress, resistance, pain, an experience which arises, probably, first as imitative effort—that there comes that great line of cleavage in his experience which indicates the rise of volition, and which separates off the series first really subjective. Persistent imitation with effort is probably the first explicit volition, and the first germinating nucleus of self-hood over against object-hood. Situations before accepted simply are set forward, aimed at, wrought; and in the fact of aiming, working, the fact of agency, which arises from the child's realization of the possible capriciousness of character, is the nascent sense of subject. The subject-sense is an actuating sense. What has formerly been projective becomes subjective. The associates of other personal bodies, the attributes which made them different from things, are attached to his own body with the further peculiarity of actuation. This may be called the subjective stage in the growth of the self-notion. It rapidly assimilates to itself all the other elements by which the child's own body differs in his experience from other active bodies—the passive inner series of pains, pleasures, strains, etc. The self suffers as well as acts. All are set over against lifeless things, and against living bodies which act, but whose actions do not contribute to his own sense of actuation or of suffering.

Again, it is easy to see what happens. The child's subject-sense goes out by a kind of return dialectic, which is really simply a second case of assimilation, to illuminate these other persons. The project of the earlier period is lighted up, claimed, clothed on with the raiment of self-hood, by analogy with the subjective. The projective becomes ejective—i. e. other people's bodies, says the child to himself, have experiences *in them* such as mine has. They are also *me's*: let them be assimilated to my *me* copy. This is the third stage; the ejective, or social self, is born.

The ego and the alter are thus born together. Both are crude and unreflective, largely organic, an aggregate of sensations, prime among which are efforts, pushes, strains, physical pleasures and pains. And the two get purified and clarified together by this twofold reaction between project and subject, and between subject and ejeet. My sense of myself grows by imitation of you, and my sense of yourself grows in terms of my sense of myself. Both ego and alter are thus essentially social, which means imitative, creations; and for a long time the child's sense of self includes too much. The circumference of the notion is too wide. It includes the infant's mother, and little brother, and nurse, in a literal sense; for they are what he thinks of and aims to act like by imitating, when he thinks of himself. To be separated from his mother is to lose a part of himself, as much so as to be separated from a hand or foot. And he is dependent for his growth directly upon these suggestions which came in for imitation from his personal *milieu*.

Self-emotions.—The emotions which terminate on one's self must be clearly distinguished from the feeling proper of self. The feeling of self underlies all other forms of consciousness when self-consciousness has once arisen. Assuming this to be so, whatever self may be, we find that the contemplation of self, when it becomes the object of our reflection, arouses certain spontaneous and peculiar forms of emotional excitement. These are the emotions of self.

Such emotions attend either an exalted estimate of one's own person or possessions, or, on the other hand, a depreciatory estimate. The former may be called emotions of *pride*, and the latter emotions of *humility*. Looked at casually, emotions of pride include the states ordinarily called *pride*, *vanity*, *haughtiness*, *conceit*, *superiority*, *complacency*, *arrogance*, *self-confidence*, *forwardness*, etc.; and under emotions of humility are *humility*, *modesty*, *self-debasement*, *self-distrust*, *inferiority*, *bashfulness*, *meanness of spirit*, *weakness*, *poverty*, *shame*, etc. See IDEAL FEELINGS.

References.—James, *Principles of Psychology* (1890); Avenarius, *Der menschliche Weltbegriff*; Royce, *Philos. Review*, Sept., 1894; Baldwin, *Mental Development: Methods and Processes* (1895). J. Mark Baldwin.

Self-control: See Will.

Self-defense: See Assault and Battery, Homicide, and Trespass.

Selfe, Sir William Lucius: See the Appendix.

Self-induction: See Induction, Electro-magnetic.

Selfridge, Thomas Oliver: See the Appendix.

Seligman, Edwin Robert Anderson, LL. B., Ph. D.: professor of political economy and finance; b. in New York, Apr. 25, 1861; graduated at Columbia College 1879; studied three years at the Universities of Berlin, Heidelberg, Geneva, and Paris; at Columbia College Law School and School of Political Science 1882–84; lecturer on Political Economy, Columbia College, 1885–87; adjunct professor 1887–90; Professor of Political Economy and Finance 1890; treasurer of the American Economic Association 1885–90; associate editor *Political Science Quarterly* since its establishment in 1886; author of *Railway Tariffs and the Interstate Commerce Law* (1887); *Two Chapters on the Mediæval Guilds of England* (1887); *Finance Statistics of the American Commonwealths* (1889); *Taxation of Corporations* (1890); *On the Shifting and Incidence of Taxation* (1892).

Se'lim: the name of three Ottoman sultans. Selim I., Yavuz, the Inflexible (1512–21); b. 1467. By the aid of the janissaries he usurped the throne, deposing his father Bayezid II., whom he is believed to have poisoned shortly after. Then he put to death all his brothers and kinsmen. Attacking Persia he defeated Shah Ismaïl at Calderon with immense slaughter (1514) and annexed Kurdistan and Mesopotamia. Conquering Syria (1516), the title Servant of the Two Holy Cities (Mecca and Medina), hitherto reserved to the caliphs, was added to his name in the official prayer. He subdued Egypt (1517), hanging at the gate of Cairo the heroic Mameluke sultan Touman Bey. The sherif of Mecca sent him the keys of the Kaaba, and Mohammed XII., the last Abasside caliph, resigned to him the insignia and the rights of the caliphate. Since then the Ottoman sultan has been considered both political and spiritual head of Islam. The next three years he devoted to reorganization of his empire. Excessive use of opium hastened his end, and he died at Tchorlu (1521), the very place where eight years before he had fought against his father. A gifted poet, profound scholar, farsighted statesman, and resistless conqueror, he was bloodthirsty and cruel beyond expression. He is the only parricide among the Ottoman sultans.—Selim II., Mest, the Drunkard (1566–74); b. 1524; son of Suleïman II., and Roxelana. His generals subdued Western Arabia (1567) and Cyprus (1571), but lost the naval battle of Lepanto (1571), where 220 Ottoman ships were sunk or captured, 30,000 prisoners taken, and 15,000 Christian galley-slaves set free. Meanwhile Selim cared only for intoxication and the pleasures of the harem, and died from over-indulgence in wine (1574).—Selim III. (1789–1807); b. 1761; son of Mustapha III.; succeeded his uncle Abd-ul Hamid I. At his accession the empire seemed near dissolution. Syria was in rebellion; Egypt was tyrannized over by the Mamelukes; the Persians and Kurds menaced the eastern frontier; armies of brigands marched through the provinces; a hopeless war against Russia and Austria was going on. Selim was the first sultan animated by Western ideas. Ridding himself of the foreign war by the disastrous treaty of Jassy (1792), he endeavored to repress disorder and introduce administrative, commercial, and military reforms. But popular fanaticism denounced his innovations as violations of the Koran. The support he received from France through the French ambassador, Gen. Sebastiani, excited the jealousy of Great Britain. A British fleet appeared before Constantinople, but was repelled. Finally the janissaries and the Mussulman clergy combined; Selim was deposed and confined in the seraglio and his cousin Mustapha IV. raised to the throne (1807). The following year Baïractar Pasha, his devoted adherent, marched upon Constantinople with a formidable army. Thereupon Mustapha had Selim bowstrung, and Baïractar penetrated the palace in triumph, only to find the corpse of his master in the throne-room. E. A. Grosvenor.

Selimnia or **Islimiye**: See Slivno.

Selinsgrove: borough; Snyder co., Pa.; on the Susquehanna river, and the Penn. Railroad; 50 miles N. of Harrisburg, the State capital (for location, see map of Pennsylvania, ref. 4–F). It has good water-power; is in an agricultural region; contains a national bank with capital of $50,000, a monthly and two weekly newspapers, several sawmills and planing-mills, and sash-factories; and is the principal outlet for the produce of the county. The Missionary Institute of the Evangelical Lutheran Church (chartered in 1858) is located here. Pop. (1880) 1,431; (1890) 1,315; (1900) 1,326.

Seli'nus (Gr. Σελινοῦς): ancient city; on the southwest coast of Sicily; was founded in the seventh century B. C. by a Megarian colony, and derived its name from the quantities of wild parsley (σέλινον) which grew in the vicinity. A strong and flourishing city, it was almost ruined by the Carthaginians under Hannibal Gisgo, when 16,000 of its inhabitants were massacred and 5,000 made slaves (409 B. C.), and was entirely destroyed during the first Punic war (264–241 B. C.). Its ruined temples served as a refuge to the early Christians, but it was never rebuilt. These temples are the vastest in Europe. The last-built and largest, measuring 369 feet by 178 feet, with seventeen columns on each side and double porticoes, was erected toward the middle of the fifth century B. C., and consecrated to Apollo. Its finest sculptures have been removed to the Museum of Palermo. See Benndorf, *Die Metopen von Selinunt* (Berlin, 1873); and Baedeker, *Southern Italy and Sicily*.

E. A. Grosvenor.

Seljuks, sel-jooks': a Turkish tribe which, being driven from the highlands of Turkestan, settled in the plains on the E. of the Caspian Sea. There they were converted to Islam. They were famous for strength and courage, and the Caliph Motassem (833–842), chose his body-guard from among them. Under the leadership of their chief Seljuk—whence the tribe derives its name—these guards revolted, seized the temporal power, and founded an independent state in Khorassan, though all the time acknowledging the spiritual supremacy of their former masters. Togrul Beg, grandson of Seljuk, conquered Balkh and Khaurezm (Khiva) in 1041, Irak Adjemi (1043), Kerman and Fars (1047), Bagdad (1055), and Irak Arabi and Mosul (1061). Having thus completed the subjugation of Persia, he assumed the title of sultan. The extent and prosperity of the empire largely increased under his nephew Alp-Arslan (1063–73), the conqueror of the Byzantine emperor Romanus Diogenes, and under Malek Shah (1073–93), the son of Alp-Arslan. Malek Shah conquered Arabia, Syria, and Palestine, Armenia, and a large part of Asia Minor, ruling as far as the Chinese frontier and from the Caspian to the Arabian Sea. He founded at Bagdad a law school and an observatory, the first established in Asia, but removed the capital to Ispahan. He encouraged the construction of roads, bridges, canals, and works of public utility, being ably seconded in all his undertakings by his vizier, Nizam-ul-Mulk. The rapid growth of the power of the Seljuks was due to their religious ardor, to the skill and intrepidity of their early chiefs, and to their peculiar facility in assimilating not only their kindred of Turkish stock, but also subject races. Their decline dates from the division of their empire by Malek Shah into sultanates for his four sons, followed by other divisions. The sultanate of Iran was the chief, and was to exercise a sort of authority over the others. It was swallowed up by the sultanate of Khaurezm (1194), which in turn was overthrown by the Mongols (1221), when the last sovereign Ala-Eddin and his gallant son Djelal-Eddin were utterly defeated by Genghis Khan. The sultanate of Aleppo fell in 1114, that of Damascus in 1155, and of Kerman in 1191. The sultanate of Iconium comprised nearly all Asia Minor, and lasted till 1299, when Ala-Eddin III., having fled from the Mongols, died at Constantinople. From its ruins arose ten principalities, one of which under the Emir Othman was in time to subdue all the rest and to develop into the Ottoman empire. The Seljuks of Iconium and Iran were the Mussulmans earliest and most frequently encountered by the hosts of the first and second crusades, and were their most formidable antagonists. E. A. G.

Sel'kirk: a county of Scotland, anciently called Ettrick Forest; bounded by the counties of Peebles, Edinburgh, Roxburgh, and Dumfries; area, 257 sq. miles; pop. (1901) 23,339. Its surface is composed principally of rounded grassy hills, the highest of which is Dun Rig (2,433 feet), and it is chiefly devoted to cattle-raising. Selkirk was the birthplace of James Hogg, the "Ettrick Shepherd"; and of Mungo Park, the traveler; and it is noted in both literature and history. With Peeblesshire it sends one member to Parliament. The royal burgh of Selkirk, 39 miles S. E.

of Edinburgh, is the county-town. Pop. (1891) 5,788. It unites with Galashiels and Hawick in sending one member to Parliament.

Selkirk, or **Sealchraig**, ALEXANDER: mariner; b. at Largo, Fifeshire, Scotland, about 1676; made several voyages to the Pacific; was sailing-master to a privateer called the Cinque Ports Galley, and having quarreled with the captain, one Stradling, was put ashore, at his own request, Sept., 1704, on the uninhabited island of Juan Fernandez, off the coast of Chili, with some nautical instruments, a few books, a knife, kettle, axe, gun, and a supply of ammunition. Here he remained until Feb. 12, 1709, when he was relieved by Capt. Woodes Rogers of the privateer The Duke. He lived chiefly on the flesh of wild goats, which abounded in the island. He became mate to Capt. Rogers, whom he accompanied around the world; arrived in England Oct. 1, 1711, when his narrative appeared in an account of the voyage (1712), and in several separate publications. Selkirk subsequently entered the navy, rose to the rank of lieutenant, and died on board the man-of-war Weymouth in 1723. De Foe's celebrated story of *Robinson Crusoe*, which appeared in 1719, has been generally supposed to be based upon the adventures of Selkirk, by whom the incidents were said to have been communicated to De Foe, but there is little reason for supposing that the latter had more than a general knowledge of the facts of the case. *The Life and Adventures of Alexander Selkirk* (Edinburgh, 1829), by John Howell, is the best source of exact information on the subject.

Selkirk, THOMAS DUNDAS, Fifth Earl of: b. in Kirkcudbrightshire, Scotland, June, 1771; studied at Edinburgh University; succeeded his father as earl in 1799; spent several of the later years of his life in promoting emigration to the Red River of the North, British America, where the colony of Manitoba was long known as the Earl of Selkirk's Settlement. He published *Sketch of the British Fur Trade* (1816); *The Red River Settlement* (1817), and other works. D. at Pau, France, Apr. 8, 1820.

Selkirk Mountains: a range of Southeast British Columbia, W. of the Rocky Mountains and N. of Idaho, lying in a bend of the upper Columbia and to the W. of Kootenay Lake. The range is about 175 miles long by 80 broad, and attention was first generally drawn to it by the difficulties encountered by the engineers of the Canadian Pacific Railway in finding a practicable pass across it. Its elevations are from 6,500 to 9,000 feet, and the highest-known mountain in the range is Mt. Macdonald (formerly Mt. Carroll), 9,940 feet high. It is near Roger Pass, toward the northern end of the range, a narrow, rock-bound valley 3 miles long and 4,300 feet above the sea. Although the average elevation of this range is somewhat lower than that of the adjacent Rocky Mountains, its more abundant rainfall and snow cause a much larger development of glaciers and of fields of perpetual snow, which also extend here to lower levels. The line of perpetual snow is formed at an elevation of about 7,000 feet, and the timber-line rises to 6,000 feet. Numerous moraines and other traces of ice-action show that the glaciers were formerly much more extensive than now. The growth of trees is very abundant and dense, and they attain a great size. Trunks 8 feet in diameter are not rare. There are many signs of minerals, and the Gold Range lies immediately W. The Selkirk Range is thought to present many features of resemblance to the Alps. Active exploration of the range began in 1888.

MARK W. HARRINGTON.

Selma: city; capital of Dallas co., Ala.; on the Alabama river, at the head of navigation by steamboats, and the Birmingham, Selma, and N. O., the Louisv. and Nashv., the Mobile and Birmingham, the Queen and Cresc. Route, the Southern, and the West. of Ala. railways; 50 miles W. of Montgomery, 160 miles N. N. E. of Mobile (for location, see map of Alabama, ref. 5–C). It is in a cotton-growing region, and has a large trade in cotton, coal, lumber, and iron. It contains Selma University (Baptist, opened in 1878), Young Men's Christian Association library and reading-room, a national bank with capital of $400,000, 2 State banks with combined capital of $350,000, and a weekly and 2 daily newspapers. There are several cotton warehouses, railway machine-shops, and manufactories. The city was a military center during the war of 1861–65, having an arsenal, a navy-yard, artillery-foundries, and powder-works, and was captured by the Union forces Apr. 2, 1865. Pop. (1880) 7,529; (1890) 7,622; (1900) 8,713.

EDITOR OF "MORNING TIMES."

Selters, or **Seltzer Water**: the water of a mineral spring at Selters, in the valley of the river Ems, in Nassau, which has been known since the ninth century. Having become the most famous and widely known, probably, of all mineral waters, it is very skillfully and extensively imitated by chemical means in the U. S., as well as throughout Europe. It is an alkaline water, containing over 6 grains of sodium carbonate to the gallon, with 30 cubic inches of free carbonic acid. There are also minute quantities of lithia, baryta, and strontia, and of fluorine, with other commoner ingredients usually found in mineral springs.

Selwyn, ALFRED RICHARD CECIL, LL. D., F. R. S.: geologist; b. in England, July 28, 1824; educated in Switzerland. In 1845 he was appointed assistant geologist on the Geological Survey of Great Britain; in 1852 appointed by the Secretary of State for the Colonies to undertake the geological survey of the colony of Victoria, Australia; and in 1854 and 1859 examined and reported on the coal-fields and gold-fields of Tasmania and Australia. He was appointed one of the Victorian commissioners of mines in 1856; a member of the board of science and of the prospecting board in 1858: commissioner for the Victoria International Exhibition in 1861; and acted in various other important capacities until he left Australia for Canada in 1869. In that year he succeeded Sir W. E. Logan in the superintendency of the Geological Survey of the Dominion. He was gazetted C. M. G. in 1886.

NEIL MACDONALD.

Semantics, or **Semasiology** [*semantics* is from Gr. σημαντικός, significant, deriv. of σημαίνειν, show by a sign, deriv. of σῆμα, sign; *semasiology* is from Gr. σημασία, a signifying]: the doctrine of historical word-meaning; the systematic discussion of the history and development of changes in the meanings of words. The meaning of a word at any time is determined solely by its power to convey meaning to a speech-community at such time. The so-called "etymology" of a word exercises no restraint upon its meaning; it serves only to help in explaining how a present meaning came to be what it is. Thus the comparison of Germ. *klein*, little, with its predecessor O. H. Germ. *kleini*, fine, neat, small, and with its cognate English *clean*, serves only to show that the meaning "little" came to the word by the route: clean, neat, trim, fine, small. Such determination of the history of meaning frequently aids most directly in fixing the horizon of a word's meaning, i. e. the range of its general or normal meaning, within which range the great variety of its occasional or special meanings is permitted. When the word home is used in the sense of an asylum, as a "home for the blind," it may be said to be a special or occasional use of the word made possible by the character of the general or normal horizon of the word's meaning. This general range of meaning covers application to an abode as habitual and permanent, and as being one's own. The intelligibility of the special uses is conditioned on the one hand by the general meaning, on the other by the power of interpretation involved in the context and situation. When it comes to pass that a special meaning displaces the general meaning and sets itself up in its stead as the general meaning, a shift of signification has taken place. Thus the word bead once meant "prayer" (cf. Germ. *gebet*). It was also applied in special use to a ball of the rosary that marked a prayer. This special meaning has become the normal meaning. See Paul's *Principien der Sprachgeschichte* (Eng. trans.), chap. iv.; Strong-Logeman-Wheeler, *History of Language*, chap. iv.; Darmesteter, *The Life of Words* (1886): R. C. Trench, *Study of Words* (20th ed. 1888); also the article LANGUAGE.

BENJ. IDE WHEELER.

Sembrich, MARCELLA: See the Appendix.

Semele, sem'ĕe-lēe (Gr. Σεμέλη): in Grecian mythology, a daughter of Cadmus. She was loved by Zeus, and was persuaded by Hera to demand of her lover that he should visit her once in all his royal majesty. Zeus begged her to desist from this demand, but as she would not, and he had sworn to grant her any wish, he came to her with thunder and lightning, and she perished in the flames. She was pregnant by Zeus with Dionysus (Bacchus). Zeus cut the infant from the womb of the dying Semele, and concealed the child in his own thigh until the time for his birth had come, when he was born for the second time.

J. R. S. S.

Semering: See SEMMERING.

Seminaries, Theological: See SCHOOLS.

Sem'inole Indians: See MUSKHOGEAN INDIANS, UNITED STATES (*History*), and OSCEOLA.

Semipalatinsk′: Russian province and town of Central Asia. The province is on the upper Irtish river, between Siberia and Lake Balkash. Area, 184,631 sq. miles. It is of triangular form, with the apex directed N. A range of mountains and hills which runs E. and W. through its middle separates the great steppe of the Irtish on the N. from the steppe of Balkash on the S. Pop. (1897) 688,639, four-fifths of whom are Kirghiz, who are generally nomadic. The remainder are nomadic Kalmuks and sedentary Russians, Sarts, and others. The chief town is Semipalatinsk, on the right bank of the Irtish, in lat. 50° 24′ N. (see map of Asia, ref. 3–E). Although of administrative importance, it is a cheaply built and decaying town, surrounded by the bare steppe, and in constant danger from moving dunes. The climate is rigorous, and industry and traffic are small. Pop. (1897) 26,353. MARK W. HARRINGTON.

Semi-Pelagianism: See ANTHROPOLOGY (*Theological*).

Semir′amis: according to Ctesias, the wife of Ninus, founder of the Assyrian kingdom,—a woman of extraordinary beauty, passion, and military prowess who flourished nearly 2,200 years B. C., survived and eclipsed her husband, and after a reign of forty-two years abdicated in favor of her son, Ninyas. All this is admitted to be mythical. Herodotus (*Hist.*, i., 184) mentions a Semiramis who ruled over Babylon five generations before Nitocris. This Semiramis of Herodotus is certainly not to be identified with the Semiramis of Ctesias. The name appears to have been derived from Sammuramat, found upon the monuments, wife of the Assyrian king Rammannirari III. (811–782 B. C.).

Semirechensk′: Russian province of Central Asia; S. of Lake Balkash, and bounded on the S. and E. by Chinese territory; area, 152,280 sq. miles. The province is oval in form, with the long axis N. and S. It falls into two natural divisions, the northern plain and the southern and western mountainous region. The plain is the country of the "seven rivers" (Russian, *Semiretchie*), all tributaries of Lake Balkash. This part is dry, largely sandy, in some places a sandy desert, grows strongly alkaline toward the lake, and has a rigorous climate. The mountainous region includes a part of the Thian-shan range and many lakes, the largest being Issykul; has more rain, a milder climate, and considerable forest growth. Production and trade are very small. Pop. (1897) 990,243, largely Kirghiz, the remainder of many races, fully half nomadic. MARK W. HARRINGTON.

Semit′ic Languages [*Semitic* (i. e. pertaining to Shem or his descendants) is based on the Greek transliteration (Σήμ) of Heb. *Shēm*, which literally means name, sign, celebrity]: a well-defined group of languages co-ordinate in importance with the group known as the Aryan or Indo-European, but sharply marked off from it. The principal representatives of the Semitic group are, in alphabetical arrangement, Arabic, Aramaic, Babylonian, Ethiopic, Hebrew, Phœnician, and Syriac. The name Semitic is an inexact term. It rests on the assumption that the nations classed in the tenth chapter of Genesis among the sons of Shem spoke languages belonging to a single group, and embraced also all the members of that group. Neither proposition is correct. The principle governing the order of enumeration in the famous table of nations is geographical position, and not linguistic affinity. Instead of Semitic, various terms have been proposed, the most satisfactory among them being Syro-Arabic, first suggested by Renan.

The basis of union between the languages belonging to the Semitic group is such that they form intersections of one and the same branch, in contradistinction to the Aryan languages, where two distinct branches emanating from the parent trunk are recognized; and, again, a subdivision into north and south is sufficient for the Semitic group, while in the case of the Aryan eight grand divisions are commonly recognized. The relation of any North Semitic language to a member of a South Semitic is closer than that between members (say) of the Indo-Iranian and the Teutonic division, and almost as close as that marking (say) the English and German within the Teutonic division. Correspondingly, within the Northern and Southern Semitic divisions the members stand in a relation toward one another closely approaching that of co-ordinate dialects.

The intimate relationship thus indicated between the languages of the Semitic group is due to a variety of causes, prominent among which are (1) the comparatively limited territory over which the languages are spread; (2) the uninterrupted communication in consequence largely of this limited territory among the nations speaking or adopting a Semitic language; and (3) the closer ethnic relationship of the Semitic nations, only two races being distinguished by scholars, as against five adopted for the Aryan group.

The chief traits characterizing the Semitic languages are (1) the peculiar relations existing between the consonants and vowels whereby the former constitute the essential elements of a stem and of its accretions, while the latter play the subsidiary though important *rôle* of particularizing the general meaning conveyed by the consonantal framework. (2) The triliteral character, either actual or adapted, of the stems within the historical period of the language. The comparatively small number of instances in which the number of consonants constituting the stem are four, and still more rarely five, are only apparent exceptions to the rule. (3) The arrested development in the expression of the time-relations in the case of the verb, which, starting out with the vague differentiation by means of pronominal affixes between the emphasis placed on the act and when placed on the actor, does not pass beyond the stage of distinguishing between the act when completed, whether in reality or in the mind of the speaker, and when not similarly completed. (4) The pragmatic character of the verbal and nounal formations and the parallel relationship existing between the two. The Semitic stem as such has both substantive and verbal force, and while the actual number of modal variations differs for the different languages of the group, the manner of expressing the variations, (*a*) by means of the reduplication of the second or third letter of the stem, (*b*) by vocalic lengthening after the first consonant or by a vocalic prefix, (*c*) by the prefixing of certain consonants *n*, *h*, *sh*, *t*, is the same in all; and not only does the noun-formation follow the same principles, but the agreement with the verb is such as to indicate the ultimate fusion of the two. (5) The paucity of auxiliary particles, more particularly of conjunctions.

Besides these general traits, there are a number of other features of a secondary order which the Semitic languages have in common. Thus, the general agreement of the vocabulary is very large, embracing a considerable number of common words, the pronouns in the first instance and terms of relationship in the second, as well as verbal stems. But within the Semitic group the agreement is closer between some as against others. The general character of the Semitic syntax is marked by its simplicity, and there is less variation between the languages in this respect than one would perhaps expect until we come to the period of a closer contact between Indo-Europeans and Semites.

Perhaps the most noticeable point of variation among the Semitic languages is to be found in the writing employed. They present at least three distinct alphabets: (*a*) The cuneiform characters of Babylonia and Assyria; (*b*) the Phœnician and its derivatives, the square-letter Hebrew, Palmyrene, Arabic, Syriac, Samaritan, together with the alphabet of the South Arabic and Abyssinian inscriptions as the probable prototype of the Phœnician; and (*c*) the Ethiopic, which is sufficiently distinct to merit a place for itself.

On the basis of the features enumerated the division into North and South Semitic languages is made. To the former belong the Phœnician, Hebrew, Moabitic, Babylono-Assyrian, and the various Aramaic dialects, biblical Aramaic, Palmyrene, Nabatæan, the idioms of the Babylonian and of the Palestinian Talmuds, Samaritan, the North Arabic and ancient Syrian inscriptions, Syriac—Eastern and Western—Mandaic, and the modern Syriac dialects of Urmia, Tur-Abdin, Salames, and of the Lebanon district. To the Southern division belong (1) classical Arabic, and the modern dialects of Egypt, Syria, and Morocco, with Maltese as a fourth, developed under Italian influence; (2) Sabæan, also known, though less correctly, as Himyaritic, of which Minæan is a dialect, and which appears to survive in some dialects spoken along the southern coast of Arabia; (3) Ethiopic or Geëz, spoken in the ancient kingdom of Abyssinia, and surviving in the modern dialects of Tigre, Tigrina, and Amharic, together with its offshoots, Gurague and Harar.

By way of simplification the North Semitic group can be said to comprise (1) Hebræo-Phœnician, (2) Babylono-Assyrian, and (3) Aramaic; and the South Semitic (1) Arabic and (2) Yemenitic-Abyssinian. Taking these up in turn, the Hebrew and Phœnician bear so close a resemblance to one another that they may be regarded as co-ordinate offshoots of some older and lost form. Of the two, the Phœnician on the whole presents the more archaic aspect. Of literature in the true sense nothing has survived in the original Phœnician. Instead there are inscriptions on tombs, tem-

ples, votive offerings, seals, and coins, covering the period from about 600 B. C. to the third century A. D., and significant chiefly as being coextensive with the large domain over which the language spread. The Phœnician script is at least as old as 1000 B. C. In the course of time slight variations arose between the Phœnician of the mainland and that spoken in the various settlements, but hardly sufficient to affect seriously the unity of Phœnician speech.

Of the Hebrew language, the oldest written remains, which date from the seventh century B. C. (see HEBREW LANGUAGE), reveal an alphabet still identical in form with Phœnician. The so-called square characters do not make their appearance till the fourth century of this era. In the Old Testament, which is the chief source of our knowledge of Hebrew, the unifying process superinduced by the late editing of the various books composing it, and the inaccurate preservation of the oldest remains, occasion great difficulties in tracing the development of the language. So much, however, is certain, that the approach to the Aramaic is closer in what may safely be regarded as the earliest sections of the collection.

The bulk of the Old Testament literature, while thus containing elements of varying antiquity, dates in its present form from the centuries intervening between 800 and 500 B. C. The Psalms (with some exceptions), Proverbs, Lamentations, Ecclesiastes, Song of Songs, Ruth, Job, Esther, and Daniel, as well as the final version of the Pentateuch, belong to the period subsequent to the Exile, the latest being in all probability Daniel and Ecclesiastes, which are to be placed in the second century B. C. After this time Hebrew still continues to flourish as the sacred language of the synagogue, and the medium of interchange between the Jewish scholars, gradually giving way to the Aramaic idiom adopted by the populace upon the return from the Babylonian exile.

Of *Moabitic* speech there is only a single specimen—the monument of King Mesha dating from about 850 B. C., and found in 1870 at Dibon, the capital of ancient Moab. The inscription suffices to prove the practical identity of the Moabitic with Hebrew, and it is likely that the speech of the various other tribes and small principalities settled around the Dead Sea and other parts of the Sinai peninsula did not differ materially from the speech of Moab.

Babylono-Assyrian is the language spoken by the ancient inhabitants of the country roughly included between the Tigris and Euphrates. The southern part of the district, which may be distinguished as the Euphrates valley, is the older settlement. The oldest literary remains of Babylonian are the inscriptions of rulers who reigned over the petty kingdoms into which the valley was split up. Next come a large number of religious texts—hymns to the gods and incantations to gods and spirits. From the south, the culture spread to the north, which is distinguished as the Assyrian empire. About the twelfth century B. C. Assyria secures a perfect independence from Babylonia, and soon obtains the supremacy over the latter. Beyond historical annals, however, no original literature was produced in Assyria, whereas in the south poetry, astronomy (in connection with astrology), and medicine (as an offshoot of magic) continued to flourish. The writing used in both Babylonia and Assyria is the cuneiform, so called from the wedge-like forms that the letters in the later phases of their development assumed. See CUNEIFORM INSCRIPTIONS.

The larger bulk of Babylonian literature consists of commercial and legal tablets of clay, giving records of all kinds of transactions, of settlements of disputes, the detailed terms of contracts, accounts, etc. Ranging from the period of 2000 B. C. through the Persian and Greek supremacy over Mesopotamia down to within a few decades of the Christian era, they furnish the most important source for the study of the common speech. The language of the north remains identical in all but minor dialectical variations with that of the south. Occupying a position midway between Hebræo-Phœnician and the Aramaic group, it is yet marked by peculiarities in verb-formation and lexicographical features that indicate an approach to the South Semitic division.

The *Aramaic* group presents a greater number of subvarieties than the two others, and also covers a wider stretch of territory. The oldest specimens of Aramaic speech are the inscriptions found at Sindschirli in Northern Syria, which date from the eighth century B. C. The Sindschirli inscriptions mark the northern limit of Aramaic speech, the southern being the Sinai peninsula and Central Arabia. In the course of time Aramaic became the popular idiom of the entire region lying between the Euphrates valley and the Mediterranean coast, and extending to the N. as far as the Taurus range. The traces of this wide reach are to be seen in the numerous dialects that arise within this district. The most notable of these are (*a*) the dialect of Palmyra; (*b*) the Samaritan, of which besides the translation of the Pentateuch and Joshua some religious fragments are preserved; (*c*) the Syriac proper, in reality the Aramaic dialect of the Christians at Edessa. Slight variations in pronunciation and expression, in addition to distinctive scripts, warrant the division into Eastern and Western Syriac. (*d*) A direct offshoot of biblical Aramaic is the later Palestinian dialect, in which the so-called Jerusalem Talmud is written; while (*e*) the idiom of the Babylonian Talmud represents an eastern variety of the same dialect, occupying a middle ground between biblical Aramaic and Syriac. Aramaic dialects survive in various degrees of corruption in the Christian settlements around the Lake of Van, in the Kurdish Mountains, and in some Lebanon villages. See ARAMAIC.

Arabic.—The most important of the languages of the southern group is the Arabic, which, through the Mohammedan conquest in the seventh century A. D. successfully usurped the place of Aramaic speech in the Semitic world. During the four centuries of Mohammedan supremacy in both Orient and Occident the intellectual movement accompanying the spread of the new religion produced an extensive literature. The only specimens of Arabic literature older than the time of Mohammed are poetical compositions, which in the process of gathering lost some, if not much, of their ancient character. European interference with Mohammedan supremacy, which begins with the crusades, has acted as a powerful factor in destroying to some extent the unity of Arabic speech, so that the dialects of Syria, Egypt, and that of the western coast of Africa have become three distinct varieties. See ARABIC.

Sabæan.—What may be considered to be an ancient form of Arabic speech has been found on inscriptions discovered by travelers in various parts of Southern Arabia (Yemen, Hadhramout), and in some Sabæan settlements of Central Arabia and in Abyssinia. They confirm the existence of an advanced culture which flourished in the south as early at least as 1000 B. C., and of which Abyssinian civilization appears to be an offshoot. In the Yemenitic inscriptions two dialects are distinguished, the Sabæan proper and the Minæan. The alphabet of the Sabæan inscriptions presents some remarkable features. It is certainly more archaic than Phœnician, and this circumstance, taken in connection with the high rank of Sabæan culture, lends additional force to the theory (which is growing in favor among scholars) that makes the Phœnicians the borrowers instead of the inventors of their alphabet, and fixes the place of the invention in Southern Arabia.

Ethiopic, or, to use the native name, *Geëz* (meaning emigrant), falls in the direct line of succession to Sabæan, being the form assumed by the language at the time (about the fourth century A. D.) when Abyssinia became a Christian possession. The alphabet, while connected with the Sabæan characters, has developed, partly on independent lines, partly under Greek influence, in such a way as to present a sufficiently unique appearance.

The Ethiopic literature is almost exclusively religious. Ethiopic continues in use as the sacred language of the Christian Church in Abyssinia. The popular speech bears somewhat the same relation to Ethiopic as the modern Arabic dialects do to the language of the Koran, except that the variations between the several dialects are hardly so pronounced.

The Original Home of the Semites.—Any attempt to trace the origin of the Semitic languages to some common starting-point does not include the problem of the origin of the races which in historic times appear as integral parts of the Semitic world. Separating in this way the question of race from that of language, three theories regarding the cradle of the Semites at present dispute the field. The one starting out from the general proposition that the most ancient Semitic culture, other things being equal, arose in the oldest center of Semitic settlement, would place in the Euphrates valley the original home of the Semites. A second view, held by perhaps the majority of modern scholars, seeks the home of the Semites in Arabia, as being the most favorable for the production of traits, customs, and religious ideas regarded as peculiarly Semitic. More recently evidence has been adduced in favor of Africa as the starting-point both of Semitic speech and of Semitic migration. An important factor in this theory is the relationship that has been demonstrated to exist between Egyptian and the Semitic

languages, a connection so close as to warrant the assumption of a common origin for the two, Egyptian itself being the result of a combination of a Semitic substratum with Hamitic elements. There is nothing improbable in the supposition of an eastern migration of Semites into Arabia and the Euphrates valley, and then by further moves an entrance into Palestine and Syria. If, as seems probable, the origin of the so-called Phœnician alphabet, which is so peculiarly adapted to Semitic speech, is to be sought in Southern Arabia, an additional support for what may be called the African theory will be found. See LANGUAGE.

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Semler, JOHANN SALOMO: theologian; b. at Saalfeld, Saxe-Meiningen, Dec. 18, 1725; studied theology at the University of Halle, where he was appointed professor in 1751, and director of the theological seminary in 1757. D. at Halle, Mar. 14, 1791. He took a prominent part in the starting of the rationalistic movement in the German theology, but he was cautious in forming his views and careful in arguing them; and although his talent as an author was rather small, his works are pervaded by a spirit of genuine historical criticism, which exercised great influence. His principal works are *Apparatus ad liberalem Veteris Testamenti interpretationem* (Halle, 1773); *Abhandlung von freier Untersuchung des Kanons* (4 vols., 1771–75); *Versuch einer biblischen Dämonologie* (1776); *Versuch christlicher Jahrbücher* (2 vols., 1783–86); and an autobiography (2 vols., 1781–82). Revised by S. M. JACKSON.

Semlin (Hung. *Zimony*): town of Austria, at the eastern end of the military frontier, at the confluence of the Save and the Danube, opposite Belgrade (see map of Austria-Hungary, ref. 9–H). It is poorly built, a large portion consisting of mud huts, but it carries on a very important transit trade between Austria and Turkey. Pop. about 13,000.

Sem'mering, or **Semering**: a branch of the Noric Alps, forming the boundary between Lower Austria and Styria; rises 4,416 feet above the sea, and contains, at an elevation of 3,066 feet, the principal pass leading from Vienna to Trieste. The first carriage-road was built here in 1728 by Charles VI., who placed at the turning-point of the road a memorial column with the inscription, *Aditus ad maris Adriatici litora.* In 1840 a longer but more comfortable road was completed, and in 1854 a railway was opened between Gloggnitz on the Austrian and Mürzzuschlag on the Styrian side, ascending to 2,893 feet, and leading through fifteen tunnels and over sixteen viaducts. The road was constructed by Carlo Chega, and was considered the most audacious and most ingenious engineering work of its kind.

Semmes, RAPHAEL: naval officer; b. in Charles co., Md., Sept. 27, 1809, of Scotch-Irish parentage; became a midshipman in the U. S. navy 1826; was a volunteer aide to Gen. Worth in Mexico 1847; became commander 1855; was secretary of the lighthouse board 1859–61; resigned at the beginning of the civil war; held a commission in the Confederate navy; obtained great notoriety by his exploits as commander of the Sumter and the Alabama in capturing and burning scores of U. S. merchant vessels. After the war he edited a daily paper in Mobile, Ala., subsequently becoming professor in the Louisiana Military Institute, but returned to Mobile to practice law. Author of *Service Afloat and Ashore during the Mexican War* (Cincinnati, 1851); *Campaign of General Scott in the Valley of Mexico* (1852); *The Cruise of the Alabama* (New York, 1864); and *Memoirs of Service Afloat during the War between the States* (Baltimore, 1869). He was editor of the Memphis *Bulletin* in 1867. D. at Mobile, Aug. 30, 1877. Revised by C. BELKNAP.

Semoli'na [from Ital. *semolino*, liter., dimin. of *semola*, bran (whence Fr. *semoule*, semolina) < Lat. *si'mila*, the finest wheat flour]: an article of food much used in France and Italy, and to a small extent also in Great Britain and other countries; consists of a finely cracked wheat, or a very coarse meal made from wheat. The hard-grained wheats of Spain, Odessa, and Southern Italy are best adapted for making it. As those wheats are not easily reduced to flour, small particles continually escape being crushed by the millstones, and after grinding they are separated into various grades. Semolina is used in making bread, puddings, and soups.

Sem'pach: village of Switzerland, canton of Lucerne; famous for the battle fought here on July 9, 1386, between the Austrians and the Swiss, in which the Austrian noblemen, in spite of their valor and superior numbers, were butchered like sheep by the Swiss peasants, as they were unable to use their horse, and unable to fight on foot encumbered by their heavy armor. The army of Duke Leopold, consisting of 4,000 horse, appeared before Sempach on July 9, 1396, and was there met by the confederated Swiss, numbering 1,300. As the ground was unfitted for the action of cavalry, the knights dismounted and formed themselves into a solid and compact body. The Lucerners charged, but the wall of steel was impenetrable, and not a man of the Austrians was wounded, while sixty of the bravest Lucerners, with their chief, were killed. Then Arnold von Winkelried, a knight of Unterwalden, rushed forward, grasped with outstretched arms as many pikes as he could reach, buried them in his bosom, and bore them down to the earth by the weight of his body. His companions rushed over his body into the breach thus made, slaughtered a great number of the armor-encumbered knights, and threw the remainder into the utmost confusion and dismay. See Otto Kleisner, *Die Quellen zur Sempacher Schlacht und die Winkelried-Sage* (Göttingen, 1873).

Semper, GOTTFRIED: architect; b. in Hamburg, Nov. 29, 1803; studied mathematics at Göttingen, architecture in Munich and Paris; traveled much in Italy, Sicily, and Greece; was appointed Professor of Architecture at Dresden in 1834; fled to London in 1849 on account of his participation in the revolutionary movements, and taught at the Royal Academy in Marlborough House till 1856, when he became Professor at the Polytechnic Institude of Zurich. In 1869 he was called to Vienna to give advice as to the proposed building of the museum, and in 1871 he settled there to superintend those important structures. In 1869 also he was employed upon the new Dresden theater in place of the one burned in that year; this building was not finished until 1878. His other important buildings are the Polyteehnicum at Zurich, the Church of St. Nicolai in Hamburg, the synagogue at Dresden, etc. At the Universal Exposition of 1867 he exhibited a plan of a theater in Rio de Janeiro, for which he obtained a gold medal. He wrote *Die vier Elemente der Baukunst* (Brunswick, 1851); *Ueber Industrie, Wissenschaft und Kunst* (1852); *Der Stil in den technischen und tektonischen Künsten* (2 vols., Frankfort, 1860–65), etc. He set forth with great decisiveness and defended with many ingenious arguments and acute observations the view that the antique architecture and sculpture were polychromic throughout, and he decorated the antique department of the Art Museum of Dresden in accordance with this principle. D. in Rome, May, 1879.

Revised by RUSSELL STURGIS.

Semper, KARL: naturalist; nephew of Gottfried Semper; b. at Altona, Germany, July 6, 1832; was educated in the naval school of Kiel and the Polytechnic School of Hanover, and studied natural science in the University of Würzburg. After visiting the principal countries of Europe he embarked in 1858 for the Indies, visited Manila, the Philippine Islands, China, and Japan, and was after his return to Europe, in 1866, appointed Professor of Zoölogy at Würzburg, and held the position until his death May 29, 1893. He visited the U. S. in 1877, and delivered a course of lectures before the Lowell Institute, Boston, published under the title *Animal Life as affected by the Natural Conditions of Existence* (New York, 1881). He published *Reisen im Archipel der Philippinen* (Wiesbaden, 1867–72); *Die Philippinen* (Würzburg, 1869); *Die Palau Inseln im stillen Ocean* (Leipzig, 1873); *Die natürlichen Existenzbedingungen der Thiere* (Leipzig, 1880), and other works. He also edited 9 volumes of *Arbeiten aus dem Zoologischen Institut* in Würzburg. Revised by J. S. KINGSLEY.

Senancour, se-năn'koor', ÉTIENNE PIVERT, de: author of *Obermann*; b. in Paris in 1770; educated for the priesthood, but disliking that profession ran away from home and lived in Switzerland, whence after a brief period of married life he returned to France, saddened by the loss of his young wife and beggared in fortune. His scanty earnings as a hack writer in Paris were supplemented by a small pension granted by Louis Philippe, but his struggle with poverty combined with domestic misfortunes and ill health to give his books a tone of deep melancholy. His *Rêveries sur la Nature primitive de l'Homme* (1799) is strongly marked by the influence of Rousseau. *Obermann* (1804) is the story of

a solitary and melancholy person, who gives expression to his skepticism and his weariness of life in a series of letters written from Switzerland. While the author belongs to the sentimental school of writers and the work is tinged with a somewhat morbid spirit, its style is good, and the subject-matter often striking and original. It exerted a considerable influence upon his own and the succeeding generation, and Matthew Arnold characterizes him as the most sincere and impressive of sentimental writers. D. at St.-Cloud, Feb., 1846.

Senate [viâ O. Fr. from Lat. *sena'tus*, deriv. of *se'nex*, *se'nis*, old man, elder]: originally, the deliberative assembly of the Romans; in modern times the upper house of the national Legislature in the U. S. and in several other countries. See LEGISLATURES.

Senato'bia: town; capital of Tate co., Miss.; on the Illinois Cent. Railroad; 35 miles S. of Memphis (for location, see map of Mississippi, ref. 3–F). It is in an agricultural region, is an important shipping-point of corn, cotton, and live stock, and contains a Peabody public school, a State bank with a capital of $25,000, and 2 weekly newspapers. Pop. (1880) 935; (1890) 1,077; (1900) 1,156.

Sendai, sen'dī': an important city in the northeast of Japan; situated on the left bank of the Shoshi-gawa, about 10 miles inland (see map of Japan, ref. 5–E). It was the castle-town of the great lords of the Date family, who at one time embraced Christianity; and relics of a mission to Rome made in 1615 are still preserved. The castle, partly destroyed in the civil war of 1868, is used as a barrack, Sendai being a military center for the north. It is also an educational center of importance, having a higher middle school, normal school, and several Christian schools. The Greek Church has a strong following in the neighborhood. The town is noted for the production of trays and other articles made of a fossil wood. Pop. 60,000. J. M. DIXON.

Sen'eca: city (founded in 1860); capital of Nemaha co., Kan.; on the Nemaha river, and the Kan. City N. W., and the St. Jos. and Gr. Island railways; 64 miles N. by W. of Topeka, 77 miles W. of St. Joseph, Mo. (for location, see map of Kansas, ref. 4–I). It is in an agricultural, fruit-growing, and stock-raising region, has a large butter-trade, grist-mill, foundry, and shoe-factory, and contains 4 churches, a national bank with capital of $50,000, a State bank with capital of $75,000, a private bank, and 3 weekly newspapers. Pop. (1880) 1,203; (1890) 2,032; (1900) 1,846.

EDITOR OF "TRIBUNE."

Seneca: town; Newton co., Mo.; on the St. L. and San Fran. Railway; 327 miles S. W. of St. Louis (for location, see map of Missouri, ref. 7–D). It is in an agricultural and lead and zinc mining region, has several mills and extensive stock-raising interests, and contains the only tripoli mines in the U. S., a State bank with capital of $16,000, and a weekly newspaper. Pop. (1880) 380; (1890) 1,101; (1900) 1,043.

EDITOR OF "DISPATCH."

Seneca, LUCIUS ANNÆUS: philosopher and writer of tragedies; b. at Corduba, Spain, about 4 B. C.; belonged to a Spanish-Roman family, but was educated in Rome. His father, Annæus Seneca (the prænomen Marcus is without authority; *Lucius* is found in several MSS.), the Rhetorician (b. not later than 54 B. C. at Corduba; d. in Rome about 39 A. D.), was a man of literary studies, wealthy and influential. Almost the whole of his *Suasoriarum Liber* and five books of his *Controversiarum Libri Decem* are extant, edited by Bursian (Leipzig, 1857), Kiessling (Leipzig, 1872), H. J. Müller (Prague, 1887), and give a striking aspect of the moral degradation and æsthetic futility to which the oratorical art had sunk in Rome at his time. (See Koerber, *Ueber den Rhetor Seneca und die römische Rhetorik seiner Zeit*, Marburg, 1864.) Young Seneca was trained in his father's art, and although he afterward left rhetoric for philosophy, he never forgot the lessons of his youth. His style, with all its pompous dignity and brilliant pointedness, is characterized throughout by preponderance of the form over the contents, of the expression over the thought, which rises from a lack of veracity, and results in mannerism and affectedness. Caligula said of his eloquence that it was sand without lime. After traveling in Greece he began to practice as an orator in Rome, and achieved great forensic triumphs, but in 41 A. D. Messalina had him accused of entertaining an adulterous connection with Julia, the daughter of Germanicus and the wife of Vinicius, and he was banished to Corsica. Here he lived for eight years, and wrote, among other works, *De Consolatione ad Helviam matrem Liber*, a consolatory letter to his mother, and one of the best of his writings, and *De Consolatione ad Polybium Liber*, a similar letter to Polybius, a freedman and one of Claudius's favorites, who had lost his brother; but this letter is one of his most disagreeable productions on account of its flattery, and its genuineness has been disputed. When Claudius married Agrippina, Seneca was recalled by her influence in 49 and appointed tutor to her son, Domitius, afterward the Emperor Nero. Most of Seneca's very prolific authorship belongs to this last period of his life. He wrote moral essays, philosophical letters, a biography of his father, orations, physical treatises (*Quæstiones Naturales*, and others now lost), epigrams, and tragedies. The last mentioned, nine in number, are especially interesting from being the only complete specimens of Roman tragedies extant, and from their influence upon the modern revival of tragedy. It is not certain that they were ever performed, or that they were intended to be. They are admirably adapted for recitation, being largely only versified declamations decked out with rhetoric and moral sentiments. In organic structure they are weak, and they sin against the dramatic decencies. The genuineness of these plays, often attacked, is generally conceded, although Ribbeck holds to the possibility of another Seneca, and Leo suspects the latter part of the *Hercules Œtæus*. A tenth play, *Octavia*, which is a *prætexta* and contains an allusion to Nero's death, can not be by Seneca. The best editions are by Leo (Berlin, 1878–79, 2 vols.), and by Peiper and Richter (Leipzig, 1867). Of his prose essays, some of the most celebrated, *De Ira*, *De Tranquillitate Animi*, etc., are inexhaustible sources of piquant quotations; others, *De Clementia ad Neronem Cæsarem Libri Duo*, are rather curious on account of the personal character which the author has not been able to conceal under the representation of his ideas; but the largest portion is vague and trivial—*De Constantia Sapientis*, *De Brevitate Vitæ*, etc. His 124 *Epistolæ ad Lucilium* have more interest, containing moral observations and aphorisms of practical value. His *Apocolocyntosis* is also worth reading. It is a satire on Claudius, written after the death of the emperor, and is very biting. It is a specimen of the Menippean satire, being part prose and part verse, doubtless written to please Nero, for whom Seneca also composed a funeral oration, not extant, upon Claudius. Seneca was consul in 56, but after the death of Burrus in 62 his influence with Nero began to wane. The emperor began to hint at the millions which the philosopher had amassed. Seneca became alarmed, and offered to repay the whole amount and content himself with a small annuity. Nero refused the offer, and Seneca then retired from the court, gave no levees, was never seen in public, and tried his utmost to sink into oblivion. But in vain. Some one mentioned him as an accomplice in the conspiracy of Piso, and Nero sent him an order to commit suicide, which he immediately obeyed. He opened the veins in his feet and arms, and, discoursing with his friends on the brevity of life and the equanimity of the philosopher, bled to death in a hot bath 65 A. D. From the revival of letters in Europe, and up to the beginning of the nineteenth century, the works of Seneca, both the philosophical and the poetical, were much read and much admired. Editions were numerous and translations were made into all European languages. There were, however, always some voices which protested against his fame; and when his admirers tried to prove that he was a Christian and a friend of St. Paul, his adversaries undertook to prove that he was an atheist and a hypocrite. Among later editions of his works are those of his prose writings by Fickert (3 vols., Leipzig, 1842–45) and by Haase (3 vols., Leipzig, 1852–53); of the *Apocolocyntosis* in Buecheler's Petronius (Berlin, 1882); and *Dialogorum Libri XII.* (Gertz, Copenhagen, 1886). See Farrar's *Seekers after God*; Lightfoot's *Essay on St. Paul and Seneca*, appended to his *Commentary on the Epistle to the Philippians* (London, 1879); Westerburg's *Der Ursprung der Sage dass Seneca ein Christ gewesen* (Berlin, 1881). Revised by M. WARREN.

Seneca Falls: village; Seneca co., N. Y.; on the Seneca river (the outlet of Seneca Lake), and the N. Y. Cent. and Hud. River Railroad; 3 miles W. of Cayuga Lake Park, a popular summer resort, and 16 miles W. of Auburn (for location, see map of New York, ref. 5–F). A fall of 50 feet in the river gives the village its name and affords excellent power for manufacturing. The village contains manufactories of steam fire-engines, pumps, machinery, and woolen goods;

job-printing establishment; 7 churches; an academy; a soldiers' monument; electric railway to Waterloo, Genesee, and Cayuga Lake Park; a national bank with capital of $100,000, a savings and a private bank, and 4 weekly newspapers. Pop. (1880) 5,880; (1890) 6,116; (1900) 6,519.
"Courier" Printing Company.

Seneca Indians: See Iroquoian Indians.

Seneca Lake: a body of water in Western New York, bounded by Seneca, Schuyler, Ontario, and Yates Counties. It is 35 miles long, from 1 to 4 miles broad, with an elevation of 447 feet, and its shores are bold, picturesque, and fertile. The lake is navigated by steamboats. Its waters reach Lake Ontario by Seneca and Oswego rivers. Its greatest depth is 630 feet.

Seneca-oil: a local name for Petroleum (*q. v.*).

Se'nefelder, Aloys: inventor; b. at Prague, Bohemia, Nov. 6, 1771; entered on the stage at Munich, his father being an actor: afterward attempted literature, and engaged finally in the printing business, which led to his invention of Lithography (*q. v.*). Lack of money and the imperfection of the invention in its primitive state caused him many difficulties and disappointments, and it was not until 1806, when he settled at Munich and received the support of the Bavarian Government, that he was able to perfect his invention. D. at Munich, Feb. 24, 1834. He wrote a *Lehrbuch der Lithographie* (Munich, 1818; French translation, Strassburg, 1819; English translation, *Complete Course of Lithography*, 1819). See Nagler, *Aloys Senefelder und der geistliche Rath Simon Schmidt* (Munich, 1832).

Sen'ega: a drug consisting of the root of a polygalaceous perennial plant, *Polygala senega*, which grows throughout most parts of the U. S., frequenting open fields and rocky places. It is small, with small white flowers forming a close spike at the summit of the stem. The roots are of various sizes, tapering, branched, and twisted, with a thick gnarled head from which the several yearly stems arise. The epidermis is dark-colored, corrugated, and is the active part of the root. The dried root has little smell, but leaves a pungent and acrid impression in the mouth after chewing. Senega contains a peculiar principle called *polygalic acid*, probably identical with saponine. The drug is an acrid irritant, producing vomiting and purging in overdose. Its first use in medicine was by the Seneca Indians, who employed it as a remedy in cases of rattlesnake-bite, but by physicians it is used almost exclusively as an ingredient in cough-mixtures in the second stage of respiratory catarrhs. Its effects are analogous to those of squill. Senega is an ingredient of the *compound sirup of squill* of the *United States Pharmacopœia*. Revised by H. A. Hare.

Senegal': the largest river of Senegambia, Northwest Africa. It lies almost on the border of the Sahara, and derives its water chiefly from several large southern tributaries rising in the regions of Futa Jallon and Bambara. Though a bar at its mouth obstructs navigation from the sea, the lower half of the river (500 miles) is navigated at high water by small steamers. C. C. A.

Senegal: a French colony bordering on the Atlantic in the northwestern part of Senegambia, Africa. Pop. 135,000. There is a governor-general, assisted by a colonial council, at the chief town, St. Louis. See Senegambia.

Senegam'bia [named from *Senegal* + *Gambia*, names of its two chief rivers]: a French possession in Northwest Africa, with no well-defined boundaries on the E. and S. It borders on the Atlantic and the Sahara limits it on the N. The Gambia may be called its southern boundary, and its extension to the E. may be taken as including that part of the French Sudan lying W. of the upper Niger. The population, including the colony of Senegal and the upper Niger region, is believed to be about 1,850,000. In the seventeenth century France took possession of some points on the coast, but the great extension of the colony eastward dates from the middle of the nineteenth century, and particularly from the period 1871–88, which saw the gradual advance of the French power to the upper Niger, an acquisition that cost enormously in human life and money, on account of the trying climate and stoutly contested campaigns with powerful Mohammedan chiefs. The most formidable opponents of the French advance were the great religious pretenders and potentates, Mahmadu-Lamine, whose final defeat and death was the result of the campaign under Gen. Gallieni (1886–88), and Samory, the most powerful ruler in the French Sudan, who was not finally subdued until 1893. The vast territory is for the most part sparsely peopled. It includes a number of distinct tribes, of whom the Mandingo, the Yolofs, and the Fulbe are the most important. The greater part of the country is very fertile, and rice, maize, tobacco, and cotton raising are capable of large development. In Senegal proper about one-third of the land is under cultivation, and the raising of cattle and sheep is a growing industry. The great drawbacks are the climate and the disinclination of the natives to labor, but in the best-cultivated regions the French, within a few years, have doubled the product. On the upper Senegal, in 1884–86, 45 per cent. of all the European residents died, the most fatal causes being sunstroke, dysentery, and malaria. The capital and chief port is St. Louis, on an island at the mouth of the Senegal. Pop. 20,000. From Kayes, the head of navigation on the Senegal, a railway has been built eastward 94 miles to Bafoulabe, and is to be extended to the upper Niger. Another railway connects St. Louis with Dakar, an important town at Cape Verde, and it is greatly assisting in the development of the coast districts. The most important interior settlements are Kayes, on the upper Senegal, Balfoulabe, at the mouth of the Bathoy, and Bammako, on the upper Niger, from which point the French have descended the river and occupied Timbuctu. See Dakar. C. C. Adams.

Senescence: See Old Age, Diseases of.

Senigal'lia, or **Sinigaglia** (anc. *Sena gallica*): town; province of Ancona, Italy; near the Adriatic, at the mouth of the Misa, which divides the town into two parts (see map of Italy, ref. 4–E). The streets are broad and well paved, and some of them are flanked by fine buildings constructed with porticoes forming a continuous sheltered promenade. The maritime trade is carried on by means of a short canal, for which the lower arm of the Misa has been made available. The manufacturing activity is considerable, chiefly in silk and linen. The annual fair of Senigallia (beginning July 22 and ending Aug. 8) was formerly one of the most famous in Europe, and is still much frequented. The town is the place of the victory of C. Claudius Nero over Hasdrubal (207 B. C.). Pop. 9,602. Revised by M. W. Harrington.

Senior, Nassau William: economist; b. in Berkshire, England, Sept. 26, 1790; graduated at Oxford 1812; was admitted to the bar 1819; was Professor of Political Economy at Oxford 1825–30, and again 1847–62; was master in chancery 1836–53. D. in London, June 4, 1864. He was the author of essays upon political economy, philosophy, etc., of narratives of travel in Turkey and Greece (1859) and in France and Italy (1871), and was for forty years a leading contributor to *The Edinburgh Review* and other magazines.

Senn, Nicholas: See the Appendix.

Senna [from Arab. *sanā*, senna]: the leaves of several species of Cassia (*q. v.*), various preparations of which are used medicinally. Those which constitute the commercial senna are exported from Southern India and from Alexandria. A senna-plant (*Cassia acutifolia*), indigenous in Egypt and the African deserts, furnishes most of the Alexandria senna. Great labor has been expended by chemists in endeavoring to isolate the valuable cathartic principle of senna, which was discovered by Dragendorff and Kubly in 1868 to be cathartic acid. It is a complex glucoside, and, singularly, contains sulphur. Like glucosides generally, it is easily alterable, and hence difficult of isolation and preparation. Further information may be had in the *National Dispensatory*, under *Senna*. Revised by H. A. Hare.

Sennaar': an ancient kingdom of the Eastern Sudan, Africa, which retained its name when it became a province of Egypt; lying mostly between the Bahr-el Azrek and the White Nile. The soil is so fertile along the river banks that Sennaar was long called the granary of the Egyptian Sudan, but away from the rivers the region is mostly an uninhabited sandy waste. In the flourishing days of the Egyptian Sudan there was a dense population along the two great rivers, in whose valleys a large amount of grain was raised, while in the towns gold-smelting, leather-working, pottery-making, and other industries were pursued. Sennaar, for generations the chief town, had great importance until Khartum became the center of commerce. Its population had dwindled to 8,000 before the Mahdist revolt. It was the last Egyptian stronghold to succumb to the Mahdi. Now only heaps of stone mark its site.
C. C. Adams.

Sennach'erib [Gr. Σαναχάριβος: Heb. *San'chērībh*, from Assyr. *Sin-achi-irib*, liter., "the Moon(-god) has multiplied

brothers"]: King of Assyria 705–681 B. C., son and successor of Sargon. He was vain and haughty, a terrible scourge in war, and a great builder. His campaign against the West in 701 was unsuccessful (2 Kings xviii., xix), as may be seen also from his own account of the affair. (Cf. E. Schrader, *The Cuneiform Inscriptions and the Old Testament*, i., 278–310.) He boasts that he destroyed Babylon utterly because this city bore the Assyrian yoke unwillingly. He was murdered by two of his sons. D. G. Lyon.

Sens, sänn (anc. *Agenticum*, later *Senones*): town of France, department of Yonne: on the right bank of the Yonne (see map of France, ref. 4–F); has vestiges of the old walls constructed by the Romans, a fine cathedral, manufactures of leather, serge, druggets, and glue, and an active trade in corn, wine, flax, and hemp. Pop. (1896) 14,924.

Sensation: phenomena which result within the mind immediately from impressions upon the senses. The experiences of moisture and resistance which follow from contact with a piece of iron, and the pain felt in case it is hot, are equally sensations. Sensation must be carefully distinguished from the physical phenomenon which precedes or accompanies it. The impression is the modification of the organ, especially of the nerves and nervous centers, which arises from an external stimulus, as the vibration of ether or air. The nature of the different sense-impressions is not well understood; but in each case they are some form of movement. They have all the characteristics of physical phenomena: they can be located, measured, apprehended by the senses. Sensations, on the other hand, can not be compared with movement of any kind. The difference between them is plainly seen in the fact that an impression may take place without any sensation. The impression may be too feeble, or too prolonged; or too often repeated, as the irritation of our clothing; or the attention may be occupied, so that the impression does not produce its usual sensation.

Affective and Presentative Elements in Sensation.—In most sensations there is a distinct knowledge element over and above the intensive subjective state, which constitutes the sensation proper. There is an element of knowledge of things without us or of our own bodies. This is the presentative or *perception* element in sensation. There are great differences in sensations in this respect.

The *affective* or feeling quality, on the other hand, comes out most strongly in cases of massive or voluminous stimulation: here presented relations are at a minimum and sensibility is at a maximum. When a man plunges into a very hot bath, the feeling experienced is so overwhelming that his knowledge that it is a hot bath, and that it is he himself who is taking the bath, occupies a very slight degree of consciousness. In a case of severe toothache, also, what we really have predominating in consciousness is not knowledge, but feeling. As an immediate state of consciousness, we do not *know* that we have a toothache, we *feel* it. Hamilton announced the law, already anticipated by Kant, that the two elements vary in inverse ratio—which is true only in a very rough way.

Characters of Sensation.—All sensations have certain general characters, which may be subjected to investigation. These characters are four in number.

1. *Quality*: that property by which sensations are distinguished as coming from different senses, such as color, sound, taste.

2. *Quantity*: meaning intensity or mass of sensation. Investigations in intensity constitute Psycho-physics (*q. v.*).

3. *Duration*: the time occupied by the sense-function with its accompanying physical and volitional processes. Investigations in this field constitute Psychometry (*q. v.*).

4. *Tone*: the pleasure or pain which accompanies all sensation. See Pain and Pleasure.

Quality of Sensation.—There is much uncertainty as to the proper classification of sensations. It appears very easy to discover at once what is immediately given as a pure and simple sensation. But it is not so. At the age of maturity, when one is able to make an analytical study of his states, he finds them no longer in that pure and primitive state which he would wish. They have undergone a twofold alteration. In the first place, all the senses act together, and different sensations, by virtue of the laws of association, are experienced as one. And, further, by virtue of the same laws, intellectual elements are superposed upon our sensations, making them much more complex. These associations become, after time has made them habitual, almost indissoluble; so that it is very difficult to isolate the different sensations from one another, or the great body of sensitive data from the contributions of reason and experience.

Relativity of Sense-qualities: Contrast.—Further, we find a series of phenomena which show that there is no fixed typical sensation of each quality; but that all determinations of quality are to a degree relative distinctions among many factors in consciousness. This principle of Relativity (*q. v.*) is illustrated by the so-called *phenomena of contrast*. The general statement of fact is this: Any sensation (color, sound, taste) which occurs after or with other sensations (colors, etc.) is different from what it would have been if the other sensations had not been present, or if the other sensations had themselves been different; the variation, however, is within the same sense-quality.

In the domain of the special senses, such effects of one sense-quality upon another may be subjected to experimental determination by psycho-physical methods. The phenomena of color-contrast are the richest and best understood class of facts. In general, color-contrast means that when part of the retina is stimulated to react to a particular color, there is a tendency of other portions to react to the complementary color. For example, the so-called Meyer's experiment may be cited: Put a scrap of gray paper on a colored (red) background, and spread over the whole a sheet of white tissue; the gray scrap will tend to assume the color complementary to the background (green). The white sheet over the whole is necessary to obscure distinct lines of separation between the colors beneath; if such distinct boundary-lines are exposed, the contrast-phenomena disappear. Recent research has developed a number of interesting optical phenomena of this class. Stumpf has discovered that the pitch of a tone is modified by the occurrence of another tone of a different pitch, in such a way that the interval between them is lessened. Contrasts of temperature are also easily brought about. Cold water feels colder if the hand is just from warm water. Differences in temperature of the two hands lead to exaggerated differences of sensation when they are plunged together into two vessels of water of the same temperature. Contrast is called *simultaneous* or *successive* according as the rival sensational qualities occur together or in succession.

Two theories of sensational contrast have been advocated, one called the psychological, according to which such contrasts are due to judgment or synthesis, the actual sensations themselves having fixed and unaltered qualities. This has been held by Helmholtz, and has been used to support the theory that there may be "unconscious judgments." The other, the physiological theory, holds that contrast-effects are due to complex conditions of stimulation. The different color-stimuli, for example, are not reported separately to consciousness; but only their united effect is operative in the optical center. Consequently, what we have is a case of summation or fusion of stimuli, not of comparison and judgment of sensational atoms. This latter theory is now completely victorious, principally through the brilliant experimental work of Hering.

It seems reasonably safe to conclude that there are well specialized nervous functions which correspond to the great differences of quality in sensations: this is shown by the fact that the differences are stable; that the senses are largely independent of one another in their activity; that each such function has normal minimum and maximum activities which give original degrees of intensity in consciousness. But within these limitations both qualities and intensities are subject to the law of relativity as well by reason of nervous summation as of mental synthesis.

J. Mark Baldwin.

Sensationalism: a term in philosophy sometimes used to denote the doctrine that all knowledge is derived originally from the senses. Various other terms are used as its synonyms—viz., "sensism," "sensualism," "sensuism," "empiricism," etc. Hobbes (in 1650) taught that all knowledge grows out of sensations. After sensation there remains behind the memory of it, which may reappear in consciousness. The memory of objects once perceived is aided by words. We therefore connect words to our mental representations of objects. The same word, serving as a sign for numerous similar objects, gives rise to general ideas. Locke held substantially the same views. Condillac (1755) likewise endeavored to explain all mental functions as transformations of sensation (*sensations transformées*). Desire arises from the recollection of a past sensation; the Ego is the

totality of sensations. Bonnet (1755), von Holbach (1770), Buffon (1780), Cabanis (1798), Destutt de Tracy (1815), Laromiguière (1818) held the doctrine of sensationalism. Among recent German writers Czolbe has elaborated a system of psychology that derives all the elements of self-consciousness from sensation. But he has to assume teleological forms—"the sensations and feelings which are hidden in space or the world-soul"—to explain the "fundamental limits of knowledge." His contemporaries, however—Moleschott, Büchner, Vogt—proclaim not only sensationalism, but materialism without reserve. While Cabanis said that thought is a secretion of the brain, Carl Vogt added, "the brain produces thought in the same way that the liver produces bile," etc. John Stuart Mill (1865) defines matter to be "a permanent possibility of sensation," and mind to be "a series of feelings with a background of possibilities of feeling": thus making sensation the central principle, not only of knowledge, but of being, and apparently reaching the doctrine of Berkeley, *Esse est percipi*. Post-Kantian sensationalism has had to explain away the existence of universal and necessary ideas, such as time, space, causality, etc. Mill holds the geometrical axioms to be "generalizations from observation." Herbert Spencer (1860) holds that knowledge consists in "symbolic conceptions" when it relates to aught else than concrete objects that are not "too great or too multitudinous to be mentally represented." In contrast to this, he holds that "the ultimate truth which transcends experience by underlying it is the persistence of force." Thus he makes in one instance all general ideas "symbolic," the real being particular things only; and then he makes force, which corresponds to the most symbolic of our ideas, to be the most real of realities. Within the period 1870–95 a more thorough study of physiological psychology by a scientific method has done more to clear up and reduce to exact knowledge the theory of the action of the five senses than the loose observations of twenty-five centuries previously. The articles on PSYCHOMETRY and PSYCHO-PHYSICS give the history and bibliography of this movement. It is too early to perceive the effects of these investigations into the essential nature of sense-perception upon general philosophical theories, but it is certain that they will modify very materially the conceptions and method of presentation of those who in the future defend the doctrine that all knowledge is derived from the five senses.

WILLIAM T. HARRIS.

Senses [from Lat. *sen'sus*, feeling, one of the senses, deriv. of *senti're*, *sen'sum*, feel]: special developments of the general sensibility of the living organism. In the special senses, i. e. hearing, sight, etc., the property of general sensibility of the organism has become immensely modified and intensified by being concentrated and localized in distinct organs, the ear, the eye, etc., and by being specialized so that each organ transfers from the object to consciousness only a distinct part of that total impression which the object is able to give and consciousness is capable of receiving—the ear only the audible, the eye only the visible, etc. There are five such senses—hearing, sight, smell, taste, and touch—but they all rise simply as individual developments of the same fundamental faculty of general sensibility. Their degree of individualization is very different, being highest in sight and feeblest in smell and taste; the latter both disappear very easily in mere feeling, as smell in sneezing and taste in nausea. It is apparent, however, that the general sensibility of the human organism covers a much larger ground than its five individual senses. There are sensations which enter into consciousness with great vividness without going through the special senses, as, for instance, the feelings of hunger, thirst, suffocation, pleasure, pain, rest, fatigue, etc., which are termed general sensations. See ACOUSTICS, MUSCLE-SENSE, VISION, etc., and *Organs of Special Sense* in the article HISTOLOGY. Revised by EDWARD T. REICHERT.

Sensibility: See FEELING and SENSATION.

Sensitive Plant: a low leguminous plant, *Mimosa pudica*, of tropical America, now widely dispersed over the world and commonly cultivated, on account of the rapid movement of the leaves which, when brushed or jarred, appear to shrink from the touch. This faculty is shared in a less degree by several other species of *Mimosa* and some related plants, such as the sensitive brier (*Schrankia*) of the southern parts of the U. S. See *Plant Movements* in the article PHYSIOLOGY, VEGETABLE.

Senso'rium [= Lat., the seat or organ of sensation, deriv. of *sen'sus*, sense, feeling]: the supposed seat in the nervous system of the processes which underlie sensation. The cortex or gray matter of the brain is considered the sensorium in modern discussion in physiology and psychology.

J. M. B.

Sentence [viâ O. Fr., from Lat. *senten'tia* (for **sentien'tia*), way of thinking or feeling, opinion, judgment, deriv. of *senti're*, feel, think]: in the law, a judgment or determination pronounced by a court after the trial or hearing of a cause, by which the remedy is granted or the sanction is imposed. In the common-law courts the term is confined to criminal cases, their final decision in civil suits being called a "judgment"; while the corresponding act of a court of equity is usually denominated a "decree." In those tribunals whose procedure is based upon the civil law—in the admiralty courts, the English ecclesiastical courts, and sometimes in the U. S. in the probate or surrogate courts—the term "sentence" is used, instead of "judgment" or "decree," to designate all judicial determinations. The sentences in civil causes like judgments are either final or interlocutory—final, when they pass upon all the issues material to the decision, determine the rights and duties of the parties, and terminate the pending controversy; interlocutory, when they pass upon some collateral matter or proceeding in the action, or when they establish some right preliminary to the final adjudication. In criminal trials, according to the common-law methods, the sentences are all from their very nature final. It is the exclusive province of the jury to determine the guilt or innocence of the accused. When a verdict of guilty is rendered, the prisoner is thereby convicted, and it then becomes the duty and function of the court to pronounce upon him the judgment or sentence which the law provides as a punishment for his crime. Previous to this final act in all cases of felony the convict is publicly asked by the judge if he has anything to say why the sentence of the law should not be pronounced upon him. This proceeding, which was originated at an early period of the English law, when the prisoner could not be defended by counsel, in order that he might have an opportunity to suggest any error that had occurred, is now an empty form, and yet the form must be observed, or else the judgment would be void. No error being shown, the presiding judge declares the sentence, whereby the court orders the prisoner to be capitally executed on a certain day named, or to be imprisoned for a specified period, or to be fined in a designated amount, or otherwise punished as provided by law. This sentence is entered by the clerk, and constitutes a most important part of the judicial record. The doctrines and rules of the law in reference to the nature and effects of a JUDGMENT (*q. v.*) apply also to sentences. See the treatises of Bishop and Wharton on *Criminal Law*, and Black on the *Law of Judgments*.

Revised by F. STURGES ALLEN.

Sentiment: the higher form of emotion, attaching to ideals of art and life. (See IDEALS and IDEAL FEELINGS.) The great classes into which the sentiments fall are usually distinguished as ethical, æsthetic, and religious. The religious are the most complex, and rest upon the other two. Religious objects and ideals involve both the ethical and æsthetic determinations—that is, they are both beautiful and good.

Ethical Sentiment: its Nature and Origin.—Conscience is the popular term for this emotion. It involves three elements, which are, however, closely united in a single state of mind, called ethical. If we fancy the mental life cut right through at the moment of a moral decision, we should find three elements which moralists distinguish by the phrases moral quality, moral authority, and moral ideal. These may be made clearer by a concrete instance: I give money to a beggar because I am bound by conscience to do so. The moral quality of my act is my feeling of its harmony with my better acts as a whole, and the exaction I make upon other men to be charitable also; without this conscience would be wanting—the act would be indifferent. The moral authority of the act is the feeling which at once arises that this quality has an immediate reference to my will. I am bound to choose it as my act; without this there is no conscience—conscience is dead. The moral ideal is the outreach of my feeling toward a state of will in which such a relative and hesitating decision would yield to clearer and more direct moral vision; a state of will which I can not picture, can not conceive, but which I feel my will is meant for, and for which my present act for conscience' sake is the only means to prepare me.

Moral sentiment arises evidently around acts and atti-

tudes of will. It is accordingly to be expected that the account of the genesis of WILL (*q. v.*) can throw some light upon the conditions of the rise of conscience. So if it be true that present character is the deposit of all former reactions of whatever kind, and that what we call will is a general term for concrete acts of volition, and further that volition represents a co-ordination of tendencies, then according as these tendencies are suggestions from other persons on the one hand, or represent partial expressions of one's own personal character on the other hand, there arises a division within the sense of voluntary agency, which is the germ of the notion of self. (See SELF-CONSCIOUSNESS.) Your suggestion to me may conflict with my desire: my desire may conflict with my own present sympathy. Self meets self, so to speak. The self of accommodation, imitation, the self that learns, collides with the self of habit, of character, the self that seeks to dominate. It is no longer a matter of simple habit *versus* simple suggestion, as is the case in infancy, before the self gets the degree of complicity which constitutes it a voluntary agent. It is that form of habit which is personal agency coming into conflict with that form of suggestion which is also personal to me as representing my social self. Your example is powerful to me intrinsically; not because it is abstractly good or evil, but because it represents a part of myself, inasmuch as I have become what I am in part through my sympathy with you and imitation of you. So your injunctions to me bring out a difference of motor attitude between what is socially responsive in me, in a sense public, and that which is relatively me alone, my private self.

When I come to a new moral situation, therefore, I am in a condition of relative equilibrium, or balance of two factors—my personal or habitual self and my social suggestive self. Your natural disinclination to attend a social gathering at the house of Mr. A may be overcome by an appeal to your family, social, public self in its broad sense, supplemented by an appeal to your sympathetic, narrower, social self. The new decision tends to destroy this equilibrium by re-enforcing my "copy," and its influence in my character, on one side or the other, and so to lead me out for further habit or for new social adaptations.

On this basis comes a new mental movement which involves a further development of the imitative *motif*—a development which substitutes warmth and life for the horrible coldness and death of that view which identifies voluntary morality with submission to a "word of command." The child, it is true, very soon comes across that most tremendous thing in its moral environment called authority; and acquires that most magnificent thing in our moral equipment called obedience. He acquires obedience in one of two ways, or both: by suggestion or by punishment.

But whether obedience comes by suggestion or by punishment, it has this genetic value: it leads to another refinement in the sense of self, at first projective, then subjective. The child finds himself stimulated constantly to deny his impulses, his desires, even his irregular sympathies, by conforming to the will of another. This other represents a regular, systematic, unflinching, but reasonable personality—still a person, but a very different person from the child's own. It is a stage of the child's apprehension of persons—his sense of the regularity of personal character in the midst of the capriciousness that before this stood out in contrast to the regularity of mechanical movement in things. There are extremes of indulgence, the child learns, which even the grandmother does not permit; there are extremes of severity from which even the cruel father draws back. Here, in this dawning sense of the larger limits which set barriers to personal freedom, is the "copy," forming which is a sense of personal authority or law. It is projective because he can not understand it, can not anticipate it, can not find it in himself. And it is only by imitation that he is to reproduce it, and so arrive at a knowledge of what he is to understand it to be. So it is a "copy for imitation." It is its aim—so may the child say to himself—and should be mine—if I am awake to it—to have me obey it, act like it, think like it, be like it in all respects. It is not I, but I am to become it. Here is my ideal self, my final pattern, my "ought" set before me. My parents and teachers are good because, with all their differences from one another, they yet seem to be alike in their acquiescence to this law. Only in so far as I get into the habit of being and doing like them in reference to it, get my character molded into conformity with it, only so far am I good. And so, like all other imitative functions, it teaches its lesson only by stimulating to action. I must succeed in doing—he finds out, as he grows older and begins to reflect upon right and wrong—if I would understand. But as I thus progress in doing, I forever find new patterns set for me; and so my ethical insight must always find its profoundest expression in that yearning which anticipates but does not overtake the ideal.

My sense of moral ideal, therefore, is my sense of a possible perfect, regular will taken over *in me*, in which the personal and the social self—my habits and my social calls—are brought completely into harmony; the sense of obligation in me, in any case, is the sense of lack of such harmony—of the actual discrepancies in my various thoughts of self, as my actions and tendencies give rise to them. The friend who urges you to accept an invitation to Mr. A.'s reception adds to the reasons for your attendance, this one: "And, besides, you ought to go out more." This is the profoundest reason of all—not because it has in it the word "ought" merely, but because it makes appeal to the ideal self, before the law of which all the earlier claims have their lesser or greater value. And the thought of this ideal self, made objective, as it must be by the dialectic of this germinating social sense, out of and beyond me—this is embodied in the moral sanctions of society, and finally in God; and it is at this highest level of mental growth that the religious sentiments come fully into play.

Æsthetic Sentiment.—In beauty, the elements of the ideal seem at the outset to be most fully set forth. The simplest observation of beautiful things suffices to illustrate the necessity of both unity and variety in form. There is no beauty when unity is absolute, and it is only when arrangement is possible to a degree which allows a distinction between variety which is yet unity, which has a plan, and variety which is multiplicity, which has no plan—that any such feeling arises at all. It is equally evident, also, that meaning, significance, contributes to æsthetic effect. The beauty of a landscape is cold and formal until the smoke of a peasant's hut, or the spire of a country church, is added to give it a touch of human interest. The village green has more meaning than snow-clad Alps. And, further, we feel the essential share-ableness, universality, validity of all beauty. I expect a face to appeal to you as it appeals to me.

Nature and Origin of Æsthetic Sentiment.—Psychology seems to be tending to a view of art which emphasizes the subjective or emotional side of æsthetic. Considering pleasure the most general element in æsthetic experience, we may bring the topic under the head of Hedonics, and ask what are the marks of objects, situations, ideas, which make them suitable for arousing in us the particular kind of hedonic experience called æsthetic, i. e. what constitutes beauty?

Experiments on sensation-states—especially on the apprehension of visual forms—result in showing that whenever union of parts is effected without strain to the organ stimulated, at the same time that the elements preserve their individuality in a measure, we experience pleasure. In perception a similar principle is found, known as assimilation, to which current psychological analysis is reducing the old laws of association. When a new experience is assimilated readily to old categories—fits into the ready moulds of experience, thought, or conception—then we invariably experience pleasure, not the pleasure of pure identity, but of progressive identity of a process in consciousness. In the higher spheres we find the same fundamental movement. Conception is a process by which detached elements are arranged, brought to unity, sorted out, assimilated; an argument is such a scheme of notions, which go together without strain or conflict; and a beautiful character is one whose acts of will are consistent with one another, and gets assimilated readily in an ideal of duty.

The essential thing in it all—in sensational ease, in assimilation, in logical consistency—is this: Does the attention with both its intellectual and its nervous processes move easily?—that is, is the psycho-physical process impeded or advanced? If the latter, then pleasure, and æsthetic pleasure, just in proportion as the processes to which the attention ministers, all tend to give the best sense or emotion of accommodation.

The older criteria of beauty can be accounted for on this view: unity in variety, adaptation, association, meaning, or expressiveness; and it tends to put an end to the lasting controversy between "form" and "meaning."

For Wundt's facts showing that visual beauty of form is due to ease of eye-movements, and Zeising's "golden section," and Bain's "associations of utility," and the "teleological judgments" of the intellectualists, and the "moral

worths" of the ethical idealists, as well as the "real beauty in objects" of the realists—all these get their due, as far as their psychology is concerned, in some such formula as this: The sense of beauty is an emotional state arising from progressive psycho-physical accommodation to mental objects. Of course the metaphysics of beauty and art is not touched by this, and it does not prejudice full metaphysical treatment.

REFERENCES.—Wundt, *Physiologische Psychologie* (4th ed.); Ward, article *Psychology* in *Encyc. Britan.* (9th ed.); Lotze, *Outlines of Æsthetics*: Marshall, *Pleasure, Pain, and Æsthetics* (New York, 1894): Baldwin, *Handbook of Psychology* (vol. ii., chaps. on *Pleasure and Pain* and *Emotions of Relation*). J. MARK BALDWIN.

Seoul, sā-ool' [from Korean *seul*, liter., capital], or officially **Han-yang**: the capital of Korea; on the right bank of the Han-Kang, a tributary of the Yellow Sea; lat. 37° 31′ N., lon. 127° 7′ W. (see map of China, ref. 4–M). It is surrounded by a wall, 12 to 25 feet high, now partly in ruins, with eight gates which are closed at night. It has three straight streets, about 60 feet wide and starting from the three principal gates. These are fairly well kept, but the other streets are narrow, uneven, and filthy. There are but two noteworthy buildings, the palace of the king and a small Buddhist temple of white stone, once richly ornamented, but now much defaced. The other buildings are small, low, thatched, or tiled, and densely peopled, and these buildings encroach on the great streets, from which they are cleared from time to time. There are no arrangements for sanitation or public comfort. A noteworthy object is the great bell which sounds the hours for opening and closing the gates. It was made in 1468 and is alleged to be the third in size in the world. The city dates from 1397 A. D.; became a royal city at the end of the sixteenth century, and was sacked by the Manchus in 1637. It is the heart of Korea in the same sense that Paris is the heart of France, and the ambition of every Korean gentleman is to pass his life there, at leisure to enjoy its attractions. It was long forbidden to foreigners, and in 1888 a fanatical outbreak against foreign residents occurred. The city was occupied by the Japanese in 1894. Pop. (by census in 1793) 193,000, estimated by Cavendish (1891) at 250,000, of whom 50,000 were in the suburbs. See Cavendish, *Two Months in Korea*, in *Scottish Geographical Magazine* (Nov., 1894), and the works mentioned under KOREA. MARK W. HARRINGTON.

Separate Baptists. Separate Churches, or **Separates**: See BAPTISTS and FREE-WILL BAPTISTS.

Separate Lutherans of Prussia: those Lutherans who refused to comply with the order of Frederick William III. uniting the Lutheran and Reformed Churches. See LUTHERANISM AND THE LUTHERAN CHURCH (*The Lutheran Church in the Nineteenth Century*).

Separation: See the Appendix.

Separatists: in general, those who withdraw from an established church or religious organization; sectaries. The term was commonly applied in England in the sixteenth and seventeenth centuries to those who were also called Brownists and Barrowists, and later INDEPENDENTS (*q. v.*).

Sepia: See INDIA INK.

Sepi'idæ: See CUTTLEFISH.

Se'poy [: Fr. *spahi, cipaye*, from Hind. *sipāhī*, native soldier, from Pers. *sipāhī*, horseman soldier, deriv. of *sipāh*, whence Hind. *sipāh*, military force, army]: a native soldier in the British service in India. The practice of employing the natives as troops dates back to the middle of the eighteenth century. A large force of Sepoys took part in the battle of Plassey, and Clive afterward organized a native army in Bengal. Their good conduct inspired general confidence in their loyalty, and their numbers were increased till at the time of the mutiny (see INDIA, *History*) they were about 230,000 strong, while the European troops numbered about 40,000. After the suppression of the mutiny (1858) their numbers were reduced, and in 1894 there were 145,000 natives to 75,000 Europeans in the British army in India. The Sepoys consist of Mohammedans, Rajputs, Brahmans, and men of other castes, besides Sikhs, Gurkhas, and hillmen of various tribes. The higher officers are European.

September [viâ O. Fr. from Lat. *Septem'ber* (sc. *men'sis*, month), liter., the seventh month, deriv. of *septem*, seven]: the seventh month of the old Roman year, but the ninth of the Gregorian. It is the month of the autumnal equinox, which occurs about the 22d.

Septicæ'mia: See BLOOD-POISONING.

Septima'nia [Late Lat., deriv. of Lat. *septima'nus*, pertaining to the number seven, deriv. of *septem*, seven. So called from its seven cities—Toulouse, Agen, Bordeaux, Poitiers, Saintes, Périgueux, Angoulême]: an ancient district in the southwest of France: ceded to the Goths in 419. Its name appears in the writings of Sidonius Apollinaris (430–482). It was conquered by the Saracens in 712–719; desolated by Charles Martel in 737; conquered in part by Pepin in 760; became a part of the kingdom of Aquitaine in 778; became a dukedom in 817, a marquisate in 844; and was devastated by the Normans in 859. The Spanish March was set off in 864, and soon after it passed to the house of Toulouse.

Septim'ius Severus: See SEVERUS, SEPTIMIUS.

Septuages'ima [Lat. (sc. *di'es*, day), the seventieth day, liter., fem. of *septuage'simus*, seventieth, deriv. of *septuagin'ta*, seventy]: in the ecclesiastical calendar, the third Sunday before Lent. The first Sunday in Lent is termed Quadragesima, the three preceding ones Septuagesima, Sexagesima, and Quinquagesima.

Sep'tuagint, or **LXX**. [from Lat. *Septuaginta*, liter., the Seventy, applied to this version because of the alleged number of its joint translators]: the name commonly given to the earliest Greek translation of the Old Testament, otherwise called the Alexandrian version. According to the fabulous account of its origin in the letter of the pseudo-Aristeas, repeated by Josephus (*Ant.*, xii., 2) and others, Ptolemy Philadelphus, King of Egypt from 283 (285) to 247 B. C., at the instance of his librarian, Demetrius Phalereus, sent an embassy to Jerusalem to procure from the high priest Eleazar a copy of the Jewish Law, and to make arrangements for a translation of the same into Greek for the Alexandrian Library. Seventy-two learned men were accordingly selected by the high priest, six from each tribe, and sent to Egypt with a magnificent copy of the Law written on parchment in letters of gold. They retired to the island of Pharos, where they completed the translation in seventy-two days. According to Philo (*Life of Moses*, ii., 5–7), they were divinely inspired. The legend appears with embellishments in Justin Martyr (*Hortatory Address to the Greeks*, chap. xiii. [*Ante-Nicene Fathers*, i., 278]), according to whom the translators were shut up in separate cells and worked independently, yet their several versions, being compared, were found to agree verbatim. So also Irenæus (*Against Heresies*, chap. xxi., 2; do., i., 451, *seq.*) and Clement of Alexandria (*The Stromata*, I., xxii.; do., II., 334). In this later form of the story the translation is made to include the whole Old Testament. All that can be inferred with certainty from this legend is the high estimation in which the translation was held by the Jews as early as the first century of the Christian era. There is no improbability in the supposition that Ptolemy Philadelphus may have procured a copy of the books of Moses for his universal library. Jews were then numerous in Alexandria. On the other hand, a translation of the Old Testament, or at least of the Law, must have become a necessity at that period to the Hellenistic Jews, to most of whom the Hebrew original, long before the Christian era, was a sealed book; and to this necessity alone it may have owed its origin.

The character of the translation proves it to have been the work of many hands. The Pentateuch is best translated. Anthropomorphisms and offensive expressions are, however, often softened; e. g. for "they saw the God of Israel" (Ex. xxiv. 10) we read "they saw the place where the God of Israel stood." The translation of Proverbs has considerable merit, and the book of Job was rendered by a man of genius, who was better acquainted, however, with the Greek poets than with Hebrew, and dealt very freely with his text. The speech of Job's wife (ii. 9) is a curious interpolation. Ecclesiastes is rendered with barbarous literalness, so as to be in some places unintelligible; e. g. Eccl. vii. 30. The prophets are for the most part poorly translated, especially Isaiah; and the translation of Daniel was so bad that the version of Theodotion was early substituted for it in Christian use, and but a single manuscript of it is known. In some books, particularly Jeremiah, a recension of the text was followed differing from our present Hebrew; to others, as Esther and Daniel, apocryphal additions were made. The version contains all the books commonly printed in the English Apocrypha of the Old Testament, except the second book of Esdras. Some manuscripts and editions add a third, others a fourth book of Maccabees.

As to date, the time assigned by the pseudo-Aristeas for the translation of the Pentateuch has nothing against it; and from a passage in the Prologue to Ecclesiasticus, which alludes to a Greek translation of "the Law and the Prophets and the rest of the books," it seems probable that the collection of books had assumed something like its present form before 130 B. C.

In the controversies between Jews and Christians in the second century it was found that the LXX. could not be relied on as an accurate representation of the Hebrew. Other translations were accordingly made, of which the principal were—(1) that of Aquila, in the first half of the second century, slavishly literal; (2) of Theodotion, based on the LXX., but aiming at greater fidelity; and (3) that of Symmachus, distinguished by greater freedom and elegance. These were presented in parallel columns, together with the Septuagint and the Hebrew text (in Hebrew and Greek characters), in the *Hexapla* of Origen in the first half of the third century; in the Septuagint column words and clauses not in the Hebrew were marked with an obelisk or dagger (to stab them as false), and words in the Hebrew not represented in the translation were added from one of the other versions, generally Theodotion, with an asterisk prefixed. Origen's *Hexapla* as a whole was never copied, and probably perished in the destruction of the library of Pamphilus at Cæsarea in Palestine. Copies were taken, however, of his Hexaplar text of the LXX., parts of which have come down to us in various manuscripts, and also in a Syriac version. The best edition of the remains of the *Hexapla* is that by Field (Cambridge, 1867–75, 2 vols. 4to).

The Septuagint has had a wide influence. It was habitually used by Philo and Josephus, and very often quoted by the New Testament writers. Most of the ancient versions of the Old Testament were made from it, as the Old Latin, Memphitic, Thebaic, Ethiopic, Armenian, Slavonic, etc. With all its faults, it has been the only representative of the Old Testament to the Greek or Eastern Church from the beginning, and a knowledge of it is essential to one who would understand the language of the Christian Fathers and the history of theological opinions. From no other source is so much illustration to be derived of the peculiar Greek of the New Testament. It has also considerable value as a help in the criticism of the Hebrew text.

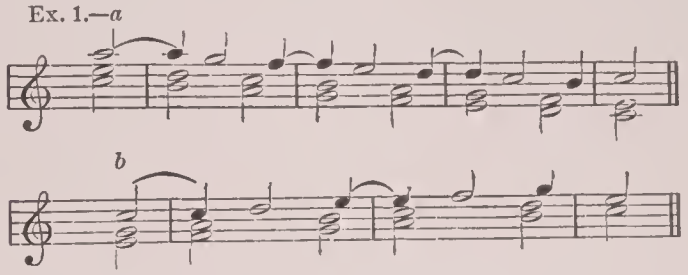
The text of the LXX. became early corrupted, and the Hexaplar edition of Origen increased the corruption, his obelisks and asterisks being often omitted or misplaced by copyists. Existing manuscripts differ considerably, and the correction of the text is a difficult problem. The primary editions of the LXX. are—(1) that contained in the Complutensian Polyglot (1514–17; published 1522); (2) the Aldine (Venice, 1518); (3) the Roman, Vatican, or Sixtine (Rome, 1587, fol.), founded largely on the Vatican manuscript of the fourth century; and (4) that of Grabe (Oxford, 1707–20), the basis of which was the Alexandrian manuscript. The edition of Bos (Franeker, 1709, 4to) exhibits the Roman text with the variations of the other three editions; and the great edition of Holmes and Parsons (Oxford, 1798–1827, 5 vols. fol.) give the same text, with the various readings of more than 300 manuscripts collated for it at great expense. The text of nearly all the oldest manuscripts of the LXX. (fourth to ninth century), as the Sinaitic, Vatican, Alexandrian, etc., has since been accurately published, but no critical edition exists in which these rich materials have been properly used. Meanwhile, the most convenient manual editions are those of Tischendorf (5th ed. Leipzig, 1875) and Henry B. Swete (Cambridge, 3 vols., 1887–94), the best; cf. Bagster's *Septuagint, Greek and English* (London, 1870, 4to), giving the Roman text with Brenton's translation in parallel columns. The concordance to the Septuagint by Trommius (Amst., 1718, 2 vols. fol.) will be superseded by that of Edwin Hatch and Henry Adeney Redpath (Oxford, 1892, *seq.*); there are lexicons by Biel (The Hague, 1779–80, 3 vols.) and Schleusner (Leipzig, 1820–21, 5 parts, or Glasgow, 1822, 3 vols.). The principal works on the version are of long standing—e. g. the classical work by H. Hody, *De Bibliorum Textibus* (Oxford, 1705, fol.); H. G. J. Thierseh, *De Pent. Vers. Alex.* (Erlangen, 1841), excellent in regard to the language; Z. Frankel, *Historisch-Kritische Studien zu der Septuaginta* (vol. i., part 1 [all pub.], Leipzig, 1841); and A. Geiger, *Urschrift u. Uebersetzungen d. Bibel in ihrer Abhängigkeit von der innern Entwickelung des Judenthums* (Breslau, 1857). Cf. Schürer, *Jewish People in the Time of Jesus Christ* (Eng. trans., second division, iii., 159–168).

Revised by S. M. Jackson.

Sepulture: See Funeral.

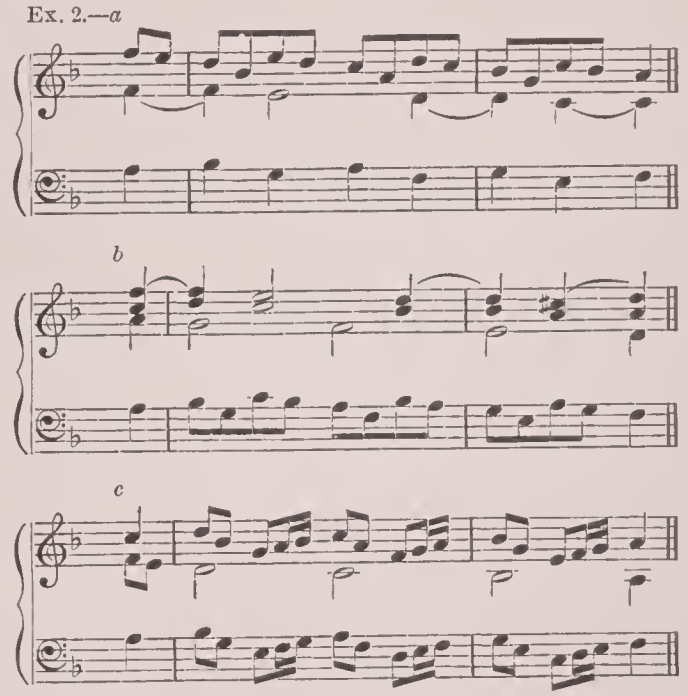
Sequence [viâ O. Fr. from Lat. *sequen'tia*, a following, deriv. of *se'qui* (pres. partic. *se'quens*, *sequen'tis*), follow]: in music, a peculiar chain-like progression, in which a short musical figure or group of notes is repeated several times on successive steps or degrees of the ascending or descending scale. As a sequence is thus only a group placed one degree higher or lower at each repetition, it can have (in itself) no proper termination, but may be continued indefinitely or through the whole range of the scale. One of the simplest forms of sequence is that made by a chain of thirds and sixths, with each sixth suspended by the seventh, as at *a*, Ex. 1, or with a suspension of the sixth by the fifth, as at *b*:

Ex. 1.—*a*



In sequences the leading trait or figure may lie in the treble, the bass, or one of the middle parts, or in any two or more of the parts together. In Ex. 2 the most forcible expression of the sequential idea is found in the treble at *a*, and in the bass at *b*, while at *c* it appears in the treble and bass combined:

Ex. 2.—*a*



Sequences are of infinite variety, and occupy an important place in fugues, organ-pieces, and instrumental compositions of almost all kinds, furnishing a grateful relief to the ear, and awakening certain emotions which seem peculiar to progressions of this class. Those given in the above examples are founded on the diatonic scale, but many of the richest sequences derive their beauty from the peculiarities of the chromatic scale, and are sometimes exceedingly elaborate and complex.

Revised by Dudley Buck.

Se'quin [= Fr., from Ital. *zecchino*, liter., dimin. of *zecca*, mint, from Arab. *sekkah*, die, stamp]: a name applied to various Italian and Levantine coins. The original sequin was a Venetian gold ducat of the thirteenth century.

Sequoi'a [Mod. Lat., named in honor of *Sequoyah*, the Cherokee Indian who invented letters for his people]: a genus of coniferous evergreen trees of the sub-order *Cupressineæ*, or cypress family, remarkable for the great size which they attain, being the "redwoods" and "big trees" of California. They are natives of California only, and of two species—one, *S. sempervirens*, the true redwood, confined to the Coast Ranges; the other, *S. gigantea*, properly called big tree or rarely mammoth tree, restricted to the western slope of the Sierra Nevada. The Pacific forest-belt produces large trees generally, but the sequoias surpass in girth, if not in height, the sugar-pines, Douglas spruces, etc., with which they are associated. They are distinguished at sight from other trees by the peculiar fibrous bark of a rich cinnamon-brown color.

The nearest relative of the genus is *Taxodium*, which is represented by the bald cypress of the southern Atlantic U. S. and Mexico. The foliage of the two species is strikingly different. The leaves of the redwood resemble those of the yew, being spreading and arranged comb-like on two sides of the branchlet; the cones are the size of a hazel-nut. The leaves of the big tree are smaller, awl-shaped, and closely oppressed to the branchlet; the cones of the size of an English walnut. The wood of the redwood is light, but firm, straight-grained, and handsome, although the rich brownish-red color fades on exposure without protection, while, like most of the cypress family, it is very durable. Only the redwood, which occurs in large quantities, affords a material of commerce, being lumbered on a large scale, and used for construction, interior finish, railway ties, etc.; the available supplies are being rapidly exhausted by the wasteful methods of lumbering. The tree is tenacious of life, the stumps even of the oldest trunks long retaining their vitality at the circumference, and sprouting into a circle of fresh young shoots, in which it differs from most other conifers. This tree (the redwood) occurs along the west slope of the Coast Ranges from Monterey Bay to the Oregon line, but is most abundant N. of San Francisco Bay up to lat. 40°. Where the redwood abounds it forms forests almost by itself. There are trees from 50 to over 75 feet in circumference and from 200 to 275 feet in height, and credible accounts are given of still larger ones. Archibald Menzies was the first botanist to collect specimens of the redwood (about 1810). They remained undescribed until 1832, when one of these specimens was figured by Lambert, and named *Taxodium sempervirens*. Soon after the tree was made known to botanists by David Douglas; in 1847 Endlicher founded upon it the genus *Sequoia*.

S. gigantea, the big tree, appears to have been first discovered in the spring of 1852 by a white hunter named Dowd, who reached the Calaveras grove. Specimens reached the Atlantic States and Europe in 1853, and Lindley first described the species as *Wellingtonia gigantea*, on Dec. 24, 1853; a figure of it also appeared in 1854 in *The Botanical Magazine*. The Californian botanists proposed to call it *Washingtonia californica*, and under this name it was published in the California *Farmer* in 1854. Meanwhile Dr. Torrey determined that this tree was of the same genus as the redwood—i. e. *Sequoia*—notwithstanding the difference in foliage, a conclusion announced also by Dr. Asa Gray in *The American Journal of Science* for Sept., 1854. Prof. Decaisne in Paris had already taken the same view, assigning the name *Sequoia gigantea*, which the tree now bears, as early as June 1854. (*Bull. Soc. Bot. France*, i., 70.) The name *Sequoia wellingtonia*, proposed by Seemann in 1855, is therefore antedated by *S. gigantea*, which must stand.

Although in general of greater size than the redwood, this tree is not so handsome. The branches are short, the spray less graceful. The wood is similar, but of a duller reddish hue. This species nowhere forms a forest by itself, but is mixed with other coniferous trees, mainly sugar-pines, and generally occurs in detached "groves." Its range in latitude is only between two and three degrees, in longitude being confined to a narrow belt on the western slope of the Sierra Nevada; its vertical range is restricted between 4,760 feet (at the northernmost locality) and 7,000 feet.

There are some twenty groups or groves segregated and named. The most northern grove known is situated in Placer County, 50 to 60 miles N. of the two groves, first discovered and most accessible in Calaveras County. The North Calaveras grove, covering 50 acres, contains ninety-three trees, of which four are over 300 feet high, the tallest standing, called the Keystone State, being 325 feet, and its diameter, 6 feet from the ground, 45 feet. Between these groves and the Merced river are two or three patches of big trees (Tuolumne and Merced grove), but none of great note until the Mariposa grove is reached. This is 16 miles S. of the Yosemite valley, and is in two patches, the lower one at 5,500 feet containing about 125 large-sized trees, one of the largest being the Grizzly Giant, over 93 feet in circumference at the ground, and over 64 at 11 feet, which is measured above the bulge of the trunk, characteristic of the cypress family. Most of these trees have been sadly injured by fire. About a dozen miles S. of this grove is the Fresno grove, said to contain about 600 trees, the largest 81 feet in circumference. From this district S. to the Tule river, but at greater elevations, trees appear to be more abundant than elsewhere, and more widely dispersed through the forest, the Dinky, King's river, New King's river, and Kaweah having been named. The age of sequoias was formerly estimated as high as 4,000 to 6,000 years, but countings of annual rings reduce the age of the oldest to between 2,000 and 2,500 years, most of them probably below this. Authentic accounts of the trees are to be found in J. D. Whitney's *Yosemite Book*, and in the writings of Muir, Clarence King, Lemmon, and others. See also *Garden and Forest*, especially vol. iii., p. 573, for a map of the groves.

FIG. 1.—Grizzly Giant, "Wawona," 275 feet high, 28 feet diameter.

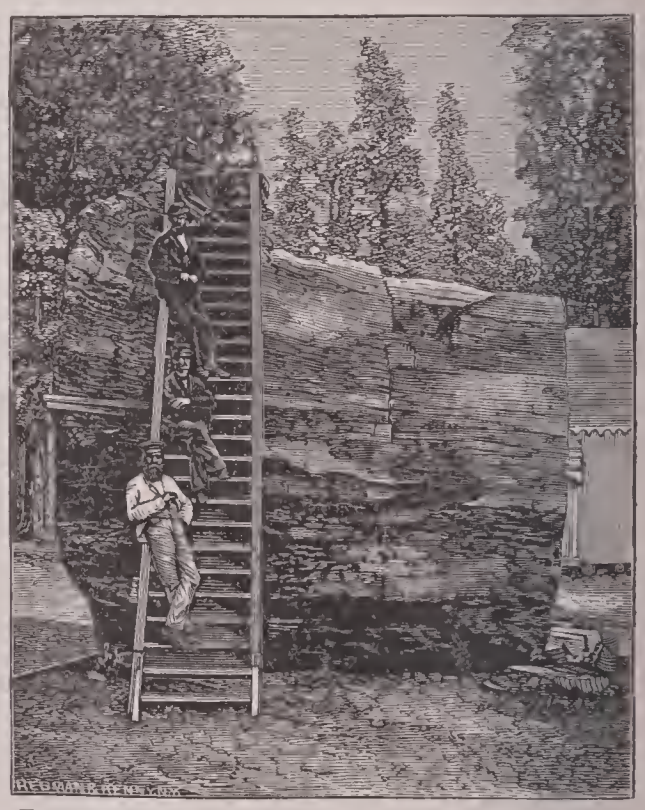


FIG. 2.—Section of a big tree, 92 feet in circumference.

Both species seem to require for their success the humid atmosphere of the region in which they occur. They thrive well, however, in many parts of Europe, especially in England and Ireland. Several trees of the *Sequoia gigantea*, over 40 feet in height, are to be found in Rochester, N. Y. In former ages, seven or eight species were in existence and distributed over a large part of the world, especially in the Tertiary period, when it occurred all around the Arctic zone, and in Europe, as far S. as Greece. B. E. FERNOW.

Sequoyah: See GUESS, GEORGE.

Séracs: See GLACIERS.

Seraing, sē'răn': town; in the province of Liège, Belgium; on the Meuse; 4 miles by rail S. W. of Liège (see map of Holland and Belgium, ref. 10–G). It has large manufactures of steam-machinery, locomotives, iron goods, and mirrors, and has rich coal mines in its vicinity. Pop. (1896) 36,873.

Serajevo: See SARAJEVO.

Serakhs: See SARAKHS.

Serampur': town; in Bengal, India; on the Hugli; in lat. 22° 45′ N., lon. 88° 26′ E.; 15 miles below the town of Hugli; is a neat and well-built city, European in style, extending for about a mile along the right bank of the river, and has large manufactures of paper (see map of N. India, ref. 7–I). It was originally a Danish settlement, founded in 1676, but was sold in 1845 to Great Britain. Under Danish rule Serampur did not prosper. It was the seat of the first Baptist missionary establishment in Hindustan, founded there in 1818. Pop. (1891) 35,952.

Revised by M. W. HARRINGTON.

Serape'um [= Latc Lat. = Gr. **Σεραπεῖον** (sc. *ἱερόν*, temple), a temple of Serapis, deriv. of **Σέραπις**, Serapis]: the name given to the collective temples and tombs of the Apis-bulls (see SERAPIS) of Memphis in Egypt. The site, now covered by about 60 feet of sand, is to the N. of the group of pyramids of Saqqarah, and the present remains are all subterranean. They were explored by Mariette in 1851–55, and all except two of the Apis-sarcophagi were found to have been rifled. Several mummies of Apis-bulls, taken from the Serapeum earlier in the century, are preserved in the Historical Society's museum in New York. The earliest remains found in the Serapeum date from the reign of Amenhotep III. of the eighteenth dynasty, and the Apis-tombs of this and of succeeding reigns down to the thirtieth year of Ramses II. form a class by themselves. Each Apis had its own separate chapel, which was connected by an inclined passageway with a single rock-hewn chamber, where the stone sarcophagus of the Apis-bull was placed. In the following period, which lasted till the time of Psammetichus I. of the twenty-sixth dynasty, the tombs were arranged in forty separate chambers on either side of a gallery about 330 feet long. This gallery and its chambers early fell into ruin, and are inaccessible. They were replaced by Psammetichus with a larger series of galleries, which aggregate 1,151 feet in length, and average 10 feet wide and 17½ feet high. Connected therewith are sixty-four chambers (26 feet high) hewn in the rock and now accessible. They still contain twenty-four large sarcophagi, each of which measures 13 feet in length, 11 feet in height, and 7 feet in width, and is estimated to weigh 65 tons. Only three are inscribed. The portion of the Serapeum above ground seems to have been built after the general plan of Egyptian temples, with two pylons, courts, and inclosures. Before it was a dromos and avenue of sphinxes which led directly to the Greek Serapeum, which was a Greek temple with cella and pronaos, and was adorned with two Corinthian columns. The importance of Mariette's discovery consisted mainly in the fact that some 500 historical monuments were found in the shape of stelæ and statuettes erected by pilgrims, who gave the dates of their pious visits. In this way many data were obtained for fixing the length of reign and succession of various Pharaohs.

According to the *Antonine Itinerary*, another Serapeum was located near the present line of the Suez Canal, at a point overlooking the Bitter Lakes. The Serapeum at Alexandria, erected by the Ptolemies, was probably in the form of a Greek temple, and was dedicated to the god in a form that was Græco-Egyptian. In the same building was the Alexandrian Library, and both perished together after the edict of Theodosius, about 390 A. D.

CHARLES R. GILLETT.

Ser'aph, plur. **Ser'aphim** [from Heb. *serāphīm* (plur.), deriv. of *sāraph*, burn]: a word which occurs but twice in the Bible (Isa. vi. 2, 6). The seraphim are described as creatures, human in appearance, with six wings, symbolical of the "devouring fire" of Jehovah's holiness.

Seraphic Brethren: See FRANCISCANS.

Seraphim, Order of the: in Sweden and Norway, a knightly order founded in 1260 or 1285 by Magnus I., King of Svealand, or, as others say, by Magnus II. in 1334. Charles IX. abolished it about 1610, and Frederick I. restored it Feb. 11, 1748. The bishop of the Seraphim, the prelate of the order, belongs to the national Lutheran Church.

Sera'pis [= Lat. = Gr. **Σέραπις**, **Ὀσαράπις**, from Egypt. *Asàr-Ḥāpi*, liter., Osiris-Apis]: an Egyptian deity, ostensibly a combination of Osiris with the Apis, the bull sacred to Ptah, an incarnation of Osiris, which symbolized the "perpetual regenerating power of the god." In some conceptions the Apis was associated with the moon. His native name, *Ḥāpi*, belonged also to the Nile, which revivified the land at the inundation, and to the cynocephalous deity of the dead, who represented the principle which revived the dead. In the later conception the deity bore a mixed character, and was Græco-Egyptian, combining in one the Greek Pluto and Esculapius and the Egyptian Osiris. The Apis-bull, which was the basis of the Serapis worship, was thought to have descended from a cow that had been impregnated by a ray of the moon. He must have distinctive marks: A triangular white spot on his forehead, a scarab-like growth beneath his tongue, a white vulture or eagle and a scarab on his flank and haunches, and a tail with both white and black hair. The discovery of an animal that possessed these features was greeted with universal joy, and its death with as universal mourning. He was kept with greatest care in a temple (the Apieum) at Memphis, where he received divine honors. When he died he was carefully mummied, and buried with great pomp and expense in the Egyptian SERAPEUM (*q. v.*). His emblem was a bull with the sun-disk and uræus serpent between his horns. The worship of the Apis began early; it is said to have been taken from Heliopolis to Memphis in the second dynasty, and Apis-priests are mentioned as early as the fourth dynasty. In pure or mixed form it continued throughout Egyptian history, and was transferred to other lands. Alexander the Great and the Roman Titus paid honors to the Apis of Memphis. According to Strabo (*Geogr.*, xvii., ii., §§ 10, 23), the worship of Serapis was also practiced at Alexandria, and at the niter mines near Naucratis in the region which the Greeks called Nitria or Nitriotis. His worship spread also to other countries, and in 82 A. D. Domitian built a temple in his honor at Rome.

CHARLES R. GILLETT.

Serena, La: capital of COQUIMBO (*q. v.*).

Se'res [= Lat. = Gr. **Σῆρες**; cf. Chin. *see*, *szĕ*, *sei*, *si*, silk]: Greek and Roman name for a people of Eastern Asia, without doubt the Chinese. See CHINA.

Seres (Lat. *Sericum*; Gr. **Σῆρες**): town; in the vilayet of Salonika, European Turkey; the center of the Turkish cotton culture and trade (see map of Turkey, ref. 4–C). Here the cultivation of the silkworm was introduced by Justinian (530). Two monks brought the eggs of the worm from China in a hollow walking-stick. Pop. 30,000 (18,000 are Greeks, 9,000 Ottomans, and 2,000 Jews).

E. A. G.

Serf [from O. Fr. *serf* < Lat. *ser'vus*, slave; cf. Eng. *servant*]: a person held in a modified form of slavery, bound to the soil and without rights as against his master, who could not, however, sell him like a chattel slave. During the Middle Ages serfdom formed one of the most prominent elements of the existing social order. It originated from the slavery of the ancient republics, and was transformed by the concurring influences of Christianity and feudalism. Slavery existed among the Germanic tribes, who reduced their captive enemies to that condition, but after the invasion of the Roman empire these slaves or thralls were raised to the position of serfs, whose numbers were greatly increased by the addition of the native population of the conquered districts. Then, too, the frequent famines and the need of protection from enemies drove many to sell themselves to the more powerful, especially to churches and monasteries. While the institution of serfdom differed both in origin and in character in the different countries of Europe, it was generally true that the condition of the serf was far superior to that of the slave under Roman law.

It is probable that the mastership which the feudal and ecclesiastical lords exercised over their serfs was for centuries felt as a blessing rather than as a burden; for the feudal system was indeed, up to the tenth century, the main support of social order, the condition of life. In countries into which feudalism did not penetrate, such as Italy, no serfdom was developed; here the peasants, the population of the agricultural districts, entered the armies of the city republics to which they belonged, and their position as citizens was not very different from that of the burghers. In England before the Norman conquest a large part of the population were in a state of serfdom, the *theow* being the lowest in the social scale and approaching the condition of a slave, while the *ceorl* could not be bought or sold and enjoyed some personal rights. With the conquest the *theow* disappears and the *ceorl* becomes the Norman *villein*, whose condition was an improvement on that of his Anglo-Saxon predecessor. If maltreated by his master he might have a hearing in the king's court, and he enjoyed the full protec-

tion of the law against strangers, but he could not own property, and could be sold with the land which he tilled. The terms *serf* and *villein* are used almost indiscriminately of the non-freemen, though originally the former term signified a lower order of bondman.

The abolition of serfdom in Europe was a gradual process. In England it gradually disappeared during the fifteenth and sixteenth centuries. It is mentioned for the last time in 1574 by a commission issued by Queen Elizabeth for its abrogation in the counties of Cornwall, Devon, Somerset, and Gloucester. In France, where both Louis IX. and Louis X. had sought support in the serfs against the feudal counts, serfdom was maintained, often in very harsh forms, up to the Revolution. In Denmark it was abolished in 1784 by Frederick VI., at that time heir-apparent only, but actually governing instead of his insane father; in Prussia in 1808 by von Stein; in Hungary in 1848 by the revolutionary anti-Austrian Diet; and in Russia in 1861 by Alexander II. See SLAVERY.

Revised by F. M. COLBY.

Serge [viâ O. Fr.: Ital. *sargia* < Lat. *se'rica*, silken garments, liter., neut. plur. of *se'ricus*, silken, deriv. of *se'res*. See SERES]: a name applied to various twilled fabrics. Silk serge is a coarse and strong material used for lining coats, making light shoes, etc. Woolen or worsted and woolen serges are made for ladies' cloaks and other uses. Some kinds of coarse serge are employed for making the garments of certain ecclesiastics. Other finer kinds are in some countries used exclusively for shrouds.

Sergeant [viâ O. Fr. *serjant*: Ital. *serviente* < Lat. *serviens, servien'tis*, servant, vassal, soldier, liter., pres. partic. of Lat. *servi're*, serve]: a non-commissioned officer (i. e. an enlisted soldier holding an appointment from the colonel authorizing him to exert a limited authority over his fellow soldiers) in the army and marines, of a rank higher than that of corporal. Each infantry company has a certain number of sergeants, one of which is of higher rank and pay than the rest, and is called first sergeant. Each battalion (or regiment, if, as in the U. S., it has but one battalion) has a sergeant-major, who is the highest non-commissioned officer of the battalion. He is the executive officer of the adjutant, and superintends the making out of details and the performance of other camp duties for the adjutant. There is also a quartermaster-sergeant to each battalion. In the U. S. service a number of quartermaster and commissary sergeants not attached to battalions, and the ordnance sergeants, whose duty relates to the care of ordnance, arms, ammunition, and military stores at the posts to which they are attached, are provided for by law to be selected from sergeants of the line who have served for a certain length of time as privates and non-commissioned officers.

Revised by JAMES MERCUR.

Sergeant, JOHN, LL. D.: lawyer; son of Jonathan D. Sergeant, lawyer; b. in Philadelphia, Pa., Dec. 5, 1779; graduated at Princeton 1795; was admitted to the Philadelphia bar 1799; was appointed a commissioner of bankruptcy 1801; was subsequently deputy attorney-general of Pennsylvania; sat several times in the Pennsylvania Legislature; was member of Congress 1815–23, 1827–29, and 1837–42; was the leading representative of the Northern States in advocating the passage of the Missouri Compromise Act 1820; was minister to the Panama congress 1826; Whig candidate for the vice-presidency on the ticket with Clay 1822, in which year his *Select Speeches* were published; president of the Pennsylvania constitutional convention 1830; declined the mission to England 1841; for half a century was regarded as one of the leaders of the Pennsylvania bar. D. in Philadelphia, Nov. 23, 1852.

Sergi, sār'jĕe, GIUSEPPE: psychologist and anthropologist; b. at Messina, Sicily, Mar. 22, 1841; educated at Messina: became Professor of Philosophy in lyceums at Messina and Milan; in 1880 Professor of Anthropology in the University of Bologna, and in 1884 professor in the University and director of the Institute for Anthropology at Rome. His principal works are *Elementi di Psicologia* (Messina, 1879); *Teoria fisiologica della Percezione* (Milan, 1881); *L'origine dei fenomeni psichici* (Milan, 1885); *Psychologie physiologique* (French trans., Paris, 1887); *Principi di psicologia*, vol. i., *Dolore e Piacere* (Milan, 1894); together with many anthropological memoirs. J. MARK BALDWIN.

Sergipe, originally **Sergipe del Rey**, sār-zheep'ā-dāl-rā': an eastern maritime state of Brazil; between Bahia, Alagoas, and the Atlantic. Area, 15,090 sq. miles. The interior is included in the Brazilian plateau, which is here low, much broken, and has little forest; a broad belt of lowland is separated from the ocean by extensive sand-dunes. The great SÃO FRANCISCO RIVER (*q. v.*) forms the northern boundary; aside from it the state has only a few insignificant streams, and the mouth of the São Francisco forms the only harbor. The climate is dry and much of the land is unfit for agriculture; the best is in the coast belt and on the edge of the plateau, where sugar and cotton are cultivated. In the interior cattle-raising is the principal industry. Sergipe is the smallest and one of the least populous and progressive of the Brazilian states. The exports are hides, sugar, cotton, tobacco, and a little gold obtained from surface-washings. Pop. (1894) estimated, 261,991. Capital, Aracajú, a small town on the coast. H. H. SMITH.

Sericulture: See SILK.

Series [from Lat. *se'ries*, connection, row, succession, series, deriv. of *se'rere*, join, bind together]: in mathematics, a succession of terms whose values proceed according to some law. The most familiar examples are the progressions of elementary algebra, called respectively arithmetical and geometrical progression. A series may terminate at a certain term, but more commonly it may be continued without end. In the latter case it is called an *infinite series*. The above-mentioned progressions are examples of infinite series, because either of them, when once started, may be continued indefinitely.

An infinite series may be either *convergent* or *divergent*. A convergent series is one the sum of all of whose terms approaches a certain limit if the series is continued indefinitely. A familiar example of this is afforded by a decreasing geometrical progression. Students of algebra know that the progression

$$1 + \tfrac{1}{2} + \tfrac{1}{4} + \tfrac{1}{8} + \text{etc., } ad\ infinitum,$$

will approach 2 as a limit, always differing from that limit by a quantity equal to the last term included in the addition, which term may be made as small as we please by continuing the series.

A divergent series is one the sum of whose terms does not thus approach a limit. A series may be divergent in two ways; the sum of the terms may increase beyond all limit, when their number becomes infinite, and may therefore be called infinity. But the sum may also be continually larger and smaller, without increasing indefinitely. Such a series is

$$1 - 1 + 1 - 1 + \text{etc.}$$

The sum of this series will always be either 0 or 1, according as the number of terms added is even or odd. It is therefore called divergent.

Series are of very extensive use in advanced mathematics, especially in the applications of algebraic methods, because of the great number of quantities which can not be expressed in any other way. Quantities expressed by a series are said to be developed in a series, and if the series is convergent their true values can be found with any degree of accuracy by taking a sufficient number of terms. But if the series in which the development is made is divergent, it can not represent the quantity. S. NEWCOMB.

Serinagur: city of Kashmir. See SRINAGAR.

Seringapatam': city of Southern India and formerly capital of Mysor; on an island in the Cavery, in lat. 12° 25′ N., lon. 76° 48′ E. (see map of S. India, ref. 6–D). Under Hyder Ali and Tippoo Sahib its fortifications were strengthened, and although unhealthful it had 300,000 inhabitants. In 1799 it was conquered by the British, and now it has less than 12,000 inhabitants, and these mostly in the suburb of Ganjam. M. W. H.

Sermon: See HOMILETICS and HOMILY.

Serous Membrane [*serous* is deriv. of *se'rum*. See SERUM]: in the human body the membranous walls of the arachnoid, pleural, pericardial, and peritoneal cavities, and the investing membrane of the testis. Serous membranes in all instances, save the peritoneum in women, are closed sacs, with their opposed walls more or less in contact, but lubricated by secreted serous fluid, so as to permit of free motion. The serous membrane is therefore a contrivance of nature to insure the freedom of the large organs of the body in the limited movements incident to their functional activity. The movements of the heart, lungs, and intestines, the more limited increase and decrease of size of the brain, and the considerable friction of the joints are facilitated and made easy by the well-lubricated serous mem-

branes investing these structures. In certain parts the reflections of the serous surfaces serve as ligaments to hold the organs in their proper places. (See HISTOLOGY.) The diseases of serous membranes are chiefly inflammatory, and often involve the underlying invested organs. Hence they are usually very grave. Acute meningitis, acute pleuritis when involving the lung also, pleuro-pneumonia, pericarditis, and peritonitis, all are attended with danger, and often are fatal. Revised by WILLIAM PEPPER.

Serpa Pinto, ALEXANDRE ALBERTO DA ROCHA: explorer; b. in Portugal, Apr. 30, 1846; entered the army, and as major led a Portuguese scientific expedition (1877–79) from Angola to the Transvaal. His *How I Crossed Africa* (1881) appeared in several languages. In 1884–86, with Cardozo, he led another expedition, extending Portuguese influence in Mozambique to Lake Nyassa. D. Dec. 28, 1900.

Serpent: a musical wind instrument of brass invented by Edme Guillaume of Auxerre in 1590. It has a curvilinear form, is composed of a mouth-piece, a neck, and a tail, and has six holes stopped with the fingers, with a compass from B flat below the bass staff to G, the treble-clef line.

Serpentine [named from its mottled yellow and green colors, thought to resemble those of the skins of certain serpents]: a rock chiefly composed of hydrous magnesium silicate. Minerals associated with it may be calcite, dolomite, iron oxides, pyrite, amphiboles, pyroxenes, olivine, etc. The rock is usually green in various shades, often quite dark; sometimes brown or red. The mottling is due to the admixture of other minerals. White spots are usually due to calcite or dolomite, the rock being called ophiolite or ophite.

Verd antique is the name of any serpentinous marble. Red, brown, and darker shades are due to the presence of iron compounds.

Serpentine occurs in large bodies interbedded with limestone and various crystalline schists, or in veins, dikes, or irregularly shaped masses, traversing other rocks in the same manner as igneous rocks. In most cases it can be shown to have resulted from the decomposition of magnesium silicates, chiefly olivine and pyroxenes. Many occurrences are plainly altered igneous rocks rich in magnesia. The origin of those serpentines which are associated with the crystalline schists is not so evident. In some cases they are altered forms of magnesium silicate minerals, possibly basic eruptive rocks or volcanic tuffs connected with rocks subsequently metamorphosed. In others they may have resulted from the alteration of magnesium carbonate into a hydrous silicate.

Serpentine is widely distributed throughout the world. On account of its color and its susceptibility to high polish it is much employed for ornamental purposes, as well as for general building. Details of its occurrence and data of economic importance may be found in Merrill's work, *Stones for Building and Decoration* (New York, 1891). See BUILDING-STONE. J. P. IDDINGS.

Serpent of Delphi: a column of Corinthian brass, fashioned to represent three intertwined serpents, and consecrated by the Greeks to the god Apollo after the battle of Platæa (479 B. C.). It was taken to Constantinople by Constantine, and has stood ever since in the Atmeïdan, the ancient Hippodrome. The heads and upper portion have been broken off, but the mutilated torse still remaining is 18¾ feet high. The names of nineteen of the Greek cities which resisted Xerxes may be distinctly discerned, cut deep in the metal not later than 475 B. C. The twelve other names higher up have been almost obliterated. No more precious monument of Greek antiquity exists. See Grosvenor, *The Hippodrome of Constantinople and its still existing Monuments* (London, 1889). E. A. GROSVENOR.

Serpents [viâ O. Fr. from Lat. *ser'pens*, liter., pres. partic. of *ser'pere*, creep: Gr. ἕρπειν: Sanskr. *sṛp-*, creep, crawl, glide, whence (by deriv.) *sar'pa*, serpent]: the *Ophidia*, an order of reptiles. They are recognized by the absence of true external limbs, and their very elongated body, which regularly graduates into the tail, there being no abrupt distinction between the two; the back and sides have generally imbricated scales. These scales are rarely granular, while the lower surface is generally covered in front of the anus with a row of very broad plates, and behind the anus with usually two, sometimes one, row; sometimes, as in the sea-snakes of the genus *Pelamis*, the scales extend upon the abdomen as well as on the sides and back; the head is covered with plates. The principal characteristics of the order, especially as given by Prof. Huxley, are as follows: the premaxillaries are generally rudimentary, and represented by a single small bone, which is connected with the maxillaries only by fibrous tissue; the palatine bones never unite directly with the vomer or with the base of the skull, but are usually connected with the maxillaries by tranverse bones, and by the pterygoids with the movable quadrate bones; thus the connection of the palato-maxillary apparatus with the rest of the skull is more or less lax, and in the typical species exceedingly so; in certain worm-like forms, however, this is not the case; the lower jaw has its rami connected at their symphysis, generally by ligamentous and extremely elastic fibers: the result of the mechanism exemplified in the typical serpents is, that the mouth-pieces are extremely dilatable, and hence prey of much greater diameter than that of the serpent in its ordinary condition can be ingested. The teeth are acute, and directed more or less backward, and are generally developed simply upon the maxillary, palatine, and dentary bones; in one genus (*Rhachiodon*) the inferior spines of eight or nine of the anterior vertebræ are developed into tooth-like processes tipped with enamel. In the specialized poisonous species poison-fangs only are developed on the maxillaries, the rows on the palatines and dentaries existing as in the typical species; in an intermediate type, containing very poisonous species, there are also rows of teeth behind the poison-fangs. The vertebræ have ball-and-socket articulations and each of them bears ribs, with the exception of the first one or two, which may be considered as cervicals. Anterior limbs are absent in all forms, but the posterior are in some types represented by rudiments which appear externally as hooks on either side, and a little in advance of the vent. The lungs are unequal in size, and in the typical forms the disparity is very great, the left one usually being the smaller of the two; sometimes (especially in the venomous species) only one of the lungs is developed: the form of the lungs is that of an elongated sac, in which the walls are produced into numerous septa "which render the cavity highly cellular near the bronchus, while at the opposite end they become smooth and but little vascular; in this latter region the lung may receive its blood from the systemic, and not from the pulmonary, circulation." The bronchus opens directly into the lung. The heart is divided into two auricles and a single very imperfectly separated ventricle.

The movements of serpents are often misconstrued. They progress by sinuous flexures from side to side, and are incapable of the vertical undulating movements which are sometimes accredited to them in pictorial illustrations. Progression is greatly facilitated by the transverse plates with which the abdomen is covered. Many serpents are also capable of ascending trees, and vertical surfaces; but they are unable to progress on polished or glass-like surfaces. Some live in marshy regions, some in rocky, some on sandy desert plains, others among the trees, and still others burrow in the earth; again, some frequent fresh waters, while a few are even modified for swimming in the ocean. These sea-serpents, the *Hydrophidæ*, are not to be confounded with the mythical sea-serpents (see SEA-SERPENT), for they are comparatively small species, with the tail strongly compressed and adapted for swimming, and with small poison-fangs. The *Scolecophidea*, in part at least, burrow in the earth, and thus by their habits, as well as form, justify the term of worm-like snakes.

Most serpents are oviparous, and lay eggs whose shell is generally more or less soft and yielding, but which have, at the same time, a greater or less amount of lime; and sometimes this is developed in sufficient quantity to give a considerable rigidity to the shell: other serpents are ovoviviparous. The innocuous species are generally oviparous, and the venomous ovoviviparous, but the exceptions are numerous. The eggs are generally extruded in a chain, being connected by a viscous substance. In most cases the mother, after laying her eggs, leaves them to be hatched by the sun or decaying vegetable matter, but some species—the pythons, for example—coil themselves around the eggs and thereby hatch them. Many species go with their young for some time after birth, and protect them from enemies. It has been well ascertained that with some species the parent opens its mouth at the approach of danger, and receives therein its young, which are afterward allowed to depart therefrom unharmed.

The venomous serpents belong to the *Proteroglypha* and *Solenoglypha*, the first including the *Elapidæ* (coral-snakes, etc.), *Najidæ* (cobras, etc.), and the second the *Viperidæ* (vipers) and *Crotalidæ* (rattlesnakes, etc.).

The order is represented by over 1,500 living species. The

representatives of the order as a whole live in hot regions, and are averse to cold. They are absent altogether in the extreme northern and southern countries, and sparingly developed and hibernating during cold weather in the temperate regions, but almost equally abundant in the tropical regions of the several quarters of the globe. In the northern part of the U. S. only three species of the poisonous snakes (the scale-headed and plate-headed rattlesnakes and the copperhead) occur, and the greatest number in any one region within the U. S. are found in Arizona and New Mexico. See Poison of Serpents and the names of different genera and species. Revised by F. A. Lucas.

Serpent-stars: See Ophiuroidea.

Serpent-worshipers: See Ophites.

Serpukhof': town; in the government of Moscow, Russia; on the Nara; 57 miles by rail S. of Moscow (see map of Russia, ref. 7–E). It has a fine cathedral of the fourteenth century, and manufactures of linen fabrics of different descriptions, mostly coarse; also leather, paper, earthenware, and furniture. Pop. (1888) 22,718.

Ser'pula [Mod. Lat., from Lat. *ser'pula*, little snake, deriv. of *ser'pere*, creep]: a genus of annelids which build calcareous tubes in which they live. The head is surrounded with feathery tentacles, one of which is modified into a stopper to close the aperture of the tube when the animal is retracted.

Serra, Junipero: missionary; b. in the island of Majorca, Nov. 24, 1713. He entered the Franciscan order, was sent to Mexico in 1749, and labored for years among the Indians of the northwestern districts. When the Jesuits were expelled, in 1767, their missions were placed in charge of the Franciscans. Father Junipero was made president of those of California, then confined to the peninsula of Lower California. One of his first measures was to extend his field to Upper California (now California). The San Diego mission was founded July 16, 1769, Monterey soon after, and others later. These were the first civilized communities within the bounds of the present State. Many of the buildings remain. D. at the San Carlos mission, Aug. 28, 1784. See Bancroft, *History of the Pacific States: California*, and *The Century Magazine* (May, 1883). H. H. S.

Serra do Mar: a division of the Brazilian Coast Range bordering the coast or running near it from Southern Paraná to Espirito Santo. The Parahyba valley separates it from the Serra da Mantiqueira. The bizarre forms of many of its peaks make this region extremely picturesque. It culminates in the Organ Mountains (*q. v.*). H. H. S.

Serran'idæ [Mod. Lat., named from *Serra'nus*, the typical genus, from Lat. *ser'ra*, saw]: a family of fishes of the sub-order *Acanthopteri*, including the sea-bass, groupers, jewfish, etc. The body is oblong and compressed; the scales ctenoid and generally moderate; the head compressed, and more or less pointed; the supramaxillary bones not retractile behind under the supraorbital bones; the spinous portion of the dorsal fin about as long as the soft or longer; anal like the soft portion of the dorsal, and with three spines. The variation in size among the species of the family is great, some being only a few inches long, while others exceed 7 or 8 feet. Among the gigantic forms are the jewfish (*Promicrops guasa*) of the Southern States and Cuba, which attains a weight of 500 or 600 lb., and the *Stereolepis gigas* of California, which appears to attain an equally large size. Almost all the species are esteemed as food.

Serrano y Dominguez, sãr-raa'nō-ee-dō-meen'gāth, Francisco, Duke de la Torre: soldier and statesman; b. at San Fernando, near Cadiz, Spain. Sept. 18, 1810; entered the army and rose rapidly in rank; joined Narvaez in effecting the overthrow of the regent Espartero in 1843; became lieutenant-general and senator in 1845, and obtained such influence over the young queen after her marriage (1846) as to give rise to much scandal. After taking part in several political intrigues and holding some important offices, he became captain-general of Cuba 1860–62, and won a dukedom as a reward for his successful efforts to reannex San Domingo to Spain. In 1866 he became president of the senate in Spain and suffered a short imprisonment in the same year. His continued opposition to the Government caused his exile to the Canary Islands July, 1868, when he took part with Prim and Topete in effecting the revolution which drove Isabella from the throne. He then became the ostensible head of the Government as president of the council of ministers and commander-in-chief of the army; was elected regent June 16, 1869; negotiated the acceptance of the Spanish crown by Prince Amadeus of Italy, by whom he was made premier Jan., 1871; resigned that post in July of the same year; took the field as commander-in-chief against the Carlists Apr., 1872; concluded with them the convention of Amorevieta in May; returned to office as premier for a few months; fled to France soon after the proclamation of the republic (Apr., 1873), but shortly returned; was made chief of the executive after the *coup d'état* of Gen. Pavia Jan., 1874, and remained at the head of the Government till the end of the year, when he resigned his authority into the hands of Alfonso XII. D. in Madrid, Nov. 26, 1885. F. M. Colby.

Serto'rius, Quintus: Roman general. He was a native of Nursia in the country of the Sabines; distinguished himself in the battle of Aquæ Sextiæ (102 B. C.) under Marius. He fought with Cinna at the Colline gate in 87 B. C. against Pompeius Strabo, but he did not participate in the bloody massacre which Marius instituted at the capture of Rome; on the contrary, he put to death a gang of about 4,000 slaves whom Marius had let loose on the city, and who had perpetrated the most horrible cruelties. In 82 B. C. he was sent to Spain as proprætor, but in the same year Sulla returned to Rome from Asia, and the power of the democratic party came to a sudden end. Although he had in the beginning only a small army, Sertorius maintained his position in Spain against the leading generals of Rome. He gained the favor of the natives, especially the Lusitanians, who became his faithful allies, and gradually drew about him the remnant of the Marian party. In 74 B. C. he formed an alliance with Mithridates. Metellus Pius, whom Sulla first sent against him, was repeatedly defeated, and even Pompey, who came to Spain in 76 B. C., achieved nothing, and was driven back across the Ebro. But intrigues and jealousies arose in Sertorius's camp, and in 72 B. C. he was invited to a banquet by Perpenna and treacherously assassinated at the festival. His biography by Plutarch is very interesting, though more full in its description of his personal character than in its narrative of his exploits. Revised by G. L. Hendrickson.

Sertula'riæ: a group of Hydroida (*q. v.*) of uncertain position. They form colonies sometimes 10 inches in height. The individual polyps are situated in horny cases (thecæ). No medusa (jellyfish) stage occurs in the life-history.

Serum [from Lat. *se'rum*, whey; cf. Gr. *ὀρός*, whey, and Sanskr. *sāra-*, curds]: the watery portion of certain animal fluids. Serum of milk is whey containing no albuminous matter, whereas serum of blood, the fluid part left after the separation of the coagulum from blood, is a strong solution of albumen in a liquid containing certain salts, neutral and alkaline. The total amount of saline matter in the serum of a healthy man is somewhat over 10 per cent., and there are present carbonates and phosphates of sodium, potassium, calcium, and magnesium, with considerable chloride of sodium, some chloride of potassium, and sulphate of sodium and potassium. The amount of albumen is in the neighborhood of 7 per cent. Both the saline and the albuminous matter prevent the solution of the blood-globules, which are very soluble in water itself, and are attacked at once on addition even of a very little water to blood. The physiological and pathological properties of blood serum have recently occupied much attention, and there bids fair to be great advancement in the treatment of disease, based upon these studies. The serum of an animal is known to possess properties which render it more or less destructive to invading micro-organisms. According as this is ill or well developed will be the likelihood or unlikelihood of a severe attack. Revised by W. Pepper.

Serum Therapeutics: that department of medical practice which secures Immunity (*q. v.*) by the introduction of certain substances in the blood which act in an antagonistic manner to the bacteria of the disease in question, or to the toxic substances developed from these or by them. According as the protective substances are present in large or small quantity, permanently or temporarily, so will be the permanence and completeness of the immunity. The same sort of immunity may be developed by artificial inoculation with the specific micro-organisms themselves. The latter may be made less powerful by certain methods of cultivation, as was done by Pasteur in the case of the anthrax bacillus, or they may be injected in small amounts, and thus immunity developed without risk of a serious attack. Immunity may, however, be obtained by injection of the products of the bacteria, obtained either from cultures of

the micro-organisms or from the blood of a person or animal previously rendered immune by a natural or experimental attack of the disease. The same substances in larger doses act also in a curative way.

Recently this treatment has been particularly lauded in diphtheria. The exact method by which the antitoxic substances in this disease are prepared is as follows: Horses or goats, preferably the former, are inoculated with cultures of the specific micro-organisms, rendered less virulent by addition of trichloride of iodine or other substances, or with small doses of the toxine of these organisms. There is thus established a specific intoxication of slight intensity, with development of antitoxic substances and leaving a certain degree of immunity, so that the animal may be injected with greater quantities the second time, etc. After repeated injections of this kind the animal becomes practically immune from any dose of the poison. The blood-serum obtained from such an animal will be active for the production of artificial immunity in another animal, or in larger dose it will prove curative of the developed disease. Whatever the outcome of this method of treatment may prove to be in man, it is sufficiently established that immunity may be conferred upon animals in this way for infection with the organisms of diphtheria, malignant œdema, anthrax, cholera, typhoid fever, pneumonia, and other diseases. WILLIAM PEPPER.

Serval: the *Felis serval*, an animal of the *Felidæ* or cat family, having a slender body, small head, long legs, long and shaggy hair, body spotted with dark brown, the general color being yellow, and the lower parts white. It is about 3 feet long, exclusive of the tail, which is tipped and ringed with black. It is found in the southern part of Africa.

Servant: See MASTER AND SERVANT.

Serva'tus Lupus: polemical writer; b. about 805; was educated in the monastery of Ferrières, in the diocese of Sens, France, and studied afterward in Fulda under Rabanus Maurus. For some time he lived at the court of Louis the Pious, and in 842 he was made abbot of Ferrières by Charles the Bald. D. after 862. He played quite a prominent part in the ecclesiastical history of his time. In the controversy between Gottschalck and Hincmar he sided with the former, and defended him both by his words in the synods and by his pen: *De tribus quæstionibus* and *Collectaneum*. His works, which also comprise a number of very interesting letters (best ed. by G. Desdevises du Dezert, Paris, 1888), are found in Migne, *Patrol. Lat.*, xix. See Nicolas, *Études sur les lettres de Servat-Loup* (Paris, 1861); F. Sprotte, *Servatus Lupus* (Ratisbon, 1880). Revised by S. M. JACKSON.

Serve'tus, MICHAEL [the popular Latinized name of MIGUEL SERVETO]: theologian; b. at Villanueva, near Saragossa, Spain, in 1509, or more probably at Tudela, in Navarre, 1511, his own testimony, though contradictory, inclining to the latter place and date; son of a notary, who sent him at the age of nineteen or seventeen to study law at the University of Toulouse, France; gave his attention principally to theology, in which he became proficient; visited Italy, and was present at the coronation of Charles V. at Bologna 1530; traveled in Germany and Switzerland; became acquainted with many of the Reformers, and partially adopted their doctrines; resided some months at Basel, where he discussed theology with the celebrated Hans Hnssgen (Œcolampadius), and broached for the first time his criticism of the current doctrine of the Trinity; proceeded to Strassburg; acquainted himself with the teachings of the Protestant divines Bucer and Capito; went thence to Hagenau, Alsace, where he published his *De Trinitatis Erroribus* (1531) and *Dialogorum de Trinitate Libri duo: de Justitia Regni Christi Capitula quatuor* (1532), works which embroiled him both with Roman Catholics and Protestants; took up his residence at Lyons under the name of Michel de Villeneuve about 1533; studied medicine, and supported himself by working as an editor of scientific works; settled at Paris 1536; studied medicine under Günther, Dubois, and Fernel; took the degree of M. D. with high honors 1536, in which year he first met with Calvin; became an eloquent and popular lecturer at the university on medical science and mathematics; published a treatise, *Syruporum Universa Ratio* (1537), attacking opinions of Galen and of the Paris faculty of medicine; had about this time several conferences on theology with Calvin, who proposed, as he himself says, to set him right on theological matters; proceeded to Charlieu, near Lyons, 1538; lived some time at Avignon; published at Lyons editions of Ptolemy's *Geographia* (1541) and of the Bible (1542) with Latin notes, which were condemned as heretical by the Roman Catholic Church; took up his residence in 1543 at Vienne, Dauphiné, living as confidential physician in the palace of the archbishop, Pierre Paulmier, a former pupil; carried on with Calvin, then at Geneva, an active theological correspondence, which resulted (1546) in a bitter quarrel; published anonymously his chief work, *Christianismi Restitutio* (Vienne, 1553), the authorship of which was recognized by Calvin, to whom he had sent much of it in MS., and made known by him to the Roman Catholic Archbishop of Lyons, Cardinal Tournon. Arrested and imprisoned by the Inquisition at Vienne, at the instance of that prelate, Servetus would probably have been acquitted for lack of evidence had not Calvin supplied portions of his correspondence as proofs against him. Servetus escaped from prison, crossed the frontier into Piedmont, and remained in concealment several months. Meanwhile his trial went on; he was condemned for heresy, and burned in effigy at Vienne June 17, 1553. He then resolved to go to Naples, but by a strange fatality went first in disguise to Geneva, where, his presence having become known to Calvin, he was arrested, brought to trial (Aug. 14) before the municipal court on charges of heresy, sedition, insult to the Fathers of the Church, and calumny against Calvin and other Protestant divines; was forced to discuss doctrinal points with Calvin, who appeared as prosecutor and drew up the final articles of accusation, thirty-eight in number; was condemned to the stake, and, notwithstanding the desire of Calvin for his decapitation as a milder form of death, was burned alive on a hill near Geneva Oct. 27, 1553. The Roman Catholic Inquisition had previously (June 17) sentenced him to the same punishment. The Reformers generally, including Melanchthon, approved his execution. Calvin might easily have been mindless of his accidental presence in Geneva, but he had threatened him with death if he came within his reach and he kept the promise he had made. *Lives* of Servetus have been published by Mosheim (1750), Trechsel (1839), W. H. Drummond (London, 1848), and Brunnemann (1865). Cf. Schaff's *Church History*, vol. vii. The most careful study of his career and the best authority on his life is H. Tollin's *Characterbild Michael Servets*, and many articles that Tollin published in various journals. The theological position of Servetus was extremely individual. He was no Arian, and while denying the tri-personality of the Godhead and the eternity of the Son, he was passionately devoted to the person of Christ and equally to the Bible as the sole standard of authority. His was a boundless intellectual curiosity, a wide and various culture, an absolute sincerity, but withal a love of controversy, not peculiar to him in his generation, which brought him into frequent danger and finally to a cruel death.

Revised by J. W. CHADWICK.

Ser'via [from Russ. *Serbiya*, deriv. of *Serbŭ*, a Servian, from Serv. *Srb*, a Servian (Turk. *Syrp*)]: a kingdom of Southern Europe in the Balkan peninsula; between 42° 20′ and 45° N. lat., and 19° 10′ and 22° 45′ E. lon. It is bounded N. by the Austro-Hungarian empire, from which it is separated by the Save and Danube rivers, E. by Roumania, from which it is separated by the Danube, and Bulgaria, S. by Bulgaria and Albania, W. by Albania and Bosnia. Area, 19,050 sq. miles.

Topography, Products, Commerce, etc.—Servia is divided by the river Morava into two unequal sections. The western section is broken by the Dinaric Alps, the eastern by the Balkans. At Orsova, on the Danube, the Balkans are separated from the Carpathians by a narrow cleft, called the Iron Gates, through which the Danube rushes. From its southern frontier, dominated by the Kopaonik Mountains nearly 7,000 feet high, Servia slopes to the north in a roughly inclined plane, and on the northwest spreads out in level tracts. The soil in the valleys and lower regions is fertile, producing rice, maize, wheat, flax, hemp, and tobacco. Along the Danube are numerous vineyards and orchards, especially of plum-trees, whence the *slivovitza*, a popular sort of brandy, is obtained. More than half the territory is covered with forests, wherein oaks and walnuts abound. Iron, copper, lead, and coal are found in certain localities, but absence of roads and lack of enterprise prevent their being worked. From the same cause the forests are untouched, except that they are given over to raising immense herds of swine. These hogs are exported, and constitute the chief industry and the principal source of revenue. There are practically no manufactures except in a primitive way, as each household supplies its own necessi-

ties. Commerce is confined to the exportation of raw materials and the importation of the most essential manufactured goods. The system of agriculture is simple and rude: little attention is paid to education, and the condition of the country and people presents a striking contrast to the progress made by Roumania and Bulgaria since 1870.

The unit of value is the dinar or franc. For the fiscal year 1901 the budget estimates were: receipts, 74,018,070 dinars; expenditures, 73,992,543. The public debt is 424,725,713 dinars. In 1899 the imports amounted to 46,428,600 dinars, seven-twelfths of which were from Austria-Hungary; exports, 65,744,388, about five-sixths of which were to Austria-Hungary. There are 354 miles of railway. Length of telegraph lines, 2,526 miles; offices, 142.

Servia is an hereditary monarchy. The national assembly or Skuptchina consists of 262 members and meets annually. Pop. (1895) 2,312,484. Except 159,510 Roumanians and 46,212 gypsies (1895), there are few not of the Servian race. With rare exceptions the inhabitants belong to the national Church, the Eastern Orthodox or Greek. Pop. of chief towns (1895): Belgrade, the capital, 59,494; Nisch, 21,524; Kragujevatch, 13,870; Lescovatch, 13,165: Pojarevatch, 11,699. In 1899 there were 24,456 marriages, 96,246 births, and 59,548 deaths. By statute of 1889 military service is obligatory on every able-bodied male Servian from the age of twenty-one to fifty-one: 2 years in active service, 8 in the reserve, 10 in the first division, and 10 in the second division of the national militia. Servia claims ability to put into the field 5,700 officers, 353,366 men, with 45,100 horses and 402 cannon.

History.—The Servians are a branch of the Slavic family. During the seventh century they were induced by the Byzantine emperor Heraclius I. to abandon their homes in the Carpathians and colonize the then depopulated territory between the Danube and Adriatic. Bound to the Byzantine empire by friendship and allegiance, they formed an efficient defense against the barbarians of the north. Christianized in the ninth century, Servia became independent in the eleventh, and its sovereign, the Grand Shupane, was recognized as a king by Pope Gregory VII. Stephen Dushan, the tenth sovereign, conquered nearly all the Balkan peninsula, threatened Constantinople, and in 1346 took the title of czar. In 1389, at the terrible battle of Kossova where the Servian king Lazarus and Sultan Murad I. were slain, Servia lost its independence, and disappears from history till the early part of the nineteenth century. Then the peasant Kara George, aided by Russia, expelled the Ottomans, and ruled from 1804 to 1813. Again the Ottomans overran the country when the swineherd Milosch Obrenoviteh, who had assassinated Kara George, headed a desperate resistance during fifteen years. Supported by Russian diplomacy he forced the Porte in 1830 to recognize him as hereditary prince of Servia. In 1869 a constitution was framed, according to which the Government appointed one-third of the Skuptschina, while the electorate of the other two-thirds was greatly restricted. In 1876 Servia declared war against the Ottomans, and was saved from destruction only by the interference of Russia. The Congress of Berlin (1878) recognized the independence of the principality, and increased its territory on the south at the expense of the Ottoman empire. Servia declared itself a kingdom Mar. 6, 1882. In Nov., 1885, King Milan made an unjustifiable attack on Bulgaria, but was ignominiously defeated and his kingdom maintained intact only through the intervention of Austria-Hungary. In 1889 a more liberal constitution was granted, all taxpaying citizens becoming electors, by whose votes the entire Skuptschina was elected. The Servians are a brave and generous people, and the unfortunate history of Servia since 1868 is largely due to the influence of their incapable and pusillanimous ruler, Milan I. (*q. v.*), who on Mar. 6, 1889, abdicated in favor of his son, Alexander I. The latter in May, 1894, by a *coup d'état*, abolished the new constitution and restored that of 1869.

Works of Reference.—Chopin, *Provinces Danubiennes*; Courrière, *Histoire de la littérature contemporaine chez les Slaves*; E. de Laveleye, *The Balkan Peninsula*; Minchin, *Servia and Montenegro*; Saint-René Taillandier, *La Serbie au XIX^e^ Siècle, Karah George et Milosch*; von Ranke, *History of Servia.*

E. A. Grosvenor.

Servian Language: See Slavic Languages.

Servian Literature: in its broadest sense, the literary monuments of the Servian or Servian-Croat language, spoken by most of the inhabitants of Servia, Bosnia, Herzegovina, Montenegro, Dalmatia, and Croatia (including Slavonia), about 6,000,000 in all. This belongs to the southern division of the Slav languages, and, though somewhat influenced by Turkish, is most closely related to Bulgarian, Slovenian, and Russian. In a narrower sense the term Servian is restricted to Servia alone. The Servian and Croat languages and literatures, although essentially of the same origin, and differing in little except that the former employs the Cyrillic (Russian) alphabet and the latter the Latin, had for centuries an independent development, owing to political, religions, and territorial influences. While Croat literature developed under the Roman Catholic Church and Western European influences, Servian literature, as the intellectual medium of a people belonging to the Greek-Oriental Church, grew under the influence of that Church and the Byzantine empire. Consequently the Servians received with the Old Slovenian liturgy also the Old Slovenian or Old Bulgarian language. This, by an admixture of dialectic peculiarities, was gradually moulded into the so-called Servian Church Slavonic, in which, until the destruction of the Old Servian realm (battle at Kossova in 1389), a rather extensive Church literature was produced.

Early Servian Literature.—Among the first writers was Stephen, first King of Servia (crowned in 1217), who wrote a biography of his father, Stephen Nemanjas (ed. by Šafařik, *Život sv. Simeuna*, Prague, 1868 and 1870). His brother Sava, who founded the Servian monastery Chilander on Mt. Athos, and was in fact the apostle of the Servian people, wrote a legend, a ritual, and a liturgy from Old Bulgarian sources. Domentian wrote lives of St. Sava and St. Simeon (ed. by Daničić, Belgrade, 1865). The *Rodoslov*, by Archbishop Danilo (1291–1338), is a genealogical account of Servian kings and archbishops (ed. by Daničić, Agram, 1866). These works were of a panegyric ecclesiastical nature, hardly popular enough to encourage secular literature.

The most important productions for the study of the old language and history of Servia are the documents and records of the old kings, and especially the *Zakonik* (a collection of laws), by King Stephen Dushan (d. in 1356). The Turkish yoke after Kossova almost completely checked literary life in Servia for nearly 400 years; but the Gospels were printed in Belgrade in 1552, and Georg Branković, during his captivity in Eger, wrote a chronicle of Servia from the origin of the Servian people to about 1700.

Literary Activity during the Turkish Supremacy.—While Servian literature was thus suppressed by the Turkish conquest, a similar and cognate literature sprang up and attained full development in the Illyrian towns or the Dalmatian cities and islands from the end of the fifteenth to that of the seventeenth century, gradually declining thereafter. Its language was Croat (West Servian-Croat) in the old historic sense, although in the south (at Ragusa) the South Servian or Herzegovinian dialect predominates. This literature frequently loses the national Slavic color owing to the imitation of the various Italian literary movements. A considerable portion of it is actual translation from the Italian, but most of it is lyric poetry, love songs in the style of the Italian sonnet poetry, idyllic tales, and epics; even the drama is represented in both tragedy and comedy. The oldest writer of this literature is Marko Marulić, at Spalato (1450–1524); his poetry is biblical, its form yet rather imperfect. The island of Lesina produced two masterly poets—Hannibal Lučić (1480–1525), author of lyric songs and the drama *Robinja*, and Peter Hektorović (1486–1572), who wrote the descriptive poem *Ribanja* (a fisherman's tale). Then Ragusa took the leadership, owing to such lyric poets as Menčetić (1457–1501) and Držić (d. about 1510), both masters of love poetry. Greatest of all was Ivan Gundulić (d. 1658), the author of the epic *Osman*, celebrating the Polish victory over the Turks at Chocim. In 1667 Ragusa was destroyed by an earthquake, which ended its material and intellectual development. Jacob Palmotič (d. 1680) portrays its destruction and rebuilding in his epic *Dubrovnik ponovljen* (Ragusa Renewed). The works of Dalmatian poets have been edited by the South Slavonic Academy at Agram (1869, *seq.*).

The revival of Servian literature was due to the political struggles carried on by Austria against the Turks for the liberation of the Servian people, at the end of the seventeenth and the beginning of the eighteenth centuries. A considerable part of Servia was thus restored to Western European life and civilization, but at the same time a reaction against the latter took place; Russian teachers were called to the schools, and the Church-Slavonic language in its Russian form introduced into the service of the Church.

The Archimandrite Iovan Rajić's *History of the Slavic Peoples, especially the Bulgarians, Croats, and Servians* (Neusatz, 1768; n. e., 4 vols., Budapest, 1823), was an incentive to nationality. Dositheus Obradović and Vuk Karadžić, and later the eminent Daničić, reorganized and reformed the popular Servian language proper, and with the liberation of the Servian nation from the Turkish yoke its literature took a high stand among those of Europe. The monk Obradović (1739–1811), who was the teacher of the children of Kara George and died a senator, exerted a paramount influence in the revival of national life and literature in Servia. Vuk Karadžić (1787–1864) collected the Servian songs which attracted much attention in Germany and England as pearls of popular poetry. The first modern poet was Lucian Mušicki (1777–1837), but his pseudo-classicism did not exercise a beneficial influence upon the developing literary taste of his people. More popular and natural is the poetry of Sima Milutinović, who wrote poems on the Servian war of independence (Leipzig, 1826) and the history of Servia in 1813–14 (Leipzig, 1837). The greatest poetical treasure of the nation, however, is their ballads. (See *Serv. Ballads*, by Child, vol. i., p. 468.) With the increasing enlightenment of the nation many prose works also were printed, and journals sprang up over the country, the most important among them being the *Srpski Letopis* (Servian Annual Record), published since 1825. During the second half of the nineteenth century Servian poetry became more and more original, national, and independent, reflecting the peculiar life of the aspiring state.

Peter Petrović Njegos (Vladika of Montenegro) wrote the celebrated epic *Gorski vijenac* (Vienna, 1847), describing the heroic liberation of Montenegro from the Turkish yoke (at the end of the eighteenth century). The other names best known are those of the lyric poets Branko Radičević, Iovan Iovanović, and Djuro Iakshić, and the novelist Milićević with his *Zimne veeri*, tales of Servian life. The *Glasnik*, edited by the Society of Savants since 1847, contains valuable articles on history, geography, literature, and philology.

The new Croat literature, permeated by the Panslavic desire to become intellectually united with the Servian sister literature, has been so modified that the only differenec between them is one of external form. The publicist Ljudevit Gaj (1809–72), at Agram, the center of the South Slavic movement, was especially active in this respect since 1834. The Croat-Servian dialect and the Latin eharaeters were to be employed by the authors of this school, but to avoid jealousies and for ethnological and political reasons, this literature was to be called Illyrian. Since 1848, however, the names Croat and Servian-Croat have prevailed. The most eminent poets of this literature are Peter Preradović (1818–72); Stanko Vraz, by birth a Slovene (1810–51), excellent in lyric poetry; Mažuranić, the author of the famous patriotic song, the epic of hate, *Smrt Smail-aga Cengijiča* (Death of Ismail Agha); and Bogović, author of dramas, songs, and historical novels. The epic popular songs of the Croats have been collected and edited by Bogošić (*Narodne pjesme iz starijih zapisa*, Belgrade, 1878), and partly by Miklosich (*Beiträge zur Kenntniss der slaw. Volkspoesie, I. Die Volksepik der Croaten*, Vienna, 1870).

Bibliography.—*Narodne Srbske pjesme*, a work on Servian popular poetry, by Karadžić (Germ. trans. by Talvj, Leipzig, 1853); Kapper, *Gesänge der Serben* (Leipzig, 1852); Ignaz Iagić, *History of Servo-Croat Literature* (1867); A. Dozon, *L'Épopée Serbe* (Paris, 1888); A. N. Pypin and V. D. Spasovič, *Istorija slavjanskich literatur* (Germ. trans. by T. Peeh, vol. i., Leipzig, 1880). Hermann Schoenfeld.

Service: See the Appendix.

Service-berry: See June-berry.

Service-tree: a rosaceous tree, *Pyrus domestica*, of Europe, Asia, and Africa, much resembling the Medlar and Sorb-tree (*qq. v.*). Its fruit, when overripened and bletted, is soft and pleasant to eat. It is considerably cultivated. The wood is very hard and valuable, and is used as a substitute for box. In parts of North America the name is applied to the shad-tree, and in others to the mountain-ash.

Servites: a community of Augustinian friars, called Servants of the Virgin Mary; founded at Florence in 1233. Bonfiglio Monaldi was their first general and one of their founders. They were confirmed in 1255 by the pope, and in 1493 a part received a reformed rule. There is also a congregation of Servite Tertiaries, and there are a few houses of Servite nuns. The Servites are mostly found in Europe, but have a monastery at Chicago, Ill. J. J. K.

Servitudes [from Lat. *servitu'do*, deriv. of *ser'vus*, slave]: The term servitude, as employed in the Roman law, covers not only the Easement (*q. v.*) of the English law, but also life-estates in land and life-interests in personal property. It is a right to use the property of another, whether real or personal. The term does not include purely contractual rights of use, such as are established by lease or loan, but is restricted to such property rights as are enforceable against all the world by actions *in rem*.

Servitudes on land, if established in favor of an adjacent and "dominant" estate, are termed real or *prædial* servitudes. These are again divided into *rustic* and *urban* servitudes. The former include rights of way, rights of drawing water from or conveying water across neighboring land, etc. Examples of the latter class are rights of light and prospect, right of discharging rain-water on neighboring land, right to have a wall or beams supported by the neighbor's wall. The modern European law of real servitudes is substantially Roman.

Servitudes upon land, if created in favor of a particular person without regard to his ownership of adjacent land, and property rights less than ownership in movables, are *personal* servitudes. They are always limited to a single life, while the real servitudes are in principle perpetual. The most important of the personal servitudes is *usufruct* This may be established not only in land (life-estate of the English law), but in any property which is capable of being used without material impairment of its substanee (so-called "non-consumptibles," e. g. a eollection of books or jewels, a service of plate). The right may be exercised directly. or it may be sold or leased. The usufructuary is bound not to deteriorate the property, and he must give security for its restoration. In the case of consumptibles (including money) a so-called *quasi-usufruct* is reeognized. Here the usufruetuary is really owner, and gives security for the restoration, not of the things or money which he has received, but of their equivalent or value.

Limited rights of using land may be conferred by law upon a neighbor or upon the public generally. In such cases continental jurists speak of *legal* servitudes.

Authorities.—Elvers (Marburg, 1856); Gavini de Campile (Paris, 1870); special works upon usufruct: Genty (Paris, 1859); Hanausek (Erlangen, 1879). Munroe Smith.

Ser'vius: a Roman grammarian of the latter half of the fourth century A. D. He is frequently mentioned in the *Saturnalia* of Macrobius, but is chiefly noted for his complete commentary upon Vergil, whieh is based upon the labors of many earlier scholars, and embodies much useful information on the text and in general on Roman religion, history, and antiquities. This commentary exists in a longer and shorter form, and the relation between the two has caused much discussion. The best edition is by Thilo [and Hagen] (Leipzig, 1881–87). See also E. Thomas's *Essai sur Servius* (Paris, 1880), and Nettleship *Lectures* (Oxford, 1885; p. 322 ff.). M. Warren.

Ser'vius Tul'lius: the sixth King of Rome (legendary dates 578–534 B. C.). The accounnt of his life is full of fables and wonderful traditions—his being the son of a female slave by the god Vulean; his edueation in the royal household under the special care of Queen Tanaquil; his marriage with the king's daughter, and his aceession to the throne by the stratagem of his mother-in-law; his death in Vicus Sceleratus, by being thrown down by the younger Tarquin from the stone steps of the senate-house, then overtaken and stabbed by Tarquin's servants on his way home, and finally driven over by the chariot of his unnatural daughter, Tullia, the wife of Tarquin. But amid the many mythical elements whieh eling to his name there appear to be some remnants of tradition that have a genuine historieal value. To him is attributed a eonstitution which made landed property the basis of the military system, and thus admitted the plebeians to a place in the army and a share in the government. He formed an alliance with the Latins, and completed the city by ineorporating with it the Quirinal, Viminal, and Esquiline hills, and surrounding the whole with a wall 5 miles in circumference, which was the legal boundary of the city up to the time of Sulla. Revised by G. L. Hendrickson.

Ses'ame, or **Benne-plant**, as it is called in the southern parts of the U. S. [*sesame* = Gr. *σησάμη, σήσαμον* (whence Lat. *se'same, se'samon*): cf. Arab. *simsim* and Hind. *samsam*, sesame]: an herbaceous plant, *Sesamum indicum*, belonging to the small family *Pedaliaceæ*, sometimes annexed to *Bignoniaceæ*, valued for the oil expressed from its seeds.

There are several varieties, which have been regarded as species. They are annual Oriental plants, naturalized in most warm climates. Sesame was probably introduced into the U. S. by slaves from Africa. Its rich oily seeds are prized by the Negroes, who also make a thick gelatinous drink of the leaves, which is very bland and useful in diarrhœas. The seeds can be made to yield half their weight in oil, which is in some respects better than olive-oil. The oil is called oil of benne and gingelly-oil.

Revised by CHARLES E. BESSEY.

Sesame-grass: a large grass, *Tripsacum dactyloides*, of the U. S. growing in moist soil near the Atlantic coast from Connecticut southward, with broad leaves and a solid stem, like that of Indian corn or sugar-cane, which it somewhat resembles. It is very coarse, and in the North is not valued, but in parts of the South and in the West Indies and Mexico is used as fodder.

Ses'amoid Bones [*sesamoid* is Gr. σησάμη, sesame + suffix *-oid*, like; so called from their supposed resemblance to a sesame-seed]: bones developed in the tendons of muscles. The most familiar example is the patella or knee-pan. They do not belong to the vertebral appendages proper, but to the sclero-skeleton.

Sesos'tris [Gr. Σέσωστρις, or Σεσόωσις; cf. Egypt. *Sesetsu* = Ramses II.]: the name applied by Greek writers to Ramses II. of the nineteenth Egyptian dynasty, about whom they grouped the record of the deeds of other famous Pharaohs as well as those which belonged to himself, thus forming a single exaggerated personality. Views have differed as to the persons thus combined, Bunsen holding to a commingling of two kings of the ancient empire, while Lepsius held that Ramses II. formed the central figure. Manetho applies the name Sesostris to Usertasen II. of the twelfth dynasty, while Herodotus and Diodorus evidently have Ramses in mind. According to the Greek story, Sesostris was reared with children born on the same day, apparently 1,700 in number, and in his youth led victorious expeditions into Ethiopia and Libya. After his father's death he equipped an army of 600,000 infantry, 24,000 cavalry, and 27,000 chariots, giving the command to his fellow students, marched against Ethiopia and took heavy tribute. He then fitted out a navy of 400 vessels and sailed to the end of the Arabian peninsula. Thence he proceeded through Arabia and along the coast, crossing the Indus and conquering India. Returning by land he subdued the Scythians. According to one account he left a portion of his army in this region, and they became the ancestors of the Colchi. Then, after conquering Thrace, he returned to Egypt with great spoil and many captives, having been absent exactly nine years. The remainder of his reign occupied fifty-nine years. He divided Egypt into thirty-six nomes or districts; built roads, canals, cities, and temples, using his captives as laborers; by grace of Thoth was learned in the law, and was reckoned among the great Egyptian lawgivers; introduced the worship of Serapis; and divided the Egyptians by a system of caste, forbidding also that a son abandon the calling of his father. In his old age he became blind and took his own life. The Greek story is in accordance with the actual facts only in a few particulars. For the Egyptian account, see RAMSES. See Herodotus (ii., §§ 102–110) and Diodorus (i., §§ 53–58), and the authorities quoted by Wiedemann, *Aegyptische Geschichte*, p. 429. CHARLES R. GILLETT.

Sessa Aurun'ca (anc. *Suessa*): town; in the province of Caserta, Southern Italy; on the crater of an extinct volcano about 6 miles from the Tyrrhene Sea (see map of Italy, ref. 6–F). Suessa was a conspicuous city of the Auronians or Aurunci ans as early as 418 B. C., and, judging from the position of important architectural remains, antiquarians and geologists are of opinion that the town was, in part at least, buried by a volcanic eruption. The present town is poorly built, but it has a cathedral, a theological seminary, and a technical college. Pop. 6,000.

Sester'tius [Lat., liter., two and a half; *se'mis*, half + *ter'tius*, third, i. e. the third (*as*) being only a half]: in ancient Rome, a silver or bronze coin worth one-fourth part of a denarius. Originally, it was worth two and a half asses, but in later times four asses made one sestertius, and the coin, originally of silver, was struck in fine bronze. The sestertium was a money of account equal to 1,000 sestertii, but it was never coined. The value of the sestertius, roughly stated, was from one and a half to five cents of U. S. money, for the value declined greatly after the fall of the republic.

Sesto, CESARE, da; painter; b. at Sesto, Milan, in the sixteenth century. He was a pupil or imitator of Leonardo da Vinci. He afterward went to Rome and became acquainted with Raphael, whose style he adopted. Baldassare Peruzzi engaged him to assist in executing the frescoes in the citadel at Ostia. His masterpiece is the picture in the Church of San Rocco of Milan, in several compartments. At Saronno he painted four narrow pilasters with figures of St. Martin, St. George, St. Sebastian, and St. Roch (San Rocco), which he inscribed *Cæsar Magnus fecit*; this has led some critics to believe that he belonged to the de Magni family, or that these frescoes were by another painter, but the similarity of workmanship does not allow of the latter hypothesis. The date of his death is supposed to be 1524.—His brother STEFANO was a sculptor whose bas-reliefs in the Certosa of Pavia are remarkable. W. J. STILLMAN.

Sestri Ponen'te: town; in the province of Genoa, Italy; beautifully situated on the seashore about 5 miles W. of Genoa (see map of Italy, ref. 4–B). It has a delightful climate, and is a favorite summer resort. The inhabitants of Sestri Ponente are extensively engaged in ship-building, and are otherwise very industrious. Pop. of commune, 10,686.

Sestus, or **Sestos**: See ABYDUS.

Sete Quedas: See PARANÁ (river).

Seth, ANDREW, M. A., LL. D.: educator and philosopher; b. in Edinburgh, Scotland, Dec. 20, 1856; educated in Edinburgh, Berlin, and other universities; became assistant in logic in Edinburgh in 1880; professor in University College, Cardiff, 1883: lecturer in the University of Edinburgh 1883; professor at St. Andrews 1887; and Professor of Logic and Metaphysics in Edinburgh University 1891. His principal works are: *The Development from Kant to Hegel, with Chapters on the Philosophy of Religion* (1882); *Essays in Philosophical Criticism* (1883; edited in conjunction with W. R. B. Haldane); *Scottish Philosophy: a Comparison of the Scottish and German Answers to Hume* (first series of Balfour Lectures, 1885; 2d ed. 1890); *Hegelianism and Personality* (second series of Balfour Lectures, 1887; 2d ed. 1893). J. MARK BALDWIN.

Se'ti [*Seti meri-n-Ptah*, belonging to Set, beloved of Ptah: Gr. Σέθως]: name of two Egyptian kings, the first and fourth rulers of the nineteenth dynasty.

SETI I., son of Ramses I. and father of Ramses II. (see RAMSES), ruled for about twenty-seven years. The period just preceding had been one of weakness, in which the limits of the kingdom were narrowed from those established by Thothmes III. (See THOTHMES.) This resulted from the internal dissensions caused by the effort of KHUNATEN (*q. v.*) to establish the solar monotheism of Aten and to abolish the worship of Amon. Monumental proof of the return of the nation to the old religion under Seti is seen in the inscriptions and representations on the walls of the hypostyle hall at Karnak, which Seti founded. Besides this great building, he was architecturally active elsewhere in Thebes and also in many parts of Egypt. He was a patron of art, and left many monuments bearing his name, some of them undoubtedly usurped. From some of his monuments even his own name has been erased, indicating the later revulsion of the Egyptians against the cult of the foreign deity Set, in whose honor Seti was named.

Manetho marked a dynastic division between Ramses I. and Seti I., and, for reasons unknown, began a new dynasty with the reign of the latter. On obvious grounds, however, the dynasty is reckoned by some from the ascent of Ramses I. to the throne. In his first year Seti I. was compelled to proceed to Asia against the beduin (*Shasu*) and the peoples of Palestine and Syria. Among the conquered peoples the Hittites (*Kheta*) are enumerated, but the strength which they exhibited under Ramses II., the succeeding king, renders this record somewhat doubtful. Later Seti I. engaged in war with the Libyans and overcame them. Gradually they enlisted as mercenaries under Seti and his successors, till some 400 years later they had grown to such power that the Libyan Shishak usurped the throne and founded a new dynasty. Seti's inscriptions claim for him a dominion extending from Mesopotamia to Punt, Nubia, and Libya, and they show that under him the mines of Sinai and Nubia were worked. The record of his exploits is sculptured on the north wall of the hypostyle hall at Karnak. (Lepsius, *Denkmäler*, iii., 126a–130b; Brugsch, *Geschichte Aegyptens*, pp. 457 ff., Broderick's English edition, pp. 242 ff.; Wiedemann, *Aegyptische Geschichte*, pp. 416 ff.; Lushington,

Transactions of the Society of Biblical Archæology, vi., pp. 509–534.) Seti's tomb at Biban el-Moluk contains a copy of the myth of the destruction of mankind by Ra. See Brugsch, *Die neue Weltordnung* (1881), and Naville, *Records of the Past* (first series, vol. vi., pp. 103 ff.).

Seti II. was the fourth king of the same dynasty. Little is known concerning him, except that he was the grandson of Ramses II. His name is found on various small objects and upon monuments of his predecessors, which he usurped. His tomb at Biban el-Moluk is ornamented with well executed inscriptions and reliefs. The famous *Tale of the Two Brothers* (in the d'Orbiney papyrus in the British Museum), resembling somewhat the story of Joseph and Potiphar's wife was prepared for his edification. Charles R. Gillett.

Set-off: in law, a cross-demand existing in favor of a defendant which in certain actions and under certain conditions may be interposed as a defense, either partly or wholly defeating recovery by the plaintiff or even resulting in a recovery against him. A set-off is distinguished from a defense in the common sense of the latter word by the fact that if an ordinary defense, as of payment, former judgment, *non-assumpsit*, etc., be not pleaded upon the trial of the action against which it is a defense, the right to set it up is lost, whereas as a set-off, except as otherwise provided by statute in a few States of the U. S., if not pleaded as a defense may be sued upon in a separate action. Set-off should be discriminated from Recoupment (*q. v.*), although it is often difficult to say in which form the opposing demand should be set up as a defense. The word *counterclaim* has a broader meaning, ordinarily including both set-off and recoupment.

This species of defense (analogous to the *compensation* of the civil and Scots law and the *reconvention* of the law of the State of Louisiana) was unknown to the common law, and was first authorized by the English statutes 2 Geo. II., ch. 22, § 13, and 8 Geo. II., ch. 24, § 4, which have been substantially re-enacted in the several States of the U. S. The original statute only permitted a set-off in the case of mutual "debts" of a definite character. The use of the technical word "debts" restricted the set-off to actions brought for the recovery of a fixed certain sum of money due upon a contract, and the demand in favor of the defendant had to be of the same nature. There could be no set-off of unliquidated damages resulting from the breach of contracts, but only of those claims the amount of which had been ascertained and settled by the promise itself, whether that promise were express or implied. The debts had to be also mutual and due to the parties in the same right.

The provisions of the original statute, however, have now been generally more or less modified by later statutes enlarging the scope of the defense. In Great Britain a defendant in an action may now set off or set up by way of counterclaim against the claims of the plaintiff any right or claim, whether such set-off or counterclaim is sound in damages or not. The provisions of the statutes in the different States of the U. S. vary, but in the majority of them the restriction of the defense to liquidated claims is retained and also the restriction as to mutuality. Where the cross-demand accrued in favor of the actual parties, the plaintiff and the defendant, if the defendant's claim is the greater of the two he may not only defeat the plaintiff's recovery, but recover a judgment for the excess. Where the cross-demands originally accrued in favor of persons who are not both the parties to the action (as, for example, where the plaintiff is an assignee of the demand in suit and the defendant's claim is against the assignor) and set-off is allowed, it can only avail as a partial or total defense. No judgment for any excess can be recovered by the defendant, since the plaintiff is not his debtor. Courts of equity, acting upon the analogies of the statute, have created an equitable set-off broader and more comprehensive than that administered by the courts of law. See Parsons on *Contracts*; Waterman's *Law of Set-off, Recoupment, and Counterclaim*; and Barbour's *Law of Set-off*. F. Sturges Allen.

Seton [= Fr., liter., augmentative of Lat. *sæ'ta*, bristle, coarse hair, (in Late Lat.) silk]: in surgery, a twist of silk or a piece of leather, India-rubber, or other material passed through a fold of skin and beneath the subcutaneous tissue for the purpose of exciting suppuration. Its action may be derivative, or it may tend to promote a salutary adhesive inflammation. The use of setons is less common than formerly, but they nevertheless often serve a very useful purpose.

Seton, Elizabeth Ann (*Bayley*): philanthropist: b. in New York, Aug. 28, 1774; married William Seton about 1794, and on his death at Pisa, 1804, returned to New York; joined the Roman Catholic Church Mar. 14, 1805; conducted a school at Baltimore 1805–08. She and her sisters-in-law, Harriet and Cecilia Seton, took the veil as Sisters of Charity Jan. 1, 1809, at Emmittsburg, Md., being the first members of that order in the U. S. A conventual establishment was opened at Emmittsburg July 30, 1812, with Mother Seton as superior-general. The new order took charge of orphan asylums in Philadelphia 1814, and in New York 1817, in which year it was incorporated by the Legislature of Maryland. At the death of the founder, at Emmittsburg Jan. 4, 1821, there were fifty members. There are in the U. S. about 110 houses and 1,450 Sisters of Charity.

Revised by J. J. Keane.

Settembri'ni, Luigi: author; b. in Naples in 1812; was appointed professor in the Lyceum of Catanzaro in 1835, but, becoming compromised in political affairs, was arrested in 1839 and imprisoned at Naples. Being set at liberty in 1842, he gave private lessons in literature until 1848, publishing in the meantime his bold *Protesta dei Popoli delle Due Sicilie*. In 1848 he held an important post in the ministry of public instruction; on May 16, 1849, the reaction having triumphed, he was arrested and thrown into the prison of San Stefano, where he occupied himself in translating the works of Lucian into Italian. On his release he devoted himself wholly to literature, and published *Lezioni di Letteratura Italiana* (3 vols., Naples, 1867–72). In 1873 he was appointed senator of the kingdom of Italy. D. in Naples, Nov. 4, 1876. See his *Ricordanze della mia vita* (2 vols., Naples, 1876–80).

Setter: a hunting-dog of a breed apparently intermediate between the pointer and the spaniel. This dog was formerly trained to sit or drop when marking down game, but at present it stands at its work like a pointer. There are several distinct strains, as the Irish and the English setters, and of late there are several new stocks which are highly prized. Notable among these are the Gordon, the Macdona, and the Laverack setters. The colors vary, but a liver color is a favorite one. See Dogs.

Settignano, set-tēēn-yaa'nō, Desiderio, da: sculptor; b. at Settignano, a suburb of Florence, in 1428. He is reported to have studied with Donatello. Very little is known of his life, which was probably spent in and near Florence. According to Vasari, he died very young, but recent writers have disputed this. His most important work, which, moreover, is not disputed, is the wall-tomb in Santa Croce in Florence, erected in memory of the scholar Carlo Marsuppini of Arezzo, one of the finest of the many splendid monuments of the Renaissance. The portrait-bust of Marietta degli Strozzi, placed in the Berlin Museum about 1880; the bust of Beatrice d'Este, in the Louvre: an exquisite bas-relief in the Via Cavour in Florence; a tabernacle, or rather ambry (Italian, *ciborio*), in the Church of San Lorenzo, are generally recognized as his work. Probably he was one of the most busily employed of those able designers in mingled architecture and sculpture in which the Florentine Renaissance was so rich. D. Jan. 16, 1464. Russell Sturgis.

Settlement of Decedents' Estates: See the Appendix.

Set-Ty'phon: an Egyptian deity. Set (Gr. Σήθ) was classed as parallel with the monster Typhon (Gr. Τυφῶν, or Τυφάων), son of Tartarus and Ge, or of Hera, who desired to gain mastery over the gods, but was slain by Zeus and buried in Tartarus. Set was believed to be the son of Seb and Nut, brother of Osiris, Isis, and Nephthys, the last being also his wife. As a solar deity he stood for the evil power of the sun's heat, and in general represented the principle of evil and harm, just as Osiris was the type of all that was good and beneficent. The worship of Set was very ancient, dating from the fifth dynasty at least, and his principal sanctuary was at Ombos in Upper Egypt, where he was regarded as the lord of the South. There he was sometimes confounded with the crocodile-headed god Sebak. It is probable that at the time of the eighteenth to the nineteenth dynasties Set was still worshiped, since several kings and other persons bore names compounded with his, such as *Seti*, "belonging to Set." As Osiris, the god of the dead, was revered out of hope, Set held his worshipers through fear of the evil which he had power to inflict on gods and men. For his connection with the Osiris myth, see Osiris.

In general Set was regarded as a foreign deity like Baal, and was in fact the principal god of the Hyksos, under the name

of Sutech. It was the demand of the Hyksos king Apepi addressed to the Egyptians, that they should adopt Set as their chief god, which led to the religious war that ended in the expulsion of the Hyksos by Aāhmes, the first king of the eighteenth dynasty. In the Hyksos city Tanis Set was regarded as a solar deity, the enemy of the serpent Apep, whereas the general Egyptian view identified the two. Set was not only a foreign god, but came to be regarded as the god of the foreigners, and after the evils of foreign oppression had been experienced, the honor paid to him gradually ceased, till during the twenty-second and following dynasties the general detestation in which he was held is evidenced by the fact that his name was erased from the monuments and his images destroyed. He is also found as the god of the Hittites, and consequently he was regarded as the enemy of Rā, the sun-god. Set was represented in the hieroglyphies as an ass-headed figure, or as an ass seated on his haunches with a forked tail in a vertical position. The ass, crocodile, and hippopotamus were sacred to Set, and red-haired men were under his special protection. See Meyer, *Set-Typhon* (Leipzig, 1875). CHARLES R. GILLETT.

Setu'bal (sometimes called ST. UBES): town; in the province of Estremadura, Portugal; on the Bay of Setubal; 20 miles S. of Lisbon (see map of Spain, ref. 17–A). It has an excellent harbor, lined with broad quays and defended by five forts. It is an old town, the *Cetobriga* of the Romans, and is surrounded by walls, but it is well built and clean. It is the chief seat of the Portuguese salt-trade, and has also an extensive trade in wine and oranges. Considerable pilchard-fisheries are carried on. Pop. 15,600.
Revised by M. W. HARRINGTON.

Seul: same as SEOUL (*q. v.*).

Seurt, or **Saird**: town; on the upper Tigris; in the vilayet of Bitlis, Kurdistan (see map of Turkey, ref. 5–I). It is probably the ancient *Tigranocerta*, built by Tigranes the Great (80 B. C.). It carries on trade in wheat, barley, mohair, and gallnuts. Pop. 12,000, Kurds, Armenians, Syrians, and Chaldeans. E. A. G.

Seuse: See SUSO.

Sevasto'pol, or **Sebas'topol**: seaport and fortress; near the southwest extremity of the Crimean peninsula in the Black Sea (see map of Russia, ref. 11–C). The roadstead and the harbor, and the extensive establishments connected with them, form the most important features of the place. It was a Tartar village (*Akhtiar*) until 1780, when the Russian Government commenced the work of establishing here its naval arsenal. The great harbor fortifications which existed at the period of the siege were planned in 1834, and also at the same time land-defenses. The latter had not been constructed when (Sept., 1854) the allied armies of Great Britain and France established themselves before the place and the memorable siege commenced. Every effort was then made to increase the strength of existing intrenchments, and the process continued *pari passu* with the siege. The bastions (of earth) mentioned in accounts of the siege had been previously thrown up. The connecting lines had not the strength of ordinary field-fortifications, the scarcity of earth preventing the excavation of ditches, except about the bastions and other points of support (e. g. the Malakoff, originally a stone tower; the Redan, an earthwork, etc.). To compensate for want of ditches, every practicable expedient was adopted to render access difficult.

Though compressed into comparatively small linear space, the real magnitude of these defenses was enormous, 5,000 or 6,000 men being at some periods daily engaged on them, and the labor being uninterrupted during the eleven months of the siege. The garrison during this period (always in free communication with the external forces by which it was replenished) was usually about 30,000 men; the number of guns mounted at the final assault is said to have been 800, several times that number having been rendered unserviceable in the course of the siege (Oct., 1854–Sept., 1855). The Russian loss in the defense was 84,000 men. (*Todleben.*) The forces actually engaged were, during the latter months, about as follows: French, 120,000; British, 27,000; say, 147,000 men. The Sardinians (5,000) and Turks are not included, as they were not directly engaged. The former and a portion of the Turkish force helped to hold the base (Balaklava) and communications of the besiegers. The French loss was 44,500 (*Niel*); hence the total loss of allies must have been about 60,000. The total loss of besieged and besiegers must have been nearly 150,000.

The fortifications and naval establishments were, after the capture, destroyed by the allies, and by the Treaty of Paris, which terminated the war, Russia was debarred from building arsenals and maintaining a naval force in the Black Sea beyond a very limited magnitude; but this restriction was removed by the abrogation of the neutrality of the Black Sea by the Conference of London (1871). The town has been rebuilt, and since 1885 the fortifications have been actively replaced and the docks reconstructed. Sevastopol has become a pleasant watering-place, and is Russia's greatest southern naval headquarters. It has ceased to be a commercial port since the opening of the new harbor at Kaffa (1895). Pop. (1897) 54,442. See CRIMEAN WAR.
Revised by M. W. HARRINGTON.

Seven Pines, Battle of: See FAIR OAKS.

Seven Sages (or **Wise Men**) **of Greece**: according to most authorities, Bias, Chilon, Cleobulus, Periander, Pittacus, Solon, and Thales, but the names are variously given. Many aphorisms in prose and verse, chiefly practical observations for the regulation of life, the work of these and other wise men of the antephilosophic period of Greece, have been collected in Orelli's *Opuscula Græcorum Veterum Sententiosa et Moralia* (vol. i., p. 138, *seq.*). J. R. S. S.

Seven Sleepers: according to an early tradition, seven Christian brothers of Ephesus who, during the persecution of Decius (251), took refuge in a cave, the entrance of which was walled up immediately after by the heathen. There they slept miraculously until 447. Then they awoke, told their story to many persons—among others to the Emperor Theodosius II.—and died after having thus confirmed the faith of the Christians. The Roman Catholic Church commemorates them on July 10. This legend can be traced at least as far back as the beginning of the sixth century. It is also told by Mohammed in the Koran. Kindred tales are found in various forms in the folk-lore of the East. E. A. G.

Seventeen-year Locust: See CICADA.

Seventh-day Adventists: See ADVENTISTS.

Seventh-day Baptists: a denomination of Christians formerly called *Sabbatarians*. They hold to the immersion of adult believers, and also to the observance of the seventh day of the week as the Sabbath, arguing that since the institution of the Sabbath at the close of creation and its formal annunciation as a part of the Sinaitic code there has always been an unbroken chain of men who have kept the seventh day of the week as a Sabbath, according to its original institution and enjoyment, and considering the introduction of the observance of Sunday, in the middle of the second century, as the first step to apostasy. Traces of the peculiar practice of observing the seventh day of the week as the Sabbath among some of the early Reformers are not few. The Sabbatarians began to attract attention in England about the time of the Commonwealth. In 1650 they assumed a denominational form in that country. The first Sabbatarian church in America was organized at Newport, R. I., in 1665, under the care of Stephen Mumford. In 1671 they left the Baptist denomination. In 1818 they assumed their present name. In the U. S. they have three colleges, one at Alfred Centre, N. Y., one at Milton, Wis., and one at Salem, W. Va., a number of academies and periodicals, a tract and publication society, and a missionary organization. The number of organizations in 1900 was 114, the number of members 9,161. In England they are at present few in number.—SEVENTH-DAY BAPTISTS (GERMAN), a small sect which in 1728 seceded from the Dunkers of Pennsylvania, and established at first a solitary, and then a conventual, life at Ephrata, Lancaster co., Pa. They hold a part of their property in common, adopt the Capuchin habit and a system of monastic names, and recommend, but do not absolutely require, celibacy. At present their leading establishment is at Snowhill, Franklin co., Pa. In 1890 there were six organizations and 194 members. Their founder was Conrad Beissel. See *A General History of the Sabbatarian Churches*, by Mrs. Tamar Davis (1851). See BAPTISTS. Revised by W. H. WHITSITT.

Seven Up: a game at cards known also as *all-fours* and *old sledge*. It is designed for two players and is played with a full pack, the cards ranking as in whist. Six cards are dealt each player, three at a time, and the next is turned face up. If the non-dealer is dissatisfied with this for trump he "begs," and the dealer must either immediately add one point to his opponent's score or lay the turned card aside and deal three more to each player, turning the next card for trump; but if this be of the same suit as before he must

lay it aside and deal three more to each, and so on until a new trump is turned. The eldest hand leads first, and thereafter the winner of the trick. A player must follow suit if he can, except that he may play a trump instead. One point is scored for (1) playing the highest trump (*high*), (2) playing the lowest trump (*low*), (3) turning up a knave or taking the knave of trumps (*jack*), and (4) taking the most valuable cards (*game*), counting here each ten as 10, ace 4, king 3, queen 2, and knave 1. The first to score seven points wins; in the last hand the points are scored in the order given above (not in the order in which they are made), except that the point for turning a knave is scored when it is turned. This game is much played, and is of especial interest as being a game from which many others have been derived by greater or less modifications and additions: examples are California jack, pedro, cinch or double pedro, draw pedro, and pitch.

Seven Wonders of the World: variously given, but generally as follows: The Colossus of Rhodes (see CHARES), Diana's temple at Ephesus (see DIANA, TEMPLE OF), the Mausoleum at Halicarnassus (see MAUSOLEUM), the PYRAMIDS (*q. v.*), the Pharos at Alexandria (see LIGHTHOUSE), the HANGING GARDEN OF BABYLON (*q. v.*), and the colossal gold and ivory statue of Zeus, by Phidias, at Olympia.

Seven Years' War: the contest between Prussia and several of the other powers of Europe extending from 1756 to 1763. Prussia, which had previously seized the Austrian province of Silesia, held it despite the efforts of Maria Theresa to regain it. The latter was determined to crush, or at least humiliate, the house of Brandenburg; and since the Peace of Aix-la-Chapelle (1748) the Austrian generals had been busy in reorganizing and increasing their armies, while the empress and her agents had been forming alliances against Prussia. The Czarina of Russia, Elizabeth, was a willing ally; she knew that Frederick II. used to make her immoralities the favorite subject of his sarcasms. But with respect to France, the hereditary enemy of Austria and just then at war with England, the former ally of Maria Theresa, the difficulties seemed almost insurmountable. Nevertheless, when George II. concluded an alliance with Prussia Jan. 16, 1756, in order to secure his Hanoverian possessions against a French invasion, and when Maria Theresa stooped to write a letter to Madame de Pompadour, Prince Kaunitz succeeded in forming an alliance between France and Austria (May 1, 1756). Sweden, whose possessions in Northern Germany were confined to Stralsund and the island of Rügen, was easily persuaded by France to make a descent on Pomerania. In Saxony the elector was so exasperated at Prussia that he even came forward with a proposal of alluring the Prussian king into Bohemia by a feigned neutrality, and then throwing an army into his rear to cut off his lines of retreat and communication. Frederick II. knew of all these plans, and when he saw that war was unavoidable he fell at once, without any declaration of war, upon Saxony with 60,000 men (Aug., 1756), took Dresden Sept. 9, shut up the Saxon army of 18,000 men in its camp between Pirna and Königstein, defeated the Austrian army under Braun, who from Bohemia hastened to the support of Saxony, compelled the Saxon army to surrender Oct. 15, and placed the whole country under Prussian control. But notwithstanding this brilliant beginning the situation in the spring of 1757 was almost overwhelming. At the north 22,000 Swedes gathered in Stralsund ready to cross the Peene; in the east 100,000 Russians under Apraxin pushed onward to Memel; in the southeast two Austrian armies approached through Bohemia—the one, of 76,000 men, under Charles of Lorraine, destined for Silesia, the other, of 46,000 men, under Daun, destined for Saxony; in the southwest two French armies marched toward Prussia—the one, of 100,000 men, under d'Estrées, through Hanover, the other, of 36,000 men, under Soubise, through Hesse-Cassel; in the south an army from the contingents of the South German states was destined to manœuver in connection with the Western Austrian and Eastern French armies. In the center of this circle stood Frederick II. with an army of about 200,000 men. Great Britain, his only ally, promised and paid him for several years a handsome subsidy, but her representative, the Duke of Cumberland, commanded an army of only 40,000 British-Hanoverian troops in Hanover. In Apr., 1757, Frederick broke into Bohemia; attacked the Austrian army under Charles of Lorraine before Prague May 6; split it in two, of which the one part retired into Prague, and the other retreated to the southwest to join Daun; invested and besieged Prague; marched with one division of his army against Daun, who came to re-enforce the city; met him at Kolin June 18; was completely defeated, and retreated with his whole force into Saxony, slowly followed by Daun, while Charles of Lorraine marched onward to Silesia. In Hanover the Duke of Cumberland was totally defeated by d'Estrées at Hastenbeck July 26, and compelled to conclude the capitulation of Kloster-Zeven Sept. 8, by which his army was dissolved. D'Estrées's successor, the Duke of Richelieu, was too much occupied with plundering Hanover to do anything serious, but in the meantime Soubise, with the second French army, had conquered Hesse and penetrated into Saxony. Frederick II. met him at Rossbach Nov. 5, and literally scattered his army to the winds. With incredible rapidity he then turned to Silesia, which had fallen into the hands of the Austrians; routed Charles of Lorraine at Leuthen Dec. 5, and reconquered the whole province with the exception of Schweidnitz. In the north the Swedes were driven back into Stralsund, and the Russians, although victorious at Grossjägerndorf Aug. 30, and still occupying Memel, suspended all hostilities on account of the illness of the czarina, which changed the whole policy of the country. Thus, when winter set in and stopped all military operations, the actual loss which Frederick II. had sustained was not great, and the prestige he had gained was enormous. The capitulation of Kloster-Zeven was not ratified by the British Parliament. On the contrary, a new British-Hanoverian army was organized and placed under the command of Duke Ferdinand of Brunswick, and during the subsequent campaigns he succeeded by his vigilance, energy, and shrewd tactics, and by several brilliant victories—at Crefeld June 23, 1758, over Clermont, and at Minden Aug. 1, 1759—in keeping the French on the other side of the Rhine. In the sea-war between Great Britain and France, Spain joined the latter in 1761, but Great Britain was so successful in North America, the West Indies, the African coast, and India, and showed herself so superior to France in all their great naval encounters—at Quiberon, 1759, and Belleisle, 1761—that she then laid the foundation of her great maritime empire. In 1758 Frederick II. defeated the Russians at Zorndorf Aug. 25, but he was himself defeated at Hochkireh Oct. 14, by the Austrians under Daun. He nevertheless kept both Silesia and Saxony, but in 1759 was so completely routed at Kunersdorf, Aug. 12, by the Russians and Austrians, that the morning after the battle he could hardly gather 5,000 men. Dresden and a large part of Saxony fell into the hands of the allies, and although he reconquered it in 1760 by the brilliant victories at Liegnitz Aug. 15, and at Torgau Nov. 3, his ruin seemed, nevertheless, unavoidable. On Oct. 25, 1760, George II. died, and the British subsidies stopped. The Russians under Todleben took Berlin and plundered it for three days. In large districts, especially of the eastern part of his kingdom, the houses were burned, the animals driven away, the men killed, and the women and children left to starve. Frederick's army, mostly foreigners and young recruits, numbered only 50,000, and with this force he had to face three hostile armies at once, each superior in numbers to his own. But the czarina died Jan. 5, 1762, and her successor, Peter III., was an enthusiastic admirer of Frederick II. Peace was concluded with Russia May 5, and with Sweden May 22, and although the projected Russo-Prussian alliance was frustrated by the assassination of Peter III., Catherine II., his successor, declared herself neutral; Austria felt too weak to carry on the war alone. Almost without any preliminary negotiations peace was concluded between Prussia and Austria at Hubertsburg Feb. 15, 1763, by which "all should remain as it had been before the war." The effort to wrench Silesia from Prussia had failed, and the heroic and triumphant resistance of the king gave him the permanent appellation of Frederick the Great. See Frederick II., *Histoire de la Guerre de Sept Ans* (6 vols., 1794–1801); Carlyle, *Frederick the Great*; Ranke, *Ursprung des siebenjährigen Krieges* (1871). Revised by C. K. ADAMS.

Severi'nus, SAINT: the apostle of Noricum; b. in Italy in the beginning of the fifth century; made a journey to the East, where he adopted a life of the severest asceticism, and devoted himself, after his return to the West, to missionary work. He first visited Pannonia, but afterward settled in Noricum, a Roman province comprising the present Austria, Styria, Carinthia, Carniola, and Tyrol. He died, after an eventful life, at Faviana, a city situated on the Danube, near the present Vienna, Jan. 8, 482. His *Life*, by his pupil Eugippius, is in Migne, *Pat. Lat.*, lxii., 550, *seq.*

Severn: a river of England which rises in Montgomeryshire at an elevation of 1,500 feet above the level of the sea, flows east, south, and then southwest, and falls into the Bristol Channel after a course of about 210 miles, though the distance from source to mouth is only 80 miles in a straight line. It is navigable for 150 miles, and the tide, which in its estuary assumes the character of the bore, locally called *hygre*, is perceptible 120 miles from its mouth. Its chief affluents are the Terne and the upper and lower Avon on the E. and the Teme and the Wye on the W. A canal 18½ miles long, and navigable for vessels of 400 tons, extends from Gloucester to the upper portion of the estuary. Other canals establish communication between the Severn and the Thames, Trent, and Mersey.

Seve'rus, Alexander: See Alexander Severus.

Severus, Septimius: Roman emperor (193–211 A. D.); b. near Leptis in Africa in 146; married the famous Julia Domna, daughter of Bassianus, priest of the Sun at Emesa. While commander-in-chief of the Roman armies in Illyria and Pannonia he was proclaimed emperor by his troops. He deposed the Emperor Julianus and crushed the rival claimants Pescennius Niger and Clodius Albinus; captured Byzantium (197) after a memorable siege which lasted three years; invaded Parthia and captured Ctesiphon; from 203 to 207 remained peacefully at Rome, where he remodeled the constitution of the Pretorian Guards: was then called to Britain to repress rebellion and marched the entire length of the island, subduing the Caledonians; died at Eboracum (York) in 211, his death being hastened by the unnatural conduct of his son Caracalla. E. A. Grosvenor.

Severus, Sulpicius: See Sulpicius Severus.

Severus, Wall of: a wall of stone partly built or repaired by the Emperor Severus in 208 A. D. to protect Roman Britain from the Caledonians. It was originally erected by Hadrian. It extended from the Solway to the Tyne, immediately N. of the wall of Hadrian, and consequently far S. of that of Antoninus. Considerable portions of the wall still remain. See Hadrian's Wall.

Sevier, sev-eer', John: pioneer and soldier; b. on Shenandoah river, Virginia, in 1745, of French parents; originally named Xavier; explored the Holston river in East Tennessee (then North Carolina), built Fort Watauga, and fought successfully against the Indians. During the Revolutionary war he distinguished himself by his bravery. He was foremost in almost all the battles and skirmishes, as well as treaties and negotiations, with the Indians during many years, and was regarded by the settlers as their friend and protector; was chosen in 1785, without opposition, Governor of the anomalous State of Franklin, comprising Western North Carolina and Eastern Tennessee. He received from President Washington the commission of brigadier-general of the territory S. of Ohio river. In 1796 the State of Tennessee was erected and admitted into the Union, and Sevier was chosen Governor, served for two consecutive terms, and was re-elected in 1803; was elected a Representative in the U. S. Congress in 1811, and re-elected in 1813. D. near Fort Decatur, Ga., Sept. 24, 1815, while on a mission to the Creek Indians. F. M. Colby.

Sevier Lake: a body of salt water in Western Utah; in lat. 39° N., lon. 130° 10′ W.; altitude, 4,000 feet. Its sole tributary is the Sevier river, which enters at the north end. Its valley is a southward arm of the Sevier desert, limited at the W. by the House Range of mountains and at the E. by the Beaver Creek Range. The lake, having no outlet, is of variable size, its extent depending on the relation between inflow and evaporation. In 1872 its length was 28 miles, its width 10 miles, its area 188 sq. miles, and its depth 15 feet; but its natural size was somewhat greater, for at that time a portion of the water of the Sevier river was used for purposes of irrigation. The whole of the river is now utilized in that way through the entire spring and summer, so that little water reaches the lake except in winter. As a result its bottom generally becomes dry each year, and the water acquires in winter a depth of but a few inches. The salts which made the natural water a strong brine have been precipitated and form a crust over the lake-bottom. This crust is estimated to contain 1,500,000,000 tons, of which about three-fourths is sodium chloride and the remainder sodium sulphate and magnesium sulphate. The only inhabitants of the lake are a species of brine-shrimp (*Artemia*) and the larvæ of certain insects. Such fishes as reach it from the river are poisoned by the brine. Old water-lines about the margin of the valley show that the lake was once of greater extent. At the time of its extreme depth, 590 feet, it coalesced with Great Salt and other lakes, the whole forming a vast inland sea. See Bonneville, Lake.

G. K. Gilbert.

Sévigné, sā'vēn'yā', Marie de Rabutin Chantal, Marquise de: writer; b. in Paris, France, Feb. 6, 1626; was left an orphan very early, but received an excellent education from her uncle, Abbé de Coulanges, and married in 1644 the Marquis Henri de Sévigné (d. 1651), to whom she bore a son and a daughter. She was rich, spirited, beautiful, one of the most prominent members of the literary circle of the Hôtel Rambouillet, and on intimate terms with all the principal actors in the civil war of the Fronde. In 1669 her daughter, to whom she was passionately attached, was married to the Marquis de Grignan, governor of Provence; the consequent separation occasioned a correspondence which, although not intended for publication, appeared after the death of the authoress, and has made her name celebrated, the letters being at once of great historical interest and of the highest literary merit. D. at Grignan, Apr. 18, 1696. The chief edition of her *Letters* is that of Regnier (14 vols., 1862-67; new ed. begun 1887). See also Walckenaer, *Mémoires touchant la Vie et les Écrits de Madame de Sévigné* (1842); Capmas, *Lettres inédites de Madame de Sévigné* (1876); Combes, *Madame de Sévigné historienne* (1885); the biographies by Bossier (1887) and Vallery-Radot (1888); and Saporta, *La famille de Madame de Sévigné en province* (1889).

F. M. Colby.

Seville, sev'il (Span. *Sevilla*, anc. *Hispalis*): capital of the province of Seville, Spain; on the left bank of the Guadalquivir, 70 miles from its mouth (see map of Spain, ref. 19–C). Under the Romans, Goths, and Moors it was the capital of wealthy and powerful empires. The earlier kings of modern Spain also resided here; and though Charles V. removed the royal residence to Valladolid, Seville rose to a still higher degree of splendor and prosperity when America was discovered, as it became the mart of the new colonies. During the French invasion (1810–13), and by the subsequent loss of the Spanish colonies, it suffered very much, but it recovered rapidly, and is an enterprising modern town. Its old Moorish walls, 5 miles in circuit, pierced by fifteen gates, and surmounted by sixty-six towers, have disappeared, except the single gate called Triana. Across the city runs the Alameda, a broad, open street lined with palaces, planted with magnificent elms, and adorned with numerous fountains, which, like the city in general, are provided with water by several great aqueducts, of which that built by Julius Cæsar and rebuilt by the Moors in 1172 is a magnificent structure resting on 410 high arches. The rest of the city, with the exception of the numerous public squares and promenades, consists mostly of narrow streets lined with high, somber-looking, but substantial houses of Moorish construction. Among its edifices the cathedral is the most remarkable. It is one of the greatest Gothic structures in the world, 431 feet long, 315 feet wide, and 145 feet high under the transept dome, and it is most magnificently adorned with paintings by Murillo, the Herreras, and other masters of the school of Seville, besides being almost overloaded with sculptures. Unique of its kind is the Giralda, a belfry 350 feet high; and most interesting on account both of their architecture and ornamentation are the Alcazar or royal palace and the university, founded in 1579. Besides the university, to which several scientific establishments are attached, Seville has many good educational institutions, and several valuable libraries and art collections. Among its manufactures are an immense cigar-factory, a cannon-foundry, several manufactories of muskets and other firearms, powder, saltpeter, soap, leather, cotton thread, etc. Its chief exports are oranges, olive-oil, wine, wool, cork, copper, lead, and quicksilver. As Seville was held by the Moors for five centuries and entirely rebuilt by them from the materials of former Roman edifices, it became a purely Moorish city, and to a certain extent it still preserves that character, though the narrow, tortuous streets are gradually giving way to broad and straight boulevards. Pop. (1887) 143,182. The province of Seville occupies the lower valley of the Guadalquivir, bounded W. by Huelva and S. by Cadiz; area, 5,295 sq. miles; pop. (1887) 544,815.

Revised by M. W. Harrington.

Sèvres, sev'r: town; in the department of Seine-et-Oise, France; on the Seine; 10½ miles S. W. of Paris by rail (see map of France, ref. 3–F). It is celebrated for its manufactures of

porcelain, which are generally acknowledged to be the most elegant ever produced, in both design and painting. The porcelain museum contains a large collection of china and earthenware from all parts of the globe. Pop. (1896) 7,317.

Sèvres, Deux, dö- : department of Western France, deriving its name from two rivers—the Sèvre-Niortaise, which flows into the Bay of Biscay, and the Sèvre-Nantaise, which joins the Loire. Area, 2,317 sq. miles. The northern part is hilly, even mountainous; the southern level. The soil is everywhere fertile; it produces more wheat than is necessary for home consumption, and affords excellent pastures. Cattle, horses, mules, and asses are extensively reared. Iron, marble, and granite are found, and considerable manufactures are carried on. Pop. (1896) 346,694. Capital, Niort.

Sewall, syu'el, JONATHAN, LL. D.: b. in Boston, Mass., Aug. 24, 1728; graduated at Harvard 1748; taught school at Salem till 1756; began the practice of law at Charlestown in 1758; became attorney-general of Massachusetts 1767; gained a suit by which a slave recovered his freedom at common law 1769; resided at Cambridge until 1774, when his Tory sentiments caused his house to be wrecked by a mob; went to England in 1775; was included among the sufferers by the penal act of Apr. 30, 1779, against the loyalists; settled at St. John, New Brunswick, 1788, and was judge of the court of vice-admiralty until his death Sept. 26, 1796. He was long reputed the author of the letters signed Massachusettensis published in defense of British policy, and replied to by John Adams over the signature of Novanglus, but it is now known that they were written by Daniel Leonard, of Taunton.—His son, JONATHAN SEWELL, LL. D. (1766–1839), who adopted the English form of the name, was chief justice of Lower Canada 1808–38.

Sewall, MAY (*Wright*): educator; b. at Milwaukee, Wis., May 27, 1844; educated at the Northwestern University; taught public schools in Michigan, and was soon made principal of the High School in Plainwell, in that State; later became, successively, the principal of the High School in Franklin, Ind., and teacher of English and German in the High School in Indianapolis; married in 1880 Theodore L. Sewall, principal of a private school for boys in that city. In 1882 Mr. and Mrs. Sewall opened a girls' classical school. Mrs. Sewall's energies were enlisted in reforms soon after reaching womanhood. She was first actively connected with the National Woman Suffrage Association, in which she held for many years the office of chairman of the executive committee. She was one of the promoters of the International Council of Women which convened in Washington in 1888, and conceived the idea of perpetuating its influence through permanent International and National Councils of Women. In the organization of both these bodies she subsequently aided, and has served as president of the National Council and vice-president at large of the International Council. She was also one of the committee that formulated the plan for the general federation of women's clubs. In Indianapolis she was one of the founders of the Woman's Club; of the Art Association; of the Equal Suffrage Society; of the Ramabai Circle; of the Indiana Branch of the Association of Collegiate Alumnæ; of the university extension work in Indianapolis, under the auspices of this latter society; of the Local Council; of the Woman's Exchange; and of the Contemporary Club. She also originated the plan of the Indianapolis Propylæum, an incorporated joint-stock company of women, which has erected a handsome building for social and educational purposes. Mrs. Sewall was appointed member at large of the board of World's Fair managers for Indiana, was chairman of the committee on women's work, and a member of the committee on education in that body. She was also made the chairman of the committee on the World's Congress of Representative Women, in the World's Congress Auxiliary of the Columbian Exposition of 1893. She has lectured frequently on social, educational, literary, and reform topics, is a contributor to periodicals, and has edited *The Historical Résumé of the World's Congress of Representative Women* (2 vols.).

SUSAN B. ANTHONY.

Sewall, SAMUEL: jurist; b. at Bishopstoke, England, Mar. 28, 1652. His parents emigrated to New England and settled at Newbury, Mass., 1667, and he entered Harvard, graduating 1671; studied theology; preached for a short time; acquired a fortune by his marriage (Feb. 28, 1676) with Hannah, daughter of John Hull, master of the mint at Boston; was assistant governor 1684–86 and 1689; visited England 1688–89; was annually chosen a member of the executive council from 1692 to 1725; was judge from 1692 to 1718, when he was made chief justice, being at the same time judge of probate for Suffolk County; presided at the trial of some of the victims of the witchcraft delusion of 1692, but was soon convinced of his error, for which he publicly asked pardon of God and man in a paper read to the congregation of the Old South church, Boston, on Fast Day, Jan. 14, 1697, by his pastor, Rev. Samuel Willard; was noted for his charity and philanthropy, having been perhaps the first American writer against slavery, on which theme he published a tract, *The Selling of Joseph* (1700); was secretary and treasurer of the society for the maintenance of Indian missions, and was author of *An Answer to Queries respecting America* (1690); *Accomplishment of Prophecies* (1713); *A Memorial relating to the Kennebec Indians* (1721); and *A Description of the New Heaven* (1727). He resigned his judicial offices 1728. D. in Boston, Jan. 1, 1730. His *Diary* and other papers have been published by the Massachusetts Historical Society.—His son, JOSEPH, b. in Boston, Aug. 26, 1688, graduated at Harvard 1707; studied theology: was ordained colleague pastor of the Old South church Sept. 16, 1713; declined the presidency of Harvard College 1724; received the degree of D. D. from the University of Glasgow 1731; gave to that institution a fund for the education of indigent students; was a friend of learning and a man of great benevolence and worth. D. in Boston, June 27, 1769. Author of *Four Sermons* (1741) and of twenty-three other sermons separately printed.

Sewall, STEPHEN: scholar; b. at York, Me., Apr. 4, 1734; graduated at Harvard 1761; taught the grammar school at Cambridge; became instructor in Hebrew in Harvard 1762, and was Hancock Professor of Hebrew 1765–85; published a *Hebrew Grammar* (1763); wrote seven of the Greek and Latin poems in *Pietas et Gratulatio* (1761) and other works, and left several MSS., now in the library of Harvard, including a *Chaldee and English Dictionary*. D. in Boston, Mass., July 23, 1804.

Seward, syu'ard: city; capital of Seward co., Neb.; on the Big Blue river, and the Fre., Elk. and Mo. Val. and the Burlington Route railways; 25 miles W. by N. of Lincoln, the State capital (for location, see map of Nebraska, ref. 10–G). It is in an agricultural region, and contains 2 national banks with combined capital of $100,000, a State bank with capital of $60,000, a savings and investment company with capital of $50,000, and a monthly and 4 weekly newspapers. Pop. (1880) 2,032; (1890) 2,108; (1900) 1,970.

EDITOR OF "BLUE VALLEY BLADE."

Seward, ANNA: poet; b. at Eyam, Derbyshire, England, in 1747; obtained some celebrity as a poet, chiefly by her elegies upon her friend Maj. André (1781), and upon Capt. Cook; resided most of her life at Lichfield, where her father was a canon residentiary; published a *Life* of her friend Dr. Erasmus Darwin (1804), in which she laid claim to the authorship of the first fifty lines of *The Botanic Garden*; also *Louisa*, a poetical novel (1782), and *Sonnets* (1789). D. at Lichfield, Mar. 23, 1809, bequeathing her MSS. to Sir Walter Scott, who published her *Poetical Works and Correspondence* (3 vols., 1810), with a prefatory memoir, but the collection met with little favor, though by her contemporaries she was called the Swan of Lichfield. Constable published six volumes of her correspondence (1811–13).

Revised by H. A. BEERS.

Seward, THEODORE FRELINGHUYSEN: author, composer, and teacher; b. at Florida, Orange co., N. Y., Jan. 25, 1835; studied music with Dr. Lowell Mason and others; taught vocal music and edited and compiled many sacred and secular music-books; edited several music periodicals; managed the concerts of the Jubilee Singers in Europe; introduced the tonic sol-fa system of instruction into the U. S. in 1880; in 1891 founded the Brotherhood of Christian Unity; author of *Hadesian Theology, or the Gospel according to Satan*; *The School of Life, or Divine Providence in the Light of Modern Science* (1894); *A Plea for the Christian Year*, and other books.

D. E. HERVEY.

Seward, WILLIAM HENRY, LL. D.: statesman; b. at Florida, Orange co., N. Y., May 16, 1801; educated at Farmers' Hall, Goshen, and at Union College, where he took the degree of A. B. in 1820; studied law in New York and Goshen, and was admitted to the bar at Utica in 1822; settled in Auburn in 1823, where he soon took a prominent place among the leaders of the profession. In 1824 his political proclivities be-

came conspicuous, and from that time he was prominently connected with all the political movements of importance in the State and nation. He earnestly advocated the election of John Quincy Adams; was one of the State committee to welcome Lafayette in 1827; was elected in 1830 as an anti-Masonic candidate for the State Senate, where he labored for the improvement of schools, construction of railroads and canals, and for the collection of those documents which form the monumental *Colonial History of New York*. During the next four years he delivered frequent addresses, denouncing the course of President Jackson, and supporting the newly formed Whig party with such fervor and success that in 1834 he was nominated for Governor. In this he was unsuccessful, but on the triumph of the Whigs in 1837 he was again nominated, and was elected by a small majority. Though his administration was one of peculiar difficulties, owing to bitter factions within the party, he recommended and succeeded in carrying so many wise measures that his position in the party was much strengthened. He was re-elected in 1840. During his administration Roman Catholics were first admitted to the public schools, many of the disabilities of foreigners were removed, the natural history and geological survey of the State were begun, and the State Museum of Natural History at Albany was established. From 1843 to 1849 his activities were confined to professional practice and to occasional addresses on scholastic and political subjects. In 1849 he was chosen as a Whig to the U. S. Senate, where at once he took a position of prominence not only as one of the leaders of his party, but also as an influential adviser of President Taylor. It was in Mar., 1849, in a speech on the admission of California, that he spoke of the exclusion of slavery from all new States as demanded by "the higher law," a phrase which was so severely criticised as treasonable by Southern members that it became famous as a watchword of abolition. On the accession of Fillmore after the death of President Taylor, Seward declined to follow his party in the support of what was deemed Fillmore's pro-slavery policy. His speeches in the Senate and before public audiences during this period gave him great prominence by reason of their comprehensiveness and independence. In 1852 he favored the nomination of Gen. Scott, but opposed the statement of the party platform concerning slavery. Re-elected to the Senate in 1855, he took prominent part in the political agitations extending to the outbreak of the war. In 1858, in the course of a speech at Rochester, he coined the second of the famous phrases that are inseparably connected with his name when he declared that the slavery question indicated "an irrepressible conflict" which could only terminate by making the country either entirely a free nation or entirely a slave-holding nation. Both in 1856 and in 1860 he was the most conspicuous candidate of the Republican party for the nomination for the presidency. In 1860 the New York delegation, headed by William M. Evarts, went to the Chicago convention with much confidence that their candidate would be chosen. On the first ballot Seward received 173½ votes and Lincoln 102. The vote of Pennsylvania went over to Lincoln and other States followed. Seward, though defeated in the convention, supported Lincoln earnestly by speaking in the West as well as in the East. When Lincoln assumed office the arduous and delicate post of Secretary of State was given Mr. Seward. Though he habitually underestimated the strength and the earnestness of the South, his management of the delicate foreign relations of the Government were characterized by tact and skill. When the Confederates Mason and Slidell were taken from the British vessel the Trent, Great Britain made a peremptory demand for their restoration, and for a time war seemed almost inevitable. The answer, first drawn by Mr. Seward and then slightly modified by President Lincoln, was a masterpiece of tact and diplomatic skill. The position taken was that the exemption from search claimed by Great Britain was what the U. S. had fought for during the war of 1812 against Great Britain, and that as Great Britain had come to the position of the U. S. the Government very cheerfully released the prisoners. In all the negotiations with foreign powers to induce them to preserve a position of strict neutrality the duties of the Secretary were performed with great skill. On the evening of Apr. 14, 1865, when President Lincoln was assassinated, one of the conspirators forced his way into Mr. Seward's bedroom, where he was lying ill, and struck him several times in the face and neck with a dagger. The wounds, though severe, did not prove mortal. Recovery, however, was very slow. Seward was retained in his position by President Johnson, whom the Secretary supported in his policy of reconstruction. After a memorable service of eight years he retired in Mar., 1869. Though much enfeebled in body he undertook with his family a voyage around the world in 1870, and published in 1871 an account of his observations. He died at Auburn, Oct. 10, 1872. His works, in 5 vols., include the most important of his speeches.

C. K. Adams.

Sewell, Elizabeth Missing: author; b. in the Isle of Wight in 1815; became well known as the author of novels of the so-called High Church school of fiction, among which were *Amy Herbert* (1844); *Gertrude* (1845); *Laneton Parsonage* (1846); *Margaret Percival* (1847), which were republished in the U. S. She also wrote works of travels, many volumes of a devotional character, poems, and histories of Greece, Rome, and Egypt for young people. D. in London, June 10, 1884. Revised by H. A. Beers.

Sewel'lel [from native (Amer. Ind.) name]: a rodent, *Haplodon rufus*, representing a special family, *Haplodontidæ*. It is noted for its rootless molars; is reddish brown, with very small eyes and a short tail; is about the size of a musk-rat, and has very strong jaws and a plump, heavy body. It is found on the Pacific coast in California, Oregon, and Washington, is gregarious, and lives in burrows. Its skin is employed by the Indians as an article of dress.

Sewen: See Bull-trout.

Sewerage [deriv. of *sewer* < M. Eng. *assewer*, from O. Fr. *esseuwer*, to drain < Lat. *ex*, out + deriv. of *aqua*, water]: a system of sewers or underground channels for carrying off the sewage or liquid refuse and the storm-water of a locality. The construction of such a system for a town is also called sewerage.

In all densely populated areas a proper regard for the health of the community requires the removal of solid and liquid refuse from the neighborhood of dwellings. Where dwellings are far apart, as in country districts, the liquid wastes from the house may be safely disposed of on the soil by very simple means; but when dwellings are crowded together, as in towns, there is no longer sufficient available open ground in the vicinity for such disposal, and sewers become a necessity. In towns where there are no sewers the sewage is run into cesspools, where it decomposes, contaminating the earth, air, and water in the vicinity, and becomes the disseminator of disease. To provide for the prompt and rapid removal of this sewage is the object of sewerage. The requisites for a sewer are that it be so constructed as to carry the sewage to its outfall with the least possible delay; that it be smooth on its interior surface, so as not to retard the flow of sewage and afford no lodging-place for the solid particles; that it be water-tight throughout its entire length.

The foremost nations of antiquity understood the necessity for sewerage, and their great cities had carefully designed and well-constructed sewers. In the ruins of Babylon and Nineveh and of the ancient cities of Egypt are found the remains of systems of sewerage. Exploration has brought to light the extensive sewers of ancient Jerusalem, and the visitor in Rome to-day sees in the Cloaca Maxima a sewer which still fulfills the purpose for which it was constructed twenty-five centuries ago.

During the dark ages sanitary works were neglected, but fatal epidemics and plagues brought thinking men at last to realize in some degree the necessity for attending to matters relating to the public health. Sanitary works were again undertaken, and with advancing civilization sanitary science has received more and more attention.

Sewers designed to carry both the liquid wastes and the storm water from any locality are called combined sewers. Those designed to carry only the sewage proper are called separate sewers.

The Separate System of Sewerage.—In this the first thing to be determined is the size of the sewers. The proper size of any sewer depends upon the number of people contributing sewage to it; the amount of sewage per day for each person; the maximum rate of discharge; and the form, grade, and interior surface of the sewer. In estimating the number of people provided for on any line of sewers, provision must be made for the extension and growth of towns and a liberal allowance made for an increase in the volume of sewage.

Amount of Sewage.—The amount of sewage per capita depends very largely upon the water-supply. It is also dependent upon the habits of the people, the amount of manufacturing in which large quantities of water are used, and

the use of water-motors for elevators, etc. The volume of sewage to be provided for per day may be taken as equal to the volume of water supplied. This varies greatly in different towns, and in different years in the same town. U. S. statistics show that the use of water varies in the different cities from 25 to 175 gal. per day per capita, and that the amount used is rapidly increasing. In many cases the increase has been 100 per cent. in twenty years. It would not be safe, in any case, to assume the consumption of water to be less than 100 gal. per day per capita, and where water is much used for manufacturing purposes and for motors a still larger amount must be provided for.

Varying Rate of Discharge.—The consumption of water, and hence the discharge of sewage, is not constant. It varies with the different hours of the day, the days of the week, and the months of the year. The time of maximum discharge varies in different places with the habits of the people and the climate. The daily maximum of water consumption is from five to seven o'clock A. M., and the amount of maximum flow per hour is from 20 to 100 per cent. in excess of the mean hourly consumption. The maximum daily consumption for the week is on Monday. Taking the whole year into consideration there are two maxima of daily consumption. One of these is during the coldest weather in winter, and the other in the hot, dry weather in summer. The maximum daily consumption varies from 20 to 50 per cent. in excess of the mean daily consumption.

The flow of sewage not being uniform, the sewers must be made large enough to provide for the maximum flow. On the other hand, any unnecessary size is a serious detriment to the efficient working of the sewer. Any increase in size of the sewer, the amount of sewage remaining the same, decreases the depth and velocity of flow of the sewage, and hence its transporting power and effectiveness.

The following table shows the comparative depth and velocity of flow in circular sewers of different sizes, laid on the same grade and carrying the same amount of sewage:

SEWER.	Depth of flow, inches.	Velocity in feet per minute.	Discharge in cubic feet per minute.
6-inch sewer	3·00	147	14·40
8-inch "	1·92	129	14·40
10-inch "	1·36	112	14·40
12-inch "	1·03	100	14·40
15-inch "	0·75	83	14·40

The following table shows the comparative velocity and discharge of a circular sewer at different depths of flow. The depth is given in fractions of the diameter, and the velocity and discharge are given in fractions of the velocity and discharge when the depth is the diameter of the sewer.

Depth of flow.	Velocity.	Discharge.	Depth of flow.	Velocity.	Discharge.
0·067	0·414	0·0277	0·600	1·0534	0·6302
0·100	0·498	0·0498	0·700	1·0932	0·7642
0·1465	0·602	0·0883	0·750	1·0984	0·8238
0·200	0·6942	0·1388	0·800	1·1028	0·8822
0·250	0·7698	0·1914	0·8535	1·1010	0·9397
0·300	0·8210	0·2463	0·900	1·0918	0·9826
0·400	0·9264	0·3702	0·933	1·0794	1·0071
0·500	1·0000	0·5000	1·000	1·0000	1·0000

Grade.—A certain velocity of flow is required in a sewer to prevent deposit. The minimum velocity to prevent deposit varies with the size of the sewer, and is from 2 to 3 feet per second. The following table gives the minimum allowable inclination for self-cleansing sewers, running half full:

6-inch pipe ..... 1 in 142 = 0·704 per 100
9-inch " ..... 1 in 203 = 0·494 per 100
12-inch " ..... 1 in 385 = 0·260 per 100
24-inch " ..... 1 in 775 = 0·129 per 100

While in extreme cases sewers may be laid with a lower grade than that indicated above, it is always at the risk of unsatisfactory working and ultimate stoppage.

In localities where the surface of the ground is nearly level and sufficient grade can not be obtained to dispose of the sewage by gravity, the sewage may be carried to its outfall by pumping, or by one of the pneumatic processes. The three most important of the pneumatic processes are the Liernur, Berlier, and Shone.

In the Liernur and Berlier systems the sewage is carried through air-tight iron pipes by atmospheric pressure, the air being exhausted from the pipes by large air-pumps.

In the Shone system the sewage is raised from a lower to a higher level by being admitted to a receiving-chamber or pneumatic ejector, and then forced by compressed air out of the ejector and to the desired elevation, when it again runs on through the sewer-pipes by gravity.

The ordinary hydraulic formulas for the flow of water in pipes will apply to sewers. The amount of sewage which any pipe will carry depends upon its velocity. The following formulas are among the best in use:

Weisbach's formula is $v = \frac{\sqrt{2gh}}{\sqrt{1 + e + c\frac{l}{d}}}$,

in which v = velocity of flow in feet per second.
h = head of water in feet.
l = length of pipe in feet.
d = diameter of pipe in feet.
e = coefficient of resistance for entrance of water into the pipe.
c = coefficient of friction in the pipe.

Baldwin Latham, in his *Sanitary Engineering*, gives tables of values for the coefficients, and extensive tables of velocities for different-sized pipes at different inclinations, according to Weisbach's formula.

Kutter's formula is

$$v = \left\{ \frac{41{\cdot}66 + \frac{1{\cdot}8113}{n} + \frac{{\cdot}002807}{S}}{1 + \left(41{\cdot}66 + \frac{{\cdot}002807}{S}\right)\frac{n}{\sqrt{R}}} \right\} \sqrt{RS} = C\sqrt{RS}$$

in which v = mean velocity in feet per second.
C = coefficient of mean velocity.
S = sine of slope.
R = hydraulic mean radius.
n = coefficient of resistance to flow, determined by experiment.

Flynn's hydraulic tables are based on this formula.

The most rapid method of determining the necessary size of sewers under given conditions is from diagrams or graphical tables. Pierson's graphical calculations, published in Staley and Pierson's *Separate System of Sewerage*, give results for pipe-sewers by both Weisbach's and Kutter's formulas.

Material for Pipes.—The best material thus far produced for sewers up to 2 feet in diameter is salt-glazed, vitrified, earthenware pipes. Sewers more than 2 feet in diameter may be constructed of brick, stone, or concrete. Sewer-pipe is sometimes made of hydraulic cement. Pipe of excellent quality can be made of this material, but it is difficult to secure uniformity of quality. Vitrified earthenware pipe has a smooth surface, is impervious to moisture, is not affected by sewage, and does not deteriorate with time. It is made of all sizes up to 2 feet, and special forms are manufactured for certain purposes. It is usually made of cylindrical form, and in lengths of 2 or 3 feet. In the usual form each length has a bell, or socket, at one end to hold the spigot end of the adjoining piece in laying. This is called the bell and spigot joint. Another method of making the joints is to make the pipes plain cylinders, and provide separate collars to slip over the joints where the pipes meet. A hand-hole is a length of pipe with a detachable section, which can be removed at any time after the pipe is laid without disturbing the line of pipe. Junctions are formed by Y or T branches. The T-branch is a socket on the side of a pipe to receive a branch at right angles. The Y-branch is a socket made to receive a branch at an acute angle. Curved pipes are prepared for turning bends. Junctions of laterals with mains, and of house-sewers with street lines, should be made with Y-branches. Fig. 1 shows in plan and elevation a junction. The Y should be elevated so that the curved piece, joining the Y with the lateral, will bring the top of the branch sewer as high or higher than the top of the main sewer.

Sewers more than 2 feet in diameter are usually built of hard-burned brick, laid in hydraulic cement. All junctions for lateral branches and house-connections should be put in when the sewer is built, as much better workmanship can then be secured in making the connections, and with less danger to the sewer.

Location.—Sewers may be located either in the streets or, where alleys are regularly laid out through the center of the blocks, in the alleys. When only one line is laid in a street it should be on the center line. In some cases, where the streets are wide or the center line is occupied by street-railway tracks, it may be advisable to put a line of sewers on each side of the street.

Depth.—The sewers should be far enough below the bottom of the cellars, to afford sufficient fall for the house-drains starting from beneath the cellar floor. The minimum depth will usually be from 6 to 8 feet.

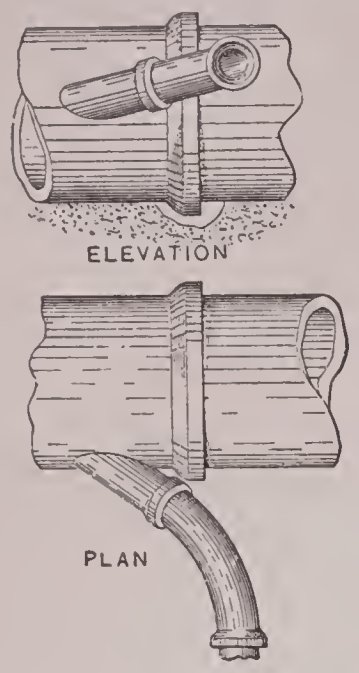


Fig. 1.

Laying.—In laying the sewers care should be taken to keep the flow-line on a continuous grade, and to make the joints water-tight. The joints should first be caulked with a gasket of oakum, or some similar material, to prevent the entrance of cement to the inside of the pipe, and the joint filled with pure cement, mixed with sufficient water to make it of the proper consistency for working. Y-branches should be placed along the line of sewers in front of each lot, so that house-drains may be connected at any time without cutting or disturbing the main line of sewers. The opening of the Y-branches should be closed with an earthenware cover.

Manholes are masonry shafts extending from the sewers to the surface of the ground, and large enough to admit a workman to inspect or clean the sewers. They are usually formed of an 8-inch brick wall. The form is the frustum of a cone with the large end down. The top should be about 2 feet in interior diameter, and the bottom about 4 feet. The form at the bottom is sometimes elliptical. The top is finished by a cast-iron cap, level with the surface of the street. The cover is perforated to aid in ventilation. Sometimes a dust-pan is placed under the cover to catch the dirt which falls through the openings in the cover.

The bottom should be of concrete, and built so as to be water-tight. It should be formed to the contour of the invert of the sewer, so that the flow of the sewage will not be checked in the manhole. Steps should be built into the wall to facilitate getting in and out. Fig. 2 is a vertical section of a manhole at right angles to the axis of the sewer. Manholes should be placed at the junctions of the laterals with the mains, and at changes of direction in the line of sewers.

Lampholes, or observation openings, are formed by a T-branch extending from the sewer to the surface of the ground. The top of the vertical pipe is covered with a cast-iron cap having a movable cover level with the pavement. Sometimes the vertical pipe is not carried to the surface, but is capped below the pavement and its position carefully recorded.

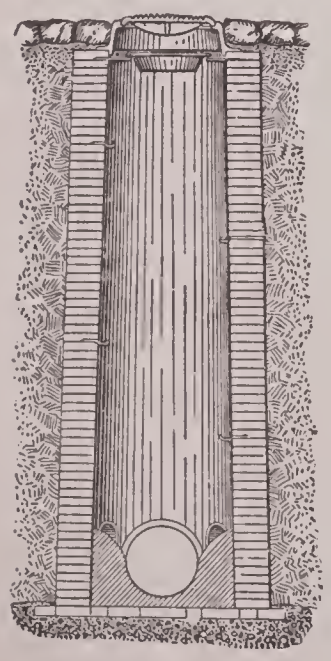


Fig. 2.

The Combined System of Sewerage.—Where the ground-water needs to be removed as well as the sewage, as is usually the case, special provision must be made for this purpose. A good sewer is not a good drain. A sewer should be water-tight, while a water-tight conduit would be of no use as a drain. The drainage should be provided for by a separate system of drain-pipes so laid as to admit the water and carry it away. They may be laid beside the sewer-pipe or under it or over it, as the circumstances may require. Where the sewers are deep enough they may be laid above the sewer and discharged into the manholes. The advantage of this method is that each section between the manholes is independent of the rest of the system, and any stoppage in one section will not affect any of the other sections.

Size of Combined Sewers.—In determining the size necessary in any case, the disposal of the storm-water is the only question to be considered. The ordinary flow of sewage is so small compared with the volume of storm-water delivered to the sewers during and immediately after a storm that the sewage may be left out of consideration. In estimating the necessary size the following conditions must be taken into consideration: The area to be drained; the rate of rainfall; the percentage of the rainfall reaching the sewer; the grade of the surface of the ground; the grade of the sewer; and the amount of ground-water.

Sewers are rarely built large enough to provide for all of the water which falls in extraordinary storms lasting only a short time. Besides this, not all of the rainfall reaches the sewers. The percentage of that which does pass into the sewers depends upon the relative proportion of roofed and paved area to the whole area to be drained, and the nature of the soil of the unpaved part. The grade of the natural surface of the ground affects the rapidity with which the storm-water reaches the sewer. It is customary to assume a certain depth, varying from half an inch to 2 inches per hour, as reaching the sewer, although the rainfall may occasionally be several times that amount.

Different formulas have been proposed for determining the size of sewers. The following are some of these. Julius W. Adams's formulas:

$$D = \sqrt[6]{\frac{QL}{1542H}}$$

in which D = diameter of sewer in feet.
Q = cubic feet per second to be provided for.
L = length of sewer.
H = rise for length L.

$$\log. D = \frac{2 \log. A + \log. N - 3{\cdot}79}{6}$$

in which D = diameter, in feet, of sewer.
A = acres to be drained.
N = length in feet in which the sewer falls 1 foot.

These formulas are on the basis of 1 inch of rain per hour, half of which reaches the sewer within the hour.

Thomas Hawksley's formula, used in the main drainage of London:

$$\log. \text{diameter of main (in inches)} = \frac{3 \log. A + N + 6{\cdot}8}{10}$$

in which A = acres drained.
N = length in feet in which the sewer falls 1 foot.

This is on the basis of 1 inch of rain per hour.

The principal difference in the various formulas is in the assumption of the amount of water which the sewer is to provide for. They are never built large enough to carry all of the water of the heaviest rainfall. Having decided the amount of water which the sewer is to carry, the size may be calculated by the formulas previously given for the flow of sewage in pipes.

Form of Sewers.—If a sewer has an approximately constant flow and is to run half full or more, the best form is circular. In combined sewers, however, the ordinary flow of sewage usually fills but a small part of the cross-section of the sewer, and in that case the egg-shaped section with the small end down is best. This concentrates the flow in the bottom of the sewer, so that the depth and velocity of flow may be kept as great as possible when the quantity of sewage is at its minimum, and by expanding in the upper part provides for the greatly increased amount delivered to the sewers by storms.

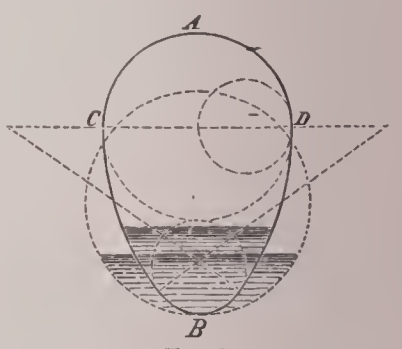


Fig. 3.

Fig. 3 shows one of the many forms of egg-shaped sewers. The vertical diameter A B is one and a half times the greatest diameter C D. C A D is a semicircle described on C D. The lower arc is described with a radius equal to one-fourth C D, and the sides are described with a radius equal to the vertical diameter. The shaded portion at the bottom of the figure shows the relative depth, and hence velocity, of the same amount of sewage in a circular and in an egg-shaped sewer of the same capacity.

Manholes.—The manholes for the combined system differ from those in the separate system, as shown in Fig. 2, only in resting on the sewer itself instead of a concrete founda-

tion. The construction of the manhole begins at the springing line of the upper arch of the sewer.

Catch-basins.—The storm-water in passing over the surface of the streets and along the gutters carries with it dirt, pieces of stone and brick, leaves, sticks, and other refuse. In order to keep this *débris* out of the sewers the storm-water is first received into a catch-basin, where the solid matter is held and the water passed on into the sewer. The opening into the sewer should be several feet from the bottom, and should be so arranged as to guard against admitting any of the solids from the catch-basin.

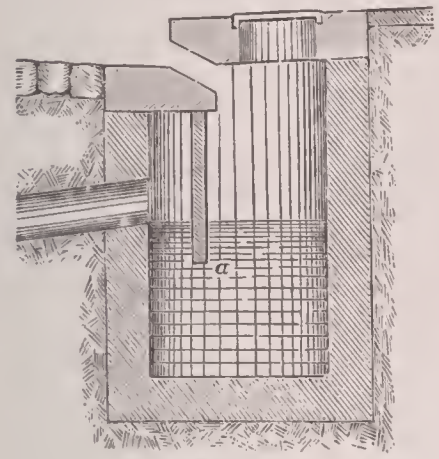


FIG. 4.

Fig. 4 is a vertical cross-section of a catch-basin placed under the outside edge of the sidewalk. The storm-water passes directly into it from the gutter, but must pass under the partition *a* to reach the outlet to the sewer, shown on the left. So long as the water in the catch-basin is above the bottom of the partition *a*, the gas from the sewer can not escape. Sometimes the outlet to the sewer is trapped.

Catch-basins should be cleaned frequently, as the organic matter carried into them by storms will decompose and become offensive. They should be placed at the lowest points, and from 200 to 300 feet apart on both sides of the street.

Sometimes when combined sewers are built provision is made for purifying the ordinary flow of sewage, but not the much larger volume of storm-water. In that case a storm-overflow is arranged, as shown in Fig. 5. It depends for its action upon the fact that an increase in the depth of flow in a sewer will increase the velocity. A is a combined sewer. With the ordinary flow of sewage, and at the beginning of a storm, when the stream will be loaded with filth from the streets, the stream will be shallow and sluggish, and will drop through the opening O into the sewer B, and be carried to the disposal-works. As the flow deepens with the storm-water the velocity increases until it is sufficient to leap the opening O and pass out through the storm-water overflow A′.

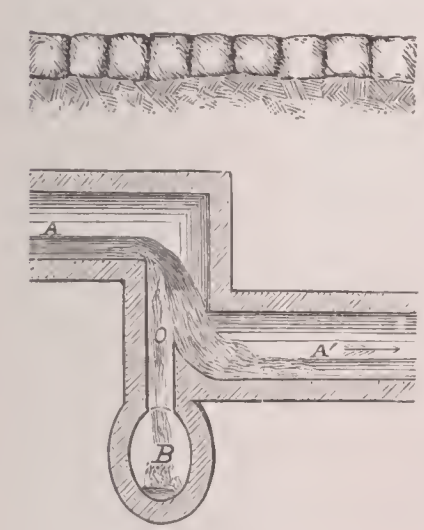


FIG. 5.

Flushing and Ventilation.—In order to keep sewers in the best possible condition and reduce the evolution of sewer-gas to a minimum, provision should be made for flushing and ventilation. In the separate system, with its comparatively small pipes, this is not difficult. With an even flow of sewage on low grades there is always a tendency to form deposits on the bottom of the sewer on account of the fungus growth on the pipes under the sewage. It needs a rush of water to detach the fungus and carry along the sediment. By discharging into the sewer the down-spouts from the gutters of a few houses near the head of each lateral sewer, flushing can be accomplished whenever there is sufficient rain. Sewers may also be flushed by making a connection between the upper ends of the laterals and the pipes supplying water to the town, and admitting the water to the sewers by turning a valve, or by taking the water from a hydrant and conducting it to the sewer through a hose. Where there are no water-works, flush-tanks mounted on wheels have been used. In some cases underground tanks are used to collect the house-sewage, and when full they discharge automatically.

The best method is to place at each dead end an automatic flush-tank supplied with water from the water-works. This can be set so as to discharge as often as may be thought desirable. A good form of flush-tank is shown in Fig. 6. It is built of brick laid in hydraulic cement, and plastered with cement outside and in, so as to be water-tight. The top is finished with a cast-iron cap provided with a movable perforated cover. Water is supplied to the tank from

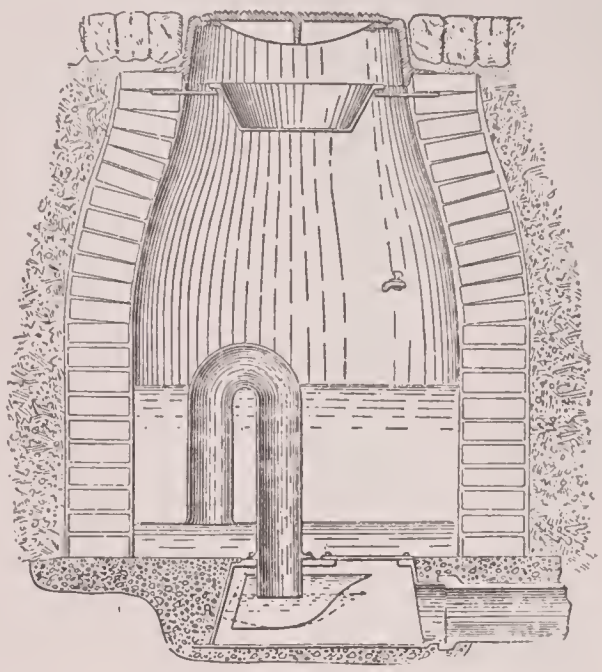


FIG. 6.

the pipes of the water-works, and the faucet so adjusted as to fill the tank as often as is desired. The tank is supplied with an automatic emptying device, which discharges the water into the sewer whenever the tank is full. There are several devices for this purpose. Under ordinary circumstances the tank should hold about 200 gal., and should be set so as to discharge once in twenty-four hours.

Ventilation of Sewers.—Separate sewers are best ventilated by continuing the house-drains, untrapped, above the roofs of the houses, either inside or outside of the house. If the holes in the manhole and flush-tank covers are kept open, and the sewers are properly flushed, the air in the sewers will be changed so frequently that comparatively little trouble will be experienced from sewer-gas from separate sewers.

In combined sewers the case is very different. The difficulties in the way of flushing and ventilating large sewers are almost insurmountable. The interior surface of brick sewers is rough, and becomes smeared with organic matter from the sewage which is constantly undergoing decomposition. During storms, detritus and the litter from the streets is swept into the sewers, and when the flow slackens to the usual dry-weather volume the *débris* from the streets is stranded and forms obstructions to the shallow, sluggish stream, formed by the sewage proper in the large sewer. Pools of sewage are formed along the line, and the decomposition of the organic matter in these pools produces sewer-gas in enormous quantities, and affords a breeding-ground for bacteria. To flush such a sewer thoroughly is usually impracticable, as it requires too much water. Sometimes an attempt is made in this direction by damming up the sewage for a time and then releasing it, producing a current strong enough to carry forward the sediment. This improves the lower lines of sewers, but is not applicable to the upper ends. Where this method is applied there is always danger of a deposit on the line above the temporary dam.

Since the evolution of sewer-gas can not be avoided, the question of ventilation becomes the more important. Several plans have been proposed for the ventilation of large sewers, but none have been as successful as could be desired. High chimneys have been used, and in some cases a draught has been secured by means of a fan or a fire. Owing to the many openings into the sewer, one chimney will affect only a limited section of the sewer. Another plan is to purify the air from the sewer by passing it through charcoal filters.

Fig. 7 is a manhole fitted with a charcoal filter for purifying the air from the sewer. It consists of a sheet-iron cylinder, open at both ends, containing a series of pans with perforated bottoms, placed one above another and filled with charcoal. The cover of the manhole is water-tight, to exclude moisture from the filter, and a separate chamber with a perforated cover is built beside the manhole to pro-

vide an escape for the air. The charcoal is about 3 inches deep in the pans. It is renewed about once a month by being reburned in retorts from which air is excluded.

Plans.—The design for a system of sewers for any town depends upon local circumstances. No one system, however well adapted for a given locality, will be universally applicable. The separate system is to be preferred where the storm-water can otherwise be provided for, or where the sewage must be pumped, or where sewage disposal-works are necessary, and its cost is a small fraction of that of combined sewers for the same locality. In some cases in addition to the small sewers, special conduits for storm-water are needed for a limited area. These need not be placed deep in the ground, and they can be discharged into the nearest natural watercourse, even within the town, where sewage could not be discharged.

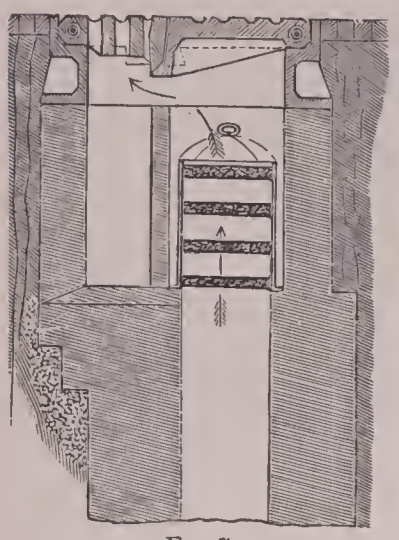


Fig. 7.

Disposal of Sewage.—After the sewage has been collected and carried away from a locality the problem of its disposal remains to be solved. It may be discharged without purification into a stream or large body of water; it may be partly purified by subsidence, or filtration, or chemical process, or by a combination of these, and then discharged; or it may be purified by application to the soil in several ways. When sewage is emptied into a large stream or body of water its disappearance is due to several causes. It is diluted by the large volume of water into which it is discharged; part of the impurities are deposited by subsidence; part of the organic matter becomes food for aquatic plants and animals; and part of it is destroyed by oxidation and nitrification. So long as the amount of sewage is very small in comparison with the volume of water into which it is discharged, this method may not be objectionable, unless the stream receiving the sewage is to be used for water-supply. The pollution of streams and lakes by sewage is a growing evil. In many countries in Europe it has been forbidden by law, and in the U. S. such laws are imperatively required in order to preserve sufficient unpolluted water-supply for the large towns.

When sewage is purified by subsidence it is collected in tanks and allowed to stand until the particles in suspension are deposited on the bottom of the tank, when the partly clarified liquid is drawn off. Sieves and filters are also employed for purifying sewage. Chemical processes of many kinds have been used. In these processes certain chemicals are mixed with the sewage, and it is purified by the precipitation of the suspended impurities, and some of those held in solution. All of these methods remove the suspended impurities and the organic matter from the sewage to a greater or less extent, but the effluent is still unfit to be turned into the natural watercourses.

A still more efficient method of purification is by applying the sewage to the soil. This may be done by broad irrigation, intermittent filtration on limited areas, or by sub-surface irrigation. Where broad irrigation is employed the ground is first underdrained and the sewage is applied to the surface by leading it in furrows. The method of application depends upon the crop under cultivation. Sometimes it is spread over nearly all of the surface for a time, and sometimes it is only run in the furrows, placed from 2 to 4 feet apart. The sewage is absorbed by the soil, and wherever the sludge accumulates it is spaded under. The city of Berlin (*q. v.*) has an excellent system of sewage farms.

Where the method of intermittent filtration is employed, filter-beds of soil are prepared with the sole object of filtering the sewage, and no attempt is made to raise any crop. The sewage is applied to the filter-beds in succession, time being given between the applications for the aëration of the soil. In sub-surface irrigation the sewage is delivered to the soil through drain-tile laid from 6 to 10 inches below the surface of the ground. The sewage passes out of the tile at the joints, and is absorbed by the soil. This method is especially applicable on private grounds, where no sewers are available. The action of the soil in purifying sewage is somewhat complicated. It filters out the suspended particles, and the organic matter in the sewage is destroyed by oxidation and by the bacteria in the soil. The effluent water is collected by drain-tile and delivered to the natural watercourses.

For further information, see Latham's *Sanitary Engineering*; Adams's *Sewers and Drains for Populous Districts*; Staley and Pierson's *Separate System of Sewerage*; and Baumeister's *Cleaning and Sewerage of Cities.* See Plumbing.

Cady Staley.

Sewing-machines [*sewing* is pres. partic. of *sew* < M. Eng. *sewen*, sew < O. Eng. *sēowan* : O. H. Germ. *siuwan* : Icel. *sȳja* : Goth. *siujan* < Teuton. *siu-* : Lith. *siuti* : Lat. *su'ere* : Gr. κασ-σύειν]: machines for stitching fabrics, operated by the foot, hand, or other motive power.

In 1790 Thomas Saint, an Englishman, secured a patent for a machine intended for "quilting, stitching, and sewing, making shoes and other articles." This machine, although made chiefly of wood, had many features similar to those common in modern sewing-machines, such as the overhanging arm, a vertical reciprocating needle-bar, having secured in its lower end by means of a set-screw a straight needle with a terminal notch instead of an eye. There was also, at a short distance from the needle, a straight awl to make the holes through which the thread was to be pushed by the notch-ended needle. On the top of the needle-bar was a large spool, from which the thread was drawn as required to form the stitch. This machine also had what is now called a feed, for moving the material after each stitch the proper distance for the next, and thread-tighteners (tensions) above and below it. The stitch used by Saint was known as the tambour stitch (now called the chain stitch)—the continuous thread was pushed by the notch-ended needle through a hole made by the awl, and the needle was then withdrawn, leaving a loop of thread below the material, which was then moved by the feed the proper distance for the next stitch, a second loop being formed passing through the first, which was then drawn tight.

At intervals in the first half of the nineteenth century machines for embroidering and ornamental stitching were invented. These could have been made to fasten two or more pieces together, but they were not intended for that work, and therefore can not with propriety be called sewing-machines. Several machines were also patented for making a running stitch, by means of fluted rollers which folded the cloth in short vertical convolutions and forced it on to a horizontal needle. Such machines used needles full of thread, and the needle was threaded in the ordinary way. In 1818 the Rev. John Adams Dodge, of Monkton, Vt., invented and (with the assistance of John Knowles, a mechanic) constructed a sewing-machine which made a back stitch in a satisfactory manner, but it was never patented or manufactured for sale.

The first sewing-machine that was manufactured for sale was patented in France in 1830, and in a modified form in the U. S. in 1850. Its inventor, Barthélemy Thimonier, constructed of wood eighty machines which made a chain stitch of such strength that they were used in the year 1830 for manufacturing army clothing. These machines were destroyed by a mob which alleged that they were depriving tailors of their bread. A few years later Thimonier had other machines constructed of metal, which were driven by a treadle and cord. These were also destroyed. Thimonier's machine anticipated many of the more important features of the machines of to-day. It had the overhanging arm, flat cloth-plate, vertical post, vertical reciprocating-needle, continuous thread, and a presser-foot.

The Hunt Machine.—About 1832–34 Walter Hunt, a New York mechanician, invented, manufactured, and sold a few sewing-machines which were successfully operated. His machine had a curved needle with an eye near its point, attached to the end of a vibrating arm. It used two continuous threads, the lower being wound on a bobbin carried in a shuttle, and made a lock stitch—i. e. one in which the thread from the needle and that from the shuttle are interlocked at or near the middle of the thickness of the materials being sewn. Hunt neglected to apply for a patent for his invention for about twenty years, and during that time the manufacture and sale of the machine was not prosecuted; his tardy application for a protecting patent was denied on the ground that he had forfeited his rights by neglect and the sale and public use of the machine at the

time of its invention. In 1842 J. J. Greenough patented a machine for sewing leather and other heavy material. This machine had a needle pointed at each end, and an eye at its middle; this needle was passed to and fro through holes previously punctured in the material by an awl, and was automatically manœuvered by pincers on each side of the goods. This machine would make either a back stitch or a "shoemaker's stitch," at the pleasure of the operator. The needle used single lengths of thread, and required frequent stoppages of the machine for rethreading. Greenough's machine did not come into extended use.

In 1843 a sewing-machine somewhat similar to Greenough's was invented by George H. Corliss (later an improver of the steam-engine), but it used two needles with eyes near their points, which were thrust horizontally through holes previously made by awls in the material to be sewed, which was secured between clamps, and automatically moved at right angles to the path of the needles. The feed was automatic, and all the movements were derived from suitably shaped cams on a revolving shaft.

The Howe Machine.—In 1846 a patent was issued to Elias Howe, Jr., for a sewing-machine on which he had been experimenting for three years. It had a curved needle (with an eye near its point) attached to the end of a vibrating arm; this needle carried the upper thread, the lower thread being wound upon a bobbin in a shuttle which was made to pass between the needle and its thread at each vibration of the arm. The cloth was suspended on pins projecting from the edge of a thin steel bar called a baster-plate, provided with perforations in which worked the teeth of a small pinion by which the baster-plate was given an intermittent movement or "feed" after each stitch. When the machine was manufactured it was found to be unsalable. The chief difficulties experienced in operating it were these: The baster-plate was not satisfactory as a "feed," the vertical suspension of the cloth was awkward and unmanageable, and the tension could not be regulated to prevent the skipping of stitches, the making of large loops in some places, and the drawing of the thread too tight in others.

Between 1848 and 1851 several inventors attempted to devise sewing-machines of more practical value. Messrs. Lerow and Blodgett made a machine which was used to a limited extent in the manufacture of clothing. This had a circular hoop studded with pins for a baster-plate; its shuttle was curved and had a continuous revolution in a circular groove; its feed was adjustable, and its tension automatic. Messrs. Morey and Johnson and John Bachelder constructed single-thread machines for making the loop or chain stitch, and these were the first in the U. S. which made that stitch.

The A. B. Wilson Machine.—In 1849 Allan B. Wilson (of the original firm of Wheeler & Wilson) made and in 1850 patented a sewing-machine having a vibrating shuttle, and the original form of what he afterward patented as his four-motion feed. This machine had a considerable sale, but was not satisfactory to its inventor, who set himself to work to produce something more practical. His efforts resulted in the invention of the revolving hook (patented Aug. 12, 1851), which carried within its concavity a double-convex circular bobbin, and a ring which held it in place. This hook caught the loop from the descending curved needle, whose eye was near its point, and passed it around the bobbin, thus dispensing with the shuttle. Wilson afterward perfected the four-motion feed and other details.

The Singer Machine.—In Sept., 1850, Isaac M. Singer, a mechanic of New York, who had become interested in sewing-machine experiments and was familiar with the Lerow and Blodgett machine, made a contract to invent an improved sewing-machine and have it built for $40. He accomplished this within twelve days, and the machine was found to be practical and efficient. This machine was the first which had the rigid overhanging arm to guide the vertical needle, in combination with a shuttle and what was called a wheel-feed. A patent for this machine was issued Aug. 12, 1851. At about this time William O. Grover (afterward of the firm of Grover & Baker), of Boston, was attempting the solution of the sewing-machine problem in a different manner.

FIG. 1.—Singer shuttle.

The Grover & Baker Machine.—On Feb. 11, 1851, Messrs. Grover & Baker patented a sewing-machine making what has been called the double-loop (or Grover & Baker) stitch, which was made by a combination and joint action of a circular reciprocating under needle, with a curved upper needle having an eye near its point, thus dispensing with both shuttle and bobbin, and enabling both the upper and under threads to be taken from commercial spools. These machines were very popular and for several years took the lead of all others, but they are no longer manufactured. Although up to this time Elias Howe, Jr., had never made a practical sewing-machine, his patents were so skillfully drawn that Grover & Baker, Singer, and Wheeler & Wilson were obliged to pay him royalty which amounted to $25 per machine, but in 1853 an agreement was entered into between the above-named manufacturers and Howe by which the royalty was considerably reduced to them, but under it manufacturers outside "the combination" (as the quadruple syndicate was called) were still obliged to pay a heavy royalty. Howe's patent was extended in 1860 for the term of seven years, at the expiration of which he again applied for a further extension; but, as he acknowledged that he had received between $1,000,000 and $2,000,000 for the use of his invention, it was thought that he had been sufficiently remunerated and his application was rejected.

Previous to the final expiration of Howe's patent (1867) but few machines for making the lock stitch had been invented and manufactured except by "the combination."

The Willcox & Gibbs Machine.—In June, 1857, James E. A. Gibbs, of Millpoint, Va., took out his first patent for a machine having a rotating hook for using a single thread to make the twisted loop stitch, a variety of the chain or tambour stitch which possesses much merit. This, with some improvements of its details by James Willcox, of Philadelphia, became the Willcox & Gibbs sewing-machine, the most popular of the single-thread machines. Several years later this machine was improved by Charles H. Willcox, who invented an automatic tension which readily adapts itself to the requirements of varying thicknesses of cloth, seams, folds, etc., and draws the stitch equally tight under all conditions.

At the expiration of Howe's patent in 1867 a large number of new machines were brought out, but few or none of them are in use.

Button-hole Machines, Leather-sewing Machines, etc.—There have been two machines and two attachments invented for finishing button-holes by the button-hole stitch—viz., the Union button-hole machine, made by the Singer Manufacturing Company, and the House or Wheeler & Wilson button-hole machine; the American button-hole and the Wheeler & Wilson button-hole attachments. A multitude of other accessories and attachments to sewing-machines, such as hemmers, braiders, corders, tuckers, fellers, pleaters, binders, quilters, rufflers, and gatherers, have been invented for the purpose of executing special kinds of work with facility, and the total number of patents issued for sewing-machines and their adjuncts is upward of 3,000.

Among the more important inventions for sewing by machinery must be mentioned machines for sewing leather goods with waxed thread. Of these, the Keats No. 1 and the Keats lock-stitch machines, the McKay shoe sewing-machine, and the Goodyear & McKay sewing-machine are the most prominent. Each of these machines has been largely used in the manufacture of boots and shoes, harness, and other articles made of leather. Machines have also been invented for sewing books; of these, the Smyth and the Boynton are the best known.

Classification of Machines.—Sewing-machines are best classified by the kind of stitch produced, and although upward of seventy kinds of stitches and machinery for making them have been invented, yet there are at the present time but three types of stitches used in machine-sewing—viz., the lock stitch, the chain stitch, and the button-hole stitch.

Lock-stitch machines may properly be divided into two types—those making the lock stitch by means of a shuttle which is thrust through the loop of the upper thread, and those in which that loop is carried by a revolving hook over a stationary bobbin. More than half of the machines manufactured are of the first-named type, of which the Singer and Domestic machines are the chief examples, the Wheeler & Wilson machine being the original and still by far the most prominent of the rotating-hook type of lock-stitch machines. These machines are all made on the "interchangeable principle," each part being exactly like its corresponding part in every machine; and to such perfection is this system

carried that the machines are assembled by selecting their component parts at random from the hundred or more receptacles containing them. This interchangeable method of construction is adopted by all sewing-machine manufacturers, and by its use the business can be thoroughly systematized and the manufacture be carried on at a minimum cost.

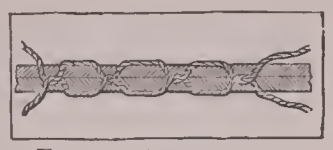


Fig. 2.—The lock stitch.

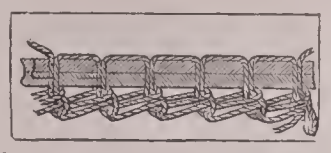


Fig. 3.—Grover & Baker stitch.

Fig. 4.—Twisted loop stitch.

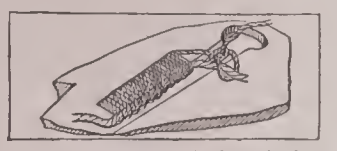


Fig. 5.—Button-hole stitch.

The revolving hook used in the Wheeler & Wilson sewing-machine has been much modified and improved; that at present used in their No. 9 machine is represented in Fig. 7. A greater possible rate of speed is claimed for these machines than for those which employ a shuttle; a further advantage is found in their running with less noise.

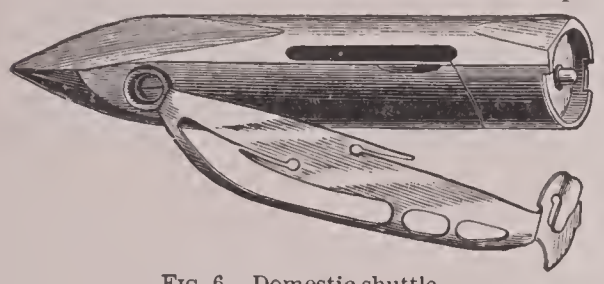


Fig. 6.—Domestic shuttle.

A variety of rotating-hook lock-stitch machine, and one which embodies an entirely new departure in sewing-machines, is the invention of Mrs. Harriet Ruth Tracy. It has a rotating bobbin-holder provided with three hooks, which in turn operate to carry the loop from the upper thread over the bobbin-holder, and a bobbin or cop containing 1,000 yards of thread. The special features of this machine are: (1) its large thread-carrying capacity in the bobbin-holder; (2) the fact that it has no take-up above the bed, the three rotating hooks disposing of all the slack (a feature which permits a large amount of thread to be carried); and (3) the rotating positive motion of the entire mechanism, which allows of very rapid running. In five seconds, by a slight change of adjustment, this machine can be made to take a chain stitch with a single thread or a chain stitch having a second or locking thread run through it on the under side of the cloth, which prevents raveling and at the same time

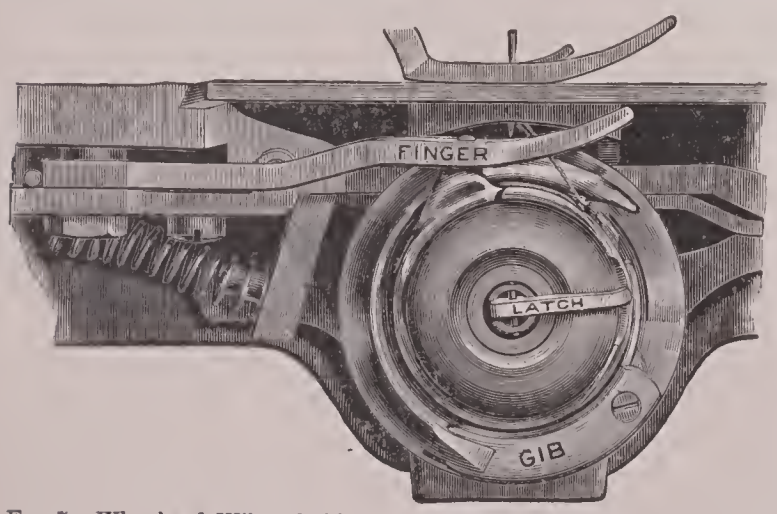


Fig. 7.—Wheeler & Wilson bobbin and bobbin case in the rotary hook.

leaves the stitch elastic. The machine is characterized by simplicity and great ingenuity.

The twisted loop or chain stitch is made only by the Willcox & Gibbs machine. A short straight needle is carried by a vertical reciprocating bar, actuated by a vibrating lever, put in motion by a link connecting it to an eccentric on the main shaft of the machine. At the front end of the main shaft is a peculiarly shaped hook, which in its rotation catches the upper thread as the needle, having an eye near its point, descends through the cloth, and forms a loop through which the needle passes on taking the next stitch; the hook then engages the upper thread again, and at the same time the first loop is thrown off the hook and the first-named stitch drawn tight by the operation of forming the

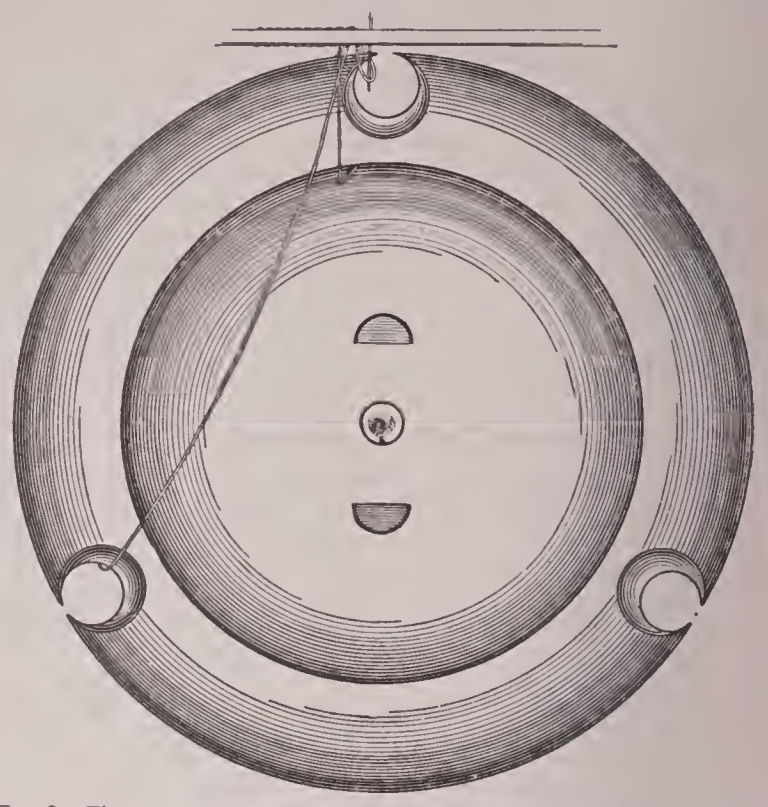


Fig. 8.—The Tracy circular three-pointed rotary-shuttle with bobbin placed inside its case ready for use.

second loop. This machine is practically silent in its operation, even when running as rapidly as to make 3,000 stitches per minute.

The button-hole sewing-machines do their work in a thoroughly efficient manner, the button-hole finished by it being much more durable than those made by hand-work. Button-hole attachments are intended to be used in connection with an ordinary lock-stitch sewing-machine; they not only make a perfect button-hole, but will also make the button-hole stitch on the edges of garments, shoes, etc., which the button-hole machine can not do.

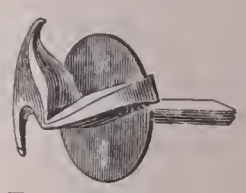


Fig. 9.—Willcox & Gibbs hook.

Besides those already enumerated, there is a large variety of sewing-machines manufactured for doing special work. Among them are the cylinder sewing-machine, having a cylindrical work-holder, for sewing seams on sleeves, trousers, water-hose, boot-legs, leather buckets, and other articles of tubular form; and the carpet sewing-machine, for making up carpets.

The operations required for the manufacture of a sewing-machine are very numerous, embracing designing, drawing, pattern-making, casting, pickling, tumbling, tool-making, forging, annealing, stamping, swaging, filing, polishing, screw-making, turning, drilling, plating, japanning, ornamenting, assembling, testing, and packing. For the manufacture of sewing-machine needles, see NEEDLES AND NEEDLE-MAKING.

There are but two sewing-machine factories in which all parts of the machine, including cases and needles, are manufactured. The manufacture of sewing-machine needles and cases has reached large proportions as independent industries. The census returns of 1890 showed that 59 establishments manufacturing sewing-machines and attachments reported. These had a combined capital of $16,043,136, employed 9,121 persons, paid $5,170,555 for wages and $3,502,173 for materials, and had products valued at $12,823,147. There were also reported 7 establishments manufacturing sewing-machine cases, which had a combined capital of $1,430,403, employed 1,842 persons, paid $886,725 for wages and $990,439 for materials, and had products valued at $2,249,551.

W. F. DURFEE.

Sexage'sima [= Late Lat. (sc. *di'es*, day), liter., fem. of *sexage'simus*, sixtieth, deriv. of *sexagin'ta*, sixty]: in the calendar the eighth Sunday, nearly sixty days, before Easter. See SEPTUAGESIMA.

Sextant [from Lat. *sex'tans*, *sextan'tis*, the sixth part of an as, also a sixth of certain other measures of land, length,

volume, etc.]: a portable astronomical instrument, invented by Newton, and reinvented by Thomas Godfrey, of Philadelphia, in 1730, and John Hadley, of England, in 1731 (see HADLEY, JOHN), using for the measurement of an angle a graduated arc of the sixth part of a circle, and employing in its construction the following theorem of optics: If a pencil be reflected by each of two plane surfaces, the deviation of the axis of the pencil is double the inclination of the reflecting planes, supposing its course to be in one plane perpendicular to the intersection of the surfaces. To show the application of this theorem to the sextant in Fig. 1, let I be the index-glass, H the horizon-glass, S the star, S I H E the pencil of light from the star S as it suffers the two reflections at the respective glasses. The star will be seen by the eye projected in the horizontal line E S'. Since S I r = r I H by the law of reflection of light,

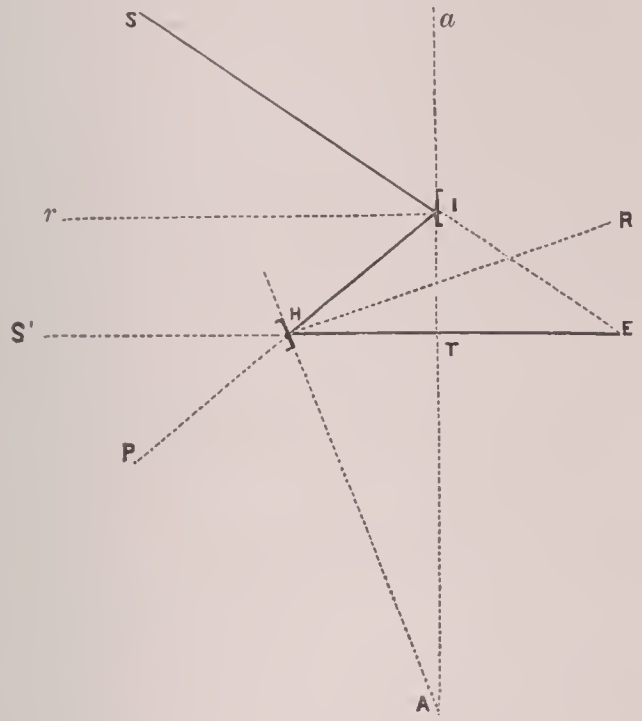


FIG. 1.

$$\therefore \text{SI}a = \text{HI}A;$$
$$\therefore \text{EI}A = \text{HI}A.$$

In a similar manner EHA = PHA,

$$\text{HEI} + \text{AIE} = \text{AHE} + \text{IAH},$$
$$\text{HEI} + \text{HIA} = \text{PHA} + \text{IAH},$$
$$= \text{HIA} + 2\text{IAH};$$
$$\therefore \text{HEI} = 2\text{IAH}.$$

But HEI is the deviation of the pencil produced by the double reflection, and we see this angle is twice the angle of the inclination of the mirrors. So long as the line of sight E S' is directed to any fixed point the angular distance to any other point may be determined by the revolution of the mirror at I; the angle through which this mirror is moved may be indicated by the revolution of the line a A, which carries at some part of it an index sweeping over a graduated arc, which is graduated to twice as many degrees as it measures in its own circumference.

The following description of the instrument is taken from Chauvenet's *Astronomy*, vol. ii., art. 81: Fig. 2 represents the most common form of the sextant constructed upon these principles. The frame is of brass, constructed so as to combine strength with lightness; the graduated arc, inlaid in the brass, is usually of silver, sometimes of gold or platinum. The divisions of the arc are usually 10′ each, which are subdivided by the vernier to 10″. The handle, H, by which it is held in the hand, is of wood. The mirrors, M and m, are of plate-glass, silvered. The upper half of the glass m is left without silvering, in order that the direct rays from a distant object may not be intercepted. To give greater distinctness to the images, a small telescope, E, is placed in the line of sight m E. It is supported in a ring, K K, which can be moved by means of a screw in a direction at right angles to the plane of the sextant, whereby the axis of the telescope can be directed either toward the silvered or the transparent part of the mirror. This motion changes the plane of reflection, which, however, remains always parallel to the plane of the sextant, the use of the motion being merely to regulate the relative brightness of the direct and reflected images. The vernier is read with the aid of a glass, R, attached to an arm which turns upon a pivot, S, and is carried upon the index-bar. The index-glass, M, or central mirror, is secured in a brass frame, which

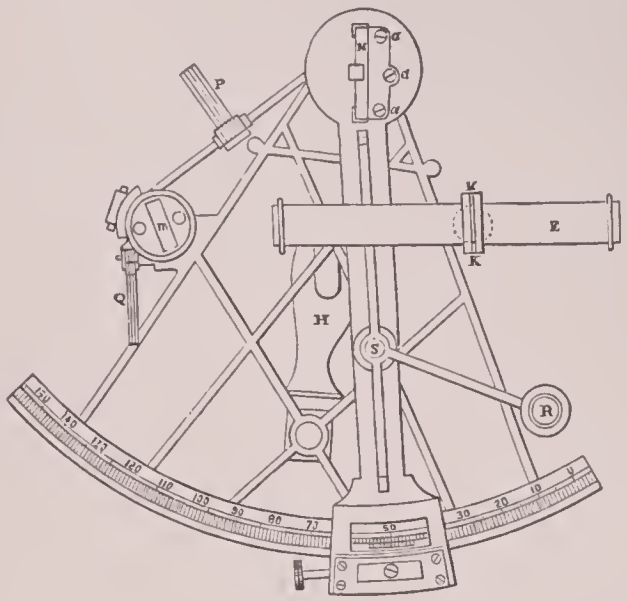


FIG. 2.

is firmly attached to the head of the index-bar by screws, a a a. This glass is generally set perpendicular to the plane of the sextant by the maker, and there are no adjusting screws connected with it. The fixed mirror m is usually called the horizon-glass, being that through which the horizon is observed in taking altitudes. It is usually provided with screws, by which its position with respect to the plane of the sextant may be rectified. At P and Q are colored glasses of different shades, which may be used separately or in combination, to defend the eye from the intense light of the sun.

For astronomical purposes the sextant is sometimes modified by making the arc a complete circle. The instrument is then known as a reflecting circle. This form has the advantage of securing higher precision in the observations.

For a discussion of the sextant generally, see William Chauvenet, *Manual of Practical and Spherical Astronomy* (Philadelphia, 1874); Dr. C. M. Bauernfeind, *Elemente der Vermessungskunde* (Munich, 1872); Merrifield and Evers, *Navigation and Nautical Astronomy* (London, 1868); E. Loomis, *Practical Astronomy* (New York, 1855). For special problems and capacity of the sextant for scientific purposes, see *Monthly Notices R. A. S.*, vol. xiii., p. 61; 1873, November; *Washington Astron. Obs.*, 1867, App. ii.; 1869, App. i.; *Pogg. Ann.*, vol. lxxix., p. 136; *Astron. Nach.*, vol. vii., p. 262; vol. xxiii., p. 321. Revised by S. NEWCOMB.

Sextus Empir'icus: Greek philosopher of the end of the second century; a physician of the "empirical" school, whence his surname. He revived the skepticism of Pyrrho and laid down the *Outlines of Pyrrhonism* in his Πυρρώνειοι ὑποτυπώσεις (three books), and in a work on skepticism (ten books), commonly cited under the title *Adversus Mathematicos*—a formal assault on all branches of learning, and valuable for the information it contains about the things assailed. His works were edited by Bekker (Berlin, 1842); German translation by Pappenheim (Leipzig, 1877). B. L. G.

Sexual Selection: a factor in organic evolution, in which there is a struggle of the individuals of one sex for the possession of the other. In the struggle for existence the less fitted perishes; in sexual selection the unfortunate one is left without offspring. Usually the struggle is between the males, and may take the form of actual battle, but not infrequently it is one in which the æsthetic senses seem to be important. See EVOLUTION. J. S. K.

Seychelles, *sā'shel'*: a group of over thirty small islands in the Indian Ocean, between lat. 3° 30′ and 5° 45′ S., and between lon. 55° 20′ and 56° 20′ E., belonging to Great Britain and a dependency of Mauritius. Area, 100 sq. miles. They are rocky and high, but very fertile and covered with a luxuriant vegetation, especially of palms. Cotton is cultivated with some success. The largest is Mahé, 16 miles long and 4 miles broad. The Seychelles were discovered by the Portuguese early in the sixteenth century; they were first settled by the French in 1756, and became a British possession in 1794. Pop. (1891) 16,440.

Revised by M. W. HARRINGTON.

Seyffarth, zīf'fȧȧrt, Gustav, Ph. D., D. D., LL. D.: scientist and archæologist; b. at Uebigau, Prussian Saxony, July 13, 1796; educated at Leipzig University, where he was Professor of Oriental Archæology from 1825 to 1855; professor in the Concordia Lutheran Theological Seminary at St. Louis, Mo., 1855–71, and afterward took up his residence in New York. He was the author of numerous works in German and Latin upon theology, Oriental philology, mythology, history, and chronology, chiefly notable for their extreme advocacy of the literal school of biblical interpretation and their entire rejection of the system and results of the Egyptian researches of Champollion and Bunsen. He resided in New York from 1871 till his death Nov. 17, 1885. See his autobiography, *Literary Life* (New York, 1886).

Revised by S. M. Jackson.

Seymour, see'mōr: town; New Haven co., Conn.; near the junction of the Naugatuck, Bladen, and Little rivers, and on the N. Y., N. H. and Hart. Railroad; 10 miles N. W. of New Haven (for location, see map of Connecticut, ref. 11–F). It contains 5 churches, new high-school (building cost $40,000), several other schools, public library, a weekly newspaper, and manufactories of paper, rubber, woolen goods, pins, nails, and mechanics' tools. The manufacture of woolen cloth was begun here over a century ago. In 1803 Gen. David Humphreys, who imported the first merino sheep into the U. S., bought the clothing-works here and built a large mill. The place was incorporated as the borough of Humphreysville in 1836, and as a town under its present name in 1850. Pop. (1880) 2,318; (1890) 3,300; (1900) 3,541.

W. C. Sharpe, editor of "Record."

Seymour: city (laid out in 1852); Jackson co., Ind.; on the Balt. and Ohio S. W., the Evansv. and Terre H., and the Pitts., Cin., Chi. and St. L. railways; 18 miles S. of Columbus, 51 miles N. of Louisville, Ky. (for location, see map of Indiana, ref. 9–E). It is noted for its manufactories, which include rolling and planing mills, foundry, woolen-mill, and spoke, carriage, furniture, harness, and cradle factories. It contains the machine-shops of the Ohio and Mississippi Division of the Balt. and Ohio S. W. Railway, 10 churches, 5 public-school buildings, including the Shields high school, 2 national banks with combined capital of $200,000, and 2 daily and 3 weekly papers. Pop. (1880) 4,250; (1890) 5,337; (1900) 6,445.

Editor of "Democrat."

Seymour, Edward, Duke of Somerset: See Somerset, Duke of.

Seymour, Frederick Beauchamp Paget, first Baron Alcester: naval officer; b. in London, Apr. 12, 1821; entered the navy in 1834, and passing through the different grades became admiral in 1882. In 1880 he was appointed commander-in-chief in the Mediterranean, and assumed supreme control of the allied fleet on the coast of Albania. In the military operations in Egypt in 1882 he bombarded the forts of Alexandria July 11–13, for which service he received the thanks of Parliament and was raised to the peerage. D. in London, Mar. 30, 1895.

Seymour, George Franklin, D. D., LL. D.: bishop; b. in New York, Jan. 5, 1829; graduated at Columbia College in 1850 and at the General Theological Seminary in 1854; had charge of a mission station at Dobbs Ferry for six years; became first head of St. Stephen's College, Annandale, 1860, and in 1861 rector of St. Mary's church, Manhattanville, N. Y.; in 1863 went to St. John's church, Brooklyn, N. Y., and was in 1865 elected Professor of Ecclesiastical History in the General Theological Seminary; in 1874 was chosen bishop of the diocese of Illinois, but the General Convention refused to confirm him; in 1875 was elected dean of the General Theological Seminary. In 1877 he was chosen Bishop of Springfield, Ill., and was consecrated June 11, 1878. Bishop Seymour has published numerous pamphlets and works, all of a theological nature, and chiefly written in defense of church doctrine.

Revised by W. S. Perry.

Seymour, Horatio, LL. D.: Governor of New York; nephew of Senator Horatio Seymour; b. at Pompey, Onondaga co., N. Y., May 31, 1810; removed in childhood to Utica; studied at Oxford and Geneva Academies, N. Y., and at Partridge's Military Institute, Middletown, Conn.; was admitted to the bar at Utica 1832, but soon withdrew from practice to devote himself to the management of the large estate he inherited by the death of his father; was a member of the staff of Gov. Marcy 1833–39; was elected to the State Assembly as a Democrat 1841, and three times re-elected, serving as Speaker in 1845; was chosen mayor of Utica 1842; was an unsuccessful candidate for Governor 1850; was Governor 1853–55; vetoed a prohibitory liquor-law Mar., 1854; was defeated in the election of that year by the Prohibitionist candidate, Myron H. Clark; was again elected Governor as a War Democrat 1862; aided in suppressing the riots in New York, and rendered efficient co-operation to the national Government in the war for the Union; was defeated for re-election in 1864, in which year he presided over the national Democratic convention at Chicago, as he did again at New York 1868, when he was nominated for the presidency much against his will, and received 80 electoral votes. D. at Utica, Feb. 12, 1886.

Seymour, Lady Jane: third queen of Henry VIII., sister of Protector Somerset, and daughter of Sir John Seymour; b. in England about 1510; became maid of honor to Queen Anne Boleyn; married Henry May 20, 1536, the day after the execution of Anne, and died shortly after giving birth to a son (Edward VI.) Oct. 24, 1537. She was chiefly notable for her sympathy with the Protestant Reformation.

Seymour, Thomas Day: scholar; b. at Hudson, O., Apr. 1, 1848; graduated at Western Reserve College 1870; studied in Berlin and Leipzig 1870–72; Professor of Greek in Western Reserve College 1872–80; appointed Professor of Greek in Yale College 1880; chairman of the managing committee of the American School of Classical Studies at Athens since 1887. He has published as author and editor *Selected Odes of Pindar* (1882); *Homeric Language and Verse* (1885); *Homer's Iliad* (i.–iii., 1887, iv.–vi., 1891); *School Iliad* (1889).

C. H. Thurber.

Seymour, Thomas Hart: Governor of Connecticut; b. at Hartford, Conn., in 1808; educated at Partridge's Military Academy at Middletown; became a lawyer at Hartford, and editor of *The Jeffersonian* (1837), a Democratic newspaper; was some time judge of probate; sat in Congress 1843–45; entered the Mexican war as major of the Ninth Regiment; became lieutenant-colonel Aug. 12, 1847; commanded the regiment after the death of Col. Ransom at Molino del Rey; was breveted colonel for services at Chapultepec Sept. 13, 1847; was Governor of Connecticut 1850–53, and minister to Russia 1853–57. D. at Hartford, Sept. 3, 1868.

Seymour, Truman: soldier; b. at Burlington, Vt., Sept. 25, 1824; graduated at West Point 1846; entered the First Artillery; was breveted lieutenant and captain for gallantry in the Mexican war; was assistant professor at West Point 1850–53; served under Maj. Anderson at Fort Sumter Apr., 1861; became chief of artillery of McCall's division in the Army of the Potomac Mar., 1862; was commissioned brigadier-general of volunteers Apr. 28, 1862; was distinguished in the Virginia and Maryland campaigns, commanding a brigade at Mechanicsville, Gaines's Mill and Glendale, and a division at Malvern Hill, Manassas, South Mountain, and Antietam; was severely wounded at Fort Wagner July 18, 1863; commanded an expedition to Florida Feb., 1864; was taken prisoner at the Wilderness; commanded a division in the Shenandoah valley Oct., 1864, and in the operations around Petersburg up to the close of the war. Breveted from major to major-general in both the volunteer and regular army. Mustered out of volunteer service Aug., 1865, he returned to his regiment; received the degree of A. M. from Williams College; major Fifth Artillery 1866; retired 1876. D. at Florence, Italy, Oct. 30, 1891.

Revised by James Mercur.

Sfax (probably the *Taphoura* of Ptolemy): fortified city on the Gulf of Gabes, or Lesser Syrtis, Tunis; lat. 34° 44′ N., lon. 10° 45′ E.; is divided into two cities, the upper and lower, the latter also called Rabat. The harbor is safe, but shallow, and large ships must anchor 2 miles out. The commerce is very large, and is chiefly with France, Italy, Great Britain, and Greece. Sfax is celebrated for its camels, sponges, and gardens. It is intensely Mohammedan, and is much admired in Arabic literature. Pop. 30,000, of whom about 5,000 are Europeans.

M. W. H.

Sforza, sfort'sȧȧ: the name of an Italian family which ruled Milan as a dukedom in the fifteenth and sixteenth centuries and exercised considerable influence on the politics of Italy by their ambition, which was generally accompanied with violence and faithlessness, and by their talent, which was not always accompanied with education, though several members showed interest for and gave much protection to science, poetry, and art. The founder of the family was (1) Giacomuzzo Attendolo, a peasant-boy from Coti-

gnola in the Romagna, b. June 10, 1369. He distinguished himself by his bodily strength, and received the surname *Sforza*, the forcer; became chief of a band of condottieri, and entered the service of Queen Joanna II. of Naples, who made him grand constable; served afterward Pope Martin V., who made him a count, and died Jan. 4, 1424.—(2) His son, Francesco, b. July 25, 1401, was chief of a large troop of mercenaries, and served the highest bidder. He invented a new tactical trick which made his troop very effective in battle; entered the service of Visconti, Duke of Milan, and was very successful in his undertakings; received Visconti's daughter, Bianca, in marriage, and Cremona as her dowry; and took Ancona from the pope. In 1447 Visconti died without any male heirs, and Milan instituted a republican government; but in 1450 Francesco seized the ducal crown, defeated his adversaries both in Milan and among the other states in Northern Italy, reigned well, and died in Milan, Mar. 8, 1466, much beloved by his subjects.—(3) His son, Galeazzo Maria, b. Jan. 24, 1444, was vicious and cruel, and was assassinated Dec. 26, 1476.—(4) He was followed by his son, Giovanni Galeazzo, b. in 1468, during whose minority the government was carried on by his mother, Bona of Savoy.—(5) In 1480, Lodovico the Moor, b. in 1451, a brother of Galeazzo Maria, banished Bona and assumed the regency, and in 1494 he poisoned his nephew and ascended the ducal throne himself. As Giovanni Galeazzo had married a Neapolitan princess, Naples remonstrated against the usurpation, and in order to avert the impending danger Lodovico induced Charles VIII. of France to assert his claim on Naples. The success of the French, however, alarmed him more than the threats of Naples, and he formed a league between all the North Italian states against France. To punish him, Louis XII. invaded his country, which he claimed as a grandson of Valentina Visconti, captured him in 1500, and confined him in a castle of Loches in the present department of Indre-et-Loire, where he died in 1510. He was possessed of great talents and considerable literary and scientific accomplishments, and the magnificent encouragement he gave to literature and art made him very popular; but he was a weak character, of a low moral standard, and all his astuteness and cunning were of very little avail to him on account of the violence of the time.—(6) His son, Massimiliano, b. in 1491, was made duke in 1512, but expelled by the French in 1513; reinstated in the same year by Charles V. after the battle of Novara, but was again driven out by Francis I. after the battle of Marignano, 1515, and finally sold his claims to the dukedom to France for a pension.—(7) His brother, Francesco II., b. in 1492, was made Duke of Milan by Charles V. in 1522 after the battle of Pavia, but rendered himself unpopular by oppressive taxes, and at his death (Oct. 24, 1535), the country was incorporated with Austria. The Counts of Santa Fiora and the Dukes of Sforza-Cesarini are descended from collateral branches of the family. Revised by F. M. Colby.

Sgambati, Giovanni: See the Appendix.

Shabbatai Tsevi, shăă-băă-tī'tse-vee': the most noted of the many impostors and self-deluded aspirants to be the Messiah of the Jews; b. in Smyrna, 1626, of Spanish descent; followed the mystic Cabbala, and became an ascetic. The air was full of Messianic ideas, the year 1666 being looked forward to by both Christians and Jews. Having divulged his intentions in 1648 he was banished; went to Salonica, Morea, Athens, Cairo, and Jerusalem, and achieved success, which was largely due to the circumstances in which his brethren lived and to the active assistance of his second wife Sarah; of Raphael Chelebi, a rich Jew of Cairo; and of Nathan of Gaza, who pretended to be Shabbatai's Elijah. In 1665 the company traveled in great pomp to Aleppo and Smyrna; in December Shabbatai was officially proclaimed Messiah. Mystic rites of all sorts led to immoral actions; but his fame spread abroad. Jews all over Europe believed in him, even deified him. They hoped for a speedy restoration to Palestine. In the early part of 1666 Shabbatai went to Constantinople, where he was imprisoned. Sept. 14 he saved his life by becoming a Mohammedan under the name of Mehmed Effendi. He played the double game of being a Mohammedan to his captors and a Jew to his followers. The Turks soon tired of this. He was banished to Dulcigno in Albania, where he died 1676. Even after his death the movement continued; there are still secret believers in his Messiahship, as the Dönmēs or Mamin in Salonica (*Ausland*, 1888, 10, 11). The most complete account will be found in Graetz, *Gesch. d. Juden* (x., chap. vii.). For the older literature, see Graetz (*ibid.*, notes 3–7); Fürst, *Bibl. Judaica* (1863, iii., pp. 184, *seq.*). See also Jost, *Gesch. d. Judenth.* (iii., p. 153); Neubauer, *Wahnwitz der Sabbatianer*, in Graetz's *Monatsschrift* (1887, p. 204); Emanuel Frances's *Life* of Shabbatai, in the *Sammelband*, published by the Mekitze Nirdamim (i., p. 133); *Wiener Zeit. f. Kunde d. Morgenl.* (ii., p. 261).

Richard Gottheil.

Shad [O. Eng. *sceadda*: Germ. dial. *schade*; cf. Welsh *ysgadenyn*: Ir. and Gael. *sgadan*, herring]: any one of several species of the family *Clupeidæ*, agreeing in the possession of a rather high and compressed body, with trenchant and serrated belly, the preoperculum and suborbital higher than long, a deep re-entering notch in the upper jaw, and the roof of the mouth and tongue at least toothless; these are by some naturalists combined in a peculiar genus, *Alosa*, but by others they are regarded as constituents of the enlarged genus *Clupea*, including the salt-water herrings, etc. The species are all inhabitants of the northern hemisphere, and anadromous, like the salmon, living for the greater portion of the year in the sea, but in the spring ascending the rivers in large schools for the purpose of spawning. The time of ascent is determined by the temperature, and the point is only limited by insurmountable obstacles in the form of dams or falls which can not be overleaped, although the larger portion spawn at intervals far below this final point. The eggs are moderate in size, the ovaries of a single female having generally, it is said, about 25,000 eggs, although sometimes as many as 100,000 to 150,000. They are discharged near the surface, and slowly sink to the bottom. The time between impregnation and hatching depends on the temperature, and varies from about three to six days; thus when the temperature is about 75° to 80° F. they hatch in about seventy hours or little more, while at a temperature of 62° to 67° they are delayed to about six days. The best-known species are four—viz., *Alosa vulgaris* and *Alosa finta* of Western Europe, *Alosa sapidissima*, ranging from the Miramichi to the Alabama, and the *Alosa reevesii* of China, which especially ascends the Yang-tse-Kiang. The European species are held in much less esteem than the American and Asiatic. The last are esteemed among the best of fishes in their respective countries, and their ovaries are also regarded as special objects of luxury. The capture of these fishes gives rise to a large industry, and in the early spring months the fishermen are to a large extent engaged in their capture by means of fixed nets as well as seines, and to a small extent by dipnets. Shad eat little or nothing when in fresh water, but sometimes rise to the fly. In the salt water and estuaries they feed chiefly on small crustaceans, such as species of *Mysis*, etc. See Fisheries, Fish-culture, and Pisciculture. Revised by F. A. Lucas.

Shad-bush or **Shad-tree**: See June-berry.

Shaddock (also called *pompelmoose*, *pomelo*, and *grapefruit*): the large fruit of the *Citrus decumana*, a small tree of the orange family (*Rutaceæ*). It has a watery pulp, cooling, acid, aromatic, and somewhat bitter. It is used for preserves. It was named from one Shaddock, who is said to have carried it from India to Jamaica. Risso describes six varieties. The tree differs from the oranges in having a pubescent young growth, the leaves very large and often emarginate and pubescent beneath, petioles much winged. It is a native of Polynesia, but is widely spread in the tropics.

Revised by L. H. Bailey.

Shadow-bird: a wading bird (*Scopus umbretta*) related to the storks and herons, found in Madagascar and Africa. It is named from its color, a deep brown with bronze reflections. The tail is barred with black, the bill is deep and compressed and hooked at the tip, and the head bears a long crest. The bird is rather sluggish. Although only 20 inches in length it builds a hollow nest of twigs about 6 feet in diameter, on a tree or ledge of rocks. F. A. L.

Shadwell, Thomas: dramatist; b. at Stanton Hall, Norfolk, England, about 1640; educated at Caius College, Cambridge; acquired considerable reputation by his comedy, *The Sullen Lovers*, produced in 1668; devoted himself thenceforth to literature, chiefly dramatic; was author, among many other plays, of *The Virtuoso* (1676), *Lancashire Witches* (1682), *The Squire of Alsatia* (1688), and *Volunteers, or The Stock-jobbers* (1693); became poet-laureate and royal historiographer 1688, succeeding Dryden in both posts, and was unjustly impaled by that poet as the hero of *Mac Flecknoe* in the character of "monarch of dullness." D. Dec. 6, 1692. His collected *Works* appeared in 4 vols., 1720.

Shafter, William Rufus: soldier; b. at Galesburg, Mich., Oct. 16, 1835; was for many years a farmer. In the civil war (1861–65) he rose to the rank of colonel and brevet brigadier-general; lieutenant-colonel in the regular army 1866; colonel 1879; brigadier-general 1897; major-general of volunteers May 4, 1898. He commanded the U. S. army at the siege of Santiago de Cuba, which he occupied July 17, 1898, the Spanish army having surrendered.

Shaftesbury, Anthony Ashley Cooper, First Earl of: party leader; b. at Wimborne St. Giles, Dorsetshire, England, July 22, 1621; entered Exeter College, Oxford, 1637; was elected for Tewkesbury to the Short Parliament in 1640; at first supported the king, but after ten months' service in the royalist army went over to the popular party in 1644, and took an active part in the war. He was a member of the "Barebones" Parliament in 1653, and of Cromwell's council of state in the same year, but later separated from the cause of the Protector and co-operated in the restoration of Charles II. As a reward for his services he was made a privy councilor in 1660 and Chancellor of the Exchequer in 1661, having previously been raised to the peerage with the title of Baron Ashley. He was one of the grantees of the province of Carolina 1663 and 1665; secured the services of John Locke as private secretary 1666, and prepared with Locke the famous aristocratic constitution for the government of the Carolinas. A member of the "Cabal" 1670, he allowed himself to be deceived as to the true nature of the disgraceful Treaty of Dover. In 1672 he was made Earl of Shaftesbury and Lord Chancellor, but in 1673 went over to the opposition and lost his office. Protesting against the prorogation of the Parliament, he was imprisoned in the Tower 1677–78, but on his release continued as the bitter foe of the court party, and, professing to believe the perjured testimony of Titus Oates, took the lead in the persecutions of the Catholics. He procured the passage of the Habeas Corpus Act 1679; presented the Duke of York before the court of king's bench as a "Popish recusant" in 1680; brought armed followers to the Oxford Parliament in 1681; was thrown into prison by order of the council on a charge of high treason July 2, but released Dec. 1, 1681, the grand jury having refused to find a true bill; went to Amsterdam Nov., 1682, and died there Jan. 22, 1683. He was the Achitophel of Dryden's satire, is brilliantly sketched by Macaulay in his *History*, and gave name to Ashley and Cooper rivers in South Carolina. See his *Life*, by W. D. Christie (1871); also Fox-Bourne's *Memoir of John Locke* (1876); and a biography by H. D. Traill in the English Worthies Series (1886).

Revised by F. M. Colby.

Shaftesbury, Anthony Ashley Cooper, Third Earl of: grandson of the first earl; b. in London, Feb. 26, 1671; was educated under the supervision of Locke; entered Parliament 1693; resided in Holland 1698–99; succeeded to the peerage 1699; supported the administration of William III., and retired from public life on the king's death; was noted as a philanthropist and stigmatized as a free-thinker; published a *Letter on Enthusiasm* (1708) in defense of the rights of the "French Prophets," *The Moralist, a Philosophical Rhapsody* (1709), *Sensus Communis* (1710), *A Soliloquy, or Advice to an Author* (1710); spent much of his time on the Continent, and was preparing a work upon the arts of design when he died at Naples, Feb. 15, 1713. His principal work, *Characteristics of Men, Matters, Opinions, and Times*, was posthumously published (3 vols., 1713–23; often reprinted), and enjoyed great popularity. See Fowler, *Shaftesbury and Hutcheson* (London, 1882).

Shaftesbury, Anthony Ashley Cooper, Seventh Earl of: b. in London, Apr. 28, 1801; took a first class in classics at Oxford, 1822; was made D. C. L. 1841; entered Parliament 1826, representing the borough of Woodstock from 1826 to 1830, Dorchester 1830 and 1831, the county of Dorset, in which the estates of the family are situated, from 1833 to 1846, and the city of Bath from 1847 to 1851; supported the administrations of Liverpool and Canning; was made a commissioner of the India board of control by the Duke of Wellington 1828; was a lord of the admiralty under Sir Robert Peel 1834–35; succeeded his father in the peerage 1851. He was chairman of the Lunacy Commission from 1828 till his death, and did much to secure the passage of bills which have been called the Magna Charta of the liberties of the insane. He labored zealously to improve the condition of the working classes; carried through the Ten Hours' Bill, and followed it up by obtaining the assent of Parliament to other measures regulating defective workshops and factories, night work, and the treatment of children by their employers in trades and manufactures, etc. His course in public life was always very independent. He was the leading philanthropist in English-speaking lands, and stood in public estimation as the embodiment of every virtue. His endorsement of any scheme was sufficient to give it success. He was therefore continually called upon to preside at meetings of all sorts. He was president of the British and Foreign Bible Society, the Pastoral Aid Society, the Evangelical Alliance, and other organizations for the propagation of evangelical doctrines, and was long regarded as the head of the so-called Exeter Hall school of Low Churchmen. He was an active promoter of the abolition of slavery throughout the world. D. at Folkestone, Oct. 1, 1885. See his *Life*, by Edwin Hodder (3 vols., London, 1886; n. e., 1 vol., 1887).

Revised by S. M. Jackson.

Shagreen' [from Fr. *chagrin*, from Turk. *sāghrī*, back of a horse (from the skin of which shagreen was first made), shagreen]: a variety of tawed leather made in Persia and other parts of the East, and long celebrated for its hardness and strength. The name shagreen is also given fish-skins, principally those of sharks and rays, covered with calcified papillæ. Shagreen prepared from the tuberculous skin of the ray (*Trygon sephen*) is called *galuchat* by the French. Shagreen is dyed in various colors, and is used as a covering for small articles, as boxes and handles of swords.

Shah [from Pers. *shāh*, king; cf. *chess*, *pasha*, and *satrap*; Pers. *khṣatra*, province: Sanskr. *kshatra-*, rule, power]: the title of the ruler of Persia and of certain other Asiatic princes. The sons and other male relatives of the Persian shah also assume this title, the full title of the monarch being *shah-in-shah*, king of kings.

Shāh Abbās: See Abbās I.

Shahap'tian Indians: a family of North American Indians, comprising the following named tribes: Chopunnish, Sahaptin, Nez Percé or Nĭmapu (the last being their own name), Klikatat, Paloos, Tenaino, Tushepaw, Tyigh, Umatilla, Walla Walla, Yakima.

Habitat.—The tribes occupied a large section of country along the Columbia river and its tributaries, their western boundary being the Cascade Mountains. The Chopunnish were found in 1804 occupying a large area in Western Idaho, Northeastern Oregon, and Southeastern Washington, on the lower Snake river and its tributaries. The Klikatat occupied the head waters of Cowlitz, White Salmon, and Klikatat rivers, Washington. The Paloos in 1805 were on Clearwater river, Idaho, above the Forks, and on the small streams tributary to it, W. of the Rocky Mountains. The Tushepaw appear to have been an eastern branch of the Nez Percé. According to Lewis and Clark's report the Walla Walla lived on both sides of Columbia river, from the mouth of Lewis (or Snake) river to the Musselshell Rapid, wintering on Tapteel (or Yakima) river. It is probable that under the general name Lewis and Clark included one or more other divisions, the Umatilla, for instance, who originally lived on Umatilla river, Oregon. The Tenaino, who are nearly related to the Warm Spring Indians, formerly lived at Celilo, Oregon, on Columbia river. The Tyigh originally occupied Tyigh creek and valley, the former being a tributary of the Des Chutes river, Oregon, about 30 miles S. of the Dalles. The Yakima (called Shanwappam by Lewis and Clark) were found in 1805 on the head waters of Cataract (or Klikatat) and Tapteel (or Yakima) rivers, Washington.

General Characteristics.—Comparatively little is known of the mutual relations of the several members of this family. The linguistic family as a whole is a rather well-defined one, though in some of its sounds and in its harsh character the language considerably resembles the Chinookan and Salishan. In habits of life the Shahaptian tribes differed considerably from the Chinook of the Columbia, to whom they were much superior, and more nearly resembled the inland Salishan tribes. Living as they did on the large watercourses, salmon constituted their most important food, but the possession of horses (for all the tribes were "horse Indians") undoubtedly wrought considerable change in their habits, and caused them to become, to some extent, hunters. At the time of Lewis and Clark's visit (1804–05) none of these tribes had any idea of agriculture, and some of the bands met by the explorers on Snake river periodically suffered from hunger. The Chopunnish were then living, like the Chinook, in communal houses, and the same custom probably prevailed also in the other divisions of the family.

One village on the Clearwater was 150 feet long, and accommodated about 50 families and 100 fighting men. Each village was under the nominal control of a chief, but nothing is known of the nature of the federation of the separate villages, if any such existed. Of late years, at least, the Nez Percé (Pierced Noses) have not worn ornaments inserted in the nose, but it is probable that at one time the custom was a general one.

History.—When Lewis and Clark passed down the Columbia, in 1804–05, the lowermost Shahaptian tribe, the Eneeshur, was at the Falls, while the first Chinookan tribe, the Echeloot, was found at the Dalles, the two tribes being but 6 miles apart. They were then at war, and there is evidence to show that during the next few years the Shahaptian tribes encroached upon the Chinookan territory, and even wrested from the Chinook the Dalles, probably the best fishing-station on the Columbia. The Klikatat, who, according to Gibbs, had crossed the Cascade Mountains from the Klikatat river, Washington, crossed the Columbia between 1820 and 1830 and overran the Willamette valley, making their way as far S. as the Umpqua valley, Oregon. Subsequently they were compelled to retire to their own country. In 1866 they were found in the wooded and prairie country between Vancouver and the Dalles, at the base of Mt. Hood, Washington. In 1849 the Paloos dwelt N. of the Cayuse. Lord (1866) mentions the Pelouze (Paloos), who were then in British Columbia, at the mouth of Pelouse river. The Shahaptian Indians are now located on various reservations in Idaho, Washington, and Oregon.

Population (1886).—Nez Percé, 1,515; Klikatat, 115; Paloos, number unknown (181 in 1851); Tenaino, 69; Tyigh, 430; Umatilla, 179; Walla Walla, 405; Yakima (numbered 400 in 1805), 943.*

Authorities.—Bancroft, *Native Races of the Pacific States*, iii., 565, 620 (1882); Cox, *History of the Nez Percés*, in *Nation*, xxxiii., 95 (1881); Gallatin, in Schooleraft's *Indian Tribes*, iii., 402 (1853); Hale, in *United States Expl. Exp.*, vi., 198, 212, 542 (1846); Gen. O. O. Howard, *True Story of the Nez Percés*, in *North American Review*, 129, 53 (1879); Lee and Frost, *Ten Years in Oregon* (1844); Lewis and Clark, *Narrative*, ed. Allen, ii. (1814). See Indians of North America.

James Owen Dorsey.

Shahjahanpur′: large city of Rohilkand, Northwest Provinces, British India; in lat. 27° 52′ N., lon. 79° 28′ E.; on the Garrah, a tributary of the Ganges (see map of N. India, ref. 5–F). The city was founded in 1647 during the reign of Shah Jahan, whose name it bears, and contains some fine mosques and the ruins of a castle. It has some export trade in cereals and sugar. Pop. (1891) 78,522. It is the chief place of a district of the same name. Area, 1,746 sq. miles. Pop. 860,000. Shahjahanpur is the name of several other towns in Northern India.

Revised by M. W. Harrington.

Shahjehanābād′: See Delhi (city).

Shāh-Nāmah, shaa-naa′ma, or **Book of Kings**: See Firdausī and Rustam.

Shairp, John Campbell: author and critic; b. at Houstoun House, Linlithgowshire, Scotland, July 30, 1819; educated at Edinburgh Academy, Glasgow University, and Baliol College, Oxford; was for some years assistant master of Rugby School; became Professor of Humanity at the United College, St. Andrews, 1861, and principal of that institution 1868, and was elected Professor of Poetry in the University of Oxford in 1877. He was the author of *Kilmahoe, a Highland Pastoral* (1864); *Studies in Poetry and Philosophy* (1868); *Lectures on Culture and Religion* (1870); *Poetic Interpretation of Nature* (1877); *Aspects of Poetry* (1881); *Life of Robert Burns* in the English Men of Letters Series; and numerous contributions to magazine literature. D. at Ormsary, Argyleshire, Sept. 18, 1885. *Glen Desseray and Other Poems* was published posthumously in 1888, edited by F. T. Palgrave. See *Portraits of Friends* (New York, 1889) for a memoir of Shairp, by William Young Sellars.

Revised by H. A. Beers.

Shakers [so called from certain rhythmical movements of the members in dancing, which forms part of their worship]; more accurately, The Millennial Church, or United Society of Believers: a religious body which originated in England about the middle of the eighteenth century, having as its first leaders James Wardlaw, a tailor, and his wife Jane, members of the Society of Friends. Jane Wardlaw, who claimed to have received from on high a call to announce the second coming of Christ in the form of a woman, gained as one of her followers Ann Lee, daughter of a blacksmith, who was born in Manchester, Feb. 29, 1736, married Abraham Stanley, a blacksmith, and united with the society of James and Jane Wardlaw in Sept., 1758. She was imprisoned in the summer of 1770, during the persecution that arose against the Shakers, and while a captive received a revelation from the Lord which showed her that by celibacy only could mankind be restored to a proper relation with God, and became the acknowledged head of the society.

On May 19, 1774, in obedience to a revelation, she embarked for North America with seven adherents, including her husband, who afterward left her, and John Haeknell, who had some property. She landed in New York Aug. 6; settled in Watervliet, 7 miles N. W. of Albany, 1776. On the famous "Dark Day" (May 19, 1780) Elder James Whittaker preached the first public testimony of Mother Ann's gospel in America. Between that time and her death at Watervliet, in Sept., 1784, it is thought that over 2,000 people received her testimony. James Whittaker succeeded as leader of the people till his death at Enfield, Conn., July, 1787.

After him Elder Joseph Meacham led the people, and, assisted by able helpers, established communal order and regulation in all their families, guiding them till his death at New Lebanon, July, 1796. He had been a Baptist elder, and was son of a Baptist elder of the same name; was born in Enfield, Conn., in 1740. He is called the Father of Church Order.

After him Lucy Wright, who was Father Joseph's chief helper on the sisters' side, guided the people twenty-five years, till her death, at the age of sixty-one, at Watervliet, Feb., 1821. She was born in Pittsfield, Mass. During her ministration five societies were established in Ohio and Kentucky, and believers increased in number threefold. Ebenezer Bishop, Rufus Bishop, Ruth Landon, and Ascenath Clark were the leading ministry from 1821 to 1852. From 1820 to 1826 three new societies were established, and the population of the seventeen societies then existing was about 5,000 souls.

In 1837 remarkable spiritual manifestations began at Watervliet, and in less than a year spread through all the families. First the youthful and unbaptized class, taken away in visions and trances, described scenes and dwellers in the spirit spheres, being, as they believed, inspired to deliver messages, both vocally and in writing, from Mother Ann and her colaborers when in the body, and their successors, from Jesus, from apostles, patriarchs, and prophets, and other excarnated witnesses, to the effect that they had come to help the leaders, to purge out disorder, and to restore church rules and discipline to the rectitude of their beginning. They brought a flood of light and of spiritual gifts, humiliating and mortifying to a carnal nature, to the vanity of youth, and pride staining to all flesh, but edifying and strengthening to the little child in Christ. They said it was to prepare us for the gospel to go forth to mankind. At the end of fifteen years one spoke in the name of Mother Ann, that evil was that day so bound and put down that it had no power to rise in the church, which then stood in purer rectitude than ever it had before. Mother Ann's special ministration lasted, it is claimed, about three years. But there were many subsequent spiritual manifestations, and many were converted by them. Crowds of spirits from Hades were taught the gospel of the judgment, and the absolute necessity of confessing and forsaking their sins to find acceptance with God.

Shakers believe that Christ has made his long and anxiously awaited second appearing in Ann Lee and her followers; that God is one in essence, but dual in his complete and perfect manifestation, the redeemed and perfected man and woman; that they are in the work of the harvest, the resurrection, the judgment day, ending the world in themselves by obedience to the everlasting gospel, and ushering in the dawn of the millennial age. They own no wives, nor husbands, nor private personal property, nor have carnal relations; they hold their possessions as a united and consecrated interest, each toiling for the good of the whole, in love serving one another, in honor preferring one another as brothers and sisters of one family. The government is wholly parental. The leading authority is vested in four persons, two of each sex, called ministry. The head of a family is an eldership, consisting when complete of four,

* Of late years the term Yakima includes a considerable proportion of the tribes speaking the Shahaptian language, and probably originally having little or no connection with the Yakima proper.

two of each sex. Elders are assisted by deacons, two of each sex when the order is full, or more if necessary, who manage temporal affairs. The total number of Shakers in the U. S. is about 1,000, forming 15 societies or settlements, of which 2 are in the State of New York, 3 in Massachusetts, 1 in Connecticut, 2 in New Hampshire, 2 in Maine, 3 in Ohio, and 2 in Kentucky. New Lebanon, in Columbia co., and Watervliet, in Albany co., N. Y., are the most important.

The Shakers publish a monthly, called *The Manifesto*, at East Canterbury, N. H. It was started in 1871. See also *The Concise History of Shakers* (East Canterbury, 1894); *Pearly Gate* (Chicago, 1894); and *The Millennial Church* (Albany, N. Y., 1848). ALONZO G. HOLLISTER, Elder.

Shakespeare, WILLIAM: dramatic poet; b. at Stratford-on-Avon, Warwickshire, England, in Apr., 1564—on the 23d of that month, O. S. (N. S., May 3), it is supposed. His father, John Shakespeare, was of the yeoman class; his mother, Mary Arden, was of a family of the minor gentry. John Shakespeare seems to have been a man of character and ability. He became a landholder, and rose rapidly through all the grades of office in Stratford until he became chief alderman and *ex-officio* justice of the peace. Misfortune, however, befell him, and he was reduced to comparative poverty, and was even subject to arrest for debt. Of Shakspeare's boyhood nothing is known; but he was doubtless educated at the grammar school in Stratford, where he got the "small Latin and less Greek" with which Ben Jonson credits him. Passages in his works showing more than ordinary familiarity with law-terms have been regarded as indicating that he was for a time in an attorney's office. This is more probable than the tradition that he was apprenticed to a butcher. The first fact that is really known about him, after his baptism, is that in his eighteenth year he had become entangled with a woman of twenty-five, Anne Hathaway, the daughter of Richard Hathaway, who lived at Shottery, near Stratford. He married this woman by special license, dated Nov. 28, 1582, and their first child, Susanna, was baptized May 26, 1583. Twin children, a boy and girl, named Hamnet and Judith, were baptized Feb. 2, 1585. Shakespeare soon (perhaps in 1585) left Stratford to seek his fortune in London. Tradition says that he had killed some of the deer of Sir Thomas Lucy, of Charlecote, near Stratford, and that the knight's vindictiveness was one of the causes of his leaving his native village. The story, not improbable in itself, finds a certain confirmation in the fact that Sir Thomas is apparently caricatured as Justice Shallow in *The Merry Wives of Windsor*.

Absolutely nothing is known of Shakespeare's first years in London. Tradition says that he began by holding horses at the door of the theater. It is certain that he soon got some humble position inside the theater (another tradition says as a mere "prompter's attendant"), and after a time became an actor, though he seems never to have risen higher than a position of what is known as "general utility." He was one of the original performers in Ben Jonson's *Every Man in his Humour*; he appeared in the same author's *Sejanus*; and there is a tradition that he played the Ghost in *Hamlet*, and that his brother Edward saw him play the part of an old man, which was probably that of Adam in *As You Like It*. A few years later he began his career as a dramatist by rewriting old plays in conjunction with others, his seniors in years and as playwrights. It was the custom of the various companies of players to have several playwrights in their pay, who, working together, produced new plays and patched up old ones. Marlowe, Greene, and Peele were perhaps among Shakespeare's collaborators. His superiority to all his contemporaries soon asserted itself, and he began to write alone or with little assistance. His first wholly original play was probably *Love's Labour 's Lost*; for in *Titus Andronicus*, a revolting tragedy characteristic of a kind of drama then in vogue, there are but slight traces even of his 'prentice hand. He probably also in his earliest dramatic days had some small share in the revision of Part I. of *Henry VI.*, which was almost certainly an old play by another author or authors.

Shakespeare's success provoked the jealousy and excited the enmity of at least one of those whom he eclipsed—Robert Greene, a gifted but dissolute man, who died in wretchedness, and who, in a pamphlet written during his last illness, sneered at Shakespeare as "an upstart crow, beautified with our feathers; . . . and that being an absolute *Johannes factotum*, is in his own conceit the only Shake-scene in a country." "Beautified with our feathers" may mean that he got credit by acting what others wrote; but some take it to be a charge of plagiarism in the revision of plays written by others. A few months later, Henry Chettle, who was one of the knot of writers to which both Greene and Shakespeare belonged, came to the defense of the latter in a pamphlet in which he says that Shakespeare's demeanor was "no less civil than he was excellent in the quality he professes": adding that "divers of worship [people of rank and reputation] have reported his uprightness of dealing, which argues his honesty, and his facetious [felicitous] grace in writing which approves his art." Among the friends that Shakespeare won was the Earl of Southampton, a nobleman of taste and culture, who took great interest in literature and the drama. To him the poet dedicated his first published poem, *Venus and Adonis*, which was his first purely literary effort: he calls it "the first heir of his invention." There is a tradition that Southampton gave Shakespeare £1,000, quite equal to £6,000 at present. This may be an exaggeration, though such munificence was not unknown in those days among English noblemen. When Shakespeare published *Lucrece*, his second poem, he dedicated this also to Southampton, saying, "The love I dedicate to your lordship is without end. . . . What I have is yours; what I have to do is yours; being in part all I have devoted yours." This is apparently the acknowledgment of a great service; and it was possibly through the nobleman's generosity that the poet-dramatist became a very considerable sharer in the Blackfriars theater, at which the company with which he was connected was in the habit of performing. Having attained this advantageous position, Shakespeare soon reached the utmost height of success, as to both reputation and profit, possible to one of his profession. The notion long prevalent that he was neglected during his life, and that his plays rose into popularity only a long time after his death, is entirely unfounded. Contemporary evidence shows that he was the most admired of all the dramatists of his day, and that when the productions of the best of his contemporaries—Ben Jonson included—failed to pay the expenses of their representation, his plays filled the house to overflowing. He entered upon a career of dramatic production which is without a parallel in the history of literature, and which soon placed him in independent circumstances. He had money to spend and money to lend; and he used it to place his father in comfort and to acquire landed property and other wealth in his native town. The Heralds' College made his father a gentleman by coat-armor, and this may have been done at the instance of the successful playwright, who thereby became a "gentleman" by descent both on his father's and his mother's side. He invested a part of his money in the tithes of Stratford, and he bought New Place, the best house in the town, and gradually added other lands to the estate. To this house he retired on his withdrawal from the theater about 1611, and there he died Apr. 23, 1616, and was buried on the 25th in the Stratford church. His daughter Judith was married to Thomas Quiney, a vintner, about two months before her father's death. Her sister Susanna became the wife of Dr. John Hall, a Stratford physician, in 1607.

Of Shakespeare's life in London very little is known, almost nothing except the successive production of his plays. Fuller says that he and Ben Jonson used to have many "wit-combats," in which he compares Jonson to a heavy Spanish galleon and Shakespeare to a light English man-of-war. Jonson was his junior, but was one of those who knew him intimately; and jealous, hot-tempered Ben loved him well and honored his memory after his death. He supports Fuller's comparison by saying, with a classical allusion, that Shakespeare was distinguished by great copiousness and facility of thought and language—so great as to be almost oppressive to his hearers. There was a sort of club of which Raleigh, Jonson, Beaumont, Selden, and Donne were members, and which met at the Mermaid Tavern; and the wit-combats probably took place at these meetings. Tradition says that Jonson owed to Shakespeare's influence the performance of his first comedy, *Every Man in his Humour*, which had been offered and rejected. This story agrees with Shakespeare's reported kindliness of nature, and with the gruff and cynical scholar-dramatist's love for him.

Shakespeare's *Sonnets*, 154 in number, were published in 1609, and were dedicated to a "Mr. W. H." as their "only begetter," but by the publisher, not by the poet, who seems to have had no agency in the publication of any of his works except *Venus and Adonis* and *Lucrece*. If, as the great majority of editors, critics, and commentators believe (among them Wordsworth, Coleridge, Sir Henry Taylor, Swinburne,

Rossetti, Victor Hugo, Malone, Farmer, Steevens, Drake, Hallam, Knight, Collier, Furnivall, Trench, and Dowden), the *Sonnets* are autobiographical, most, if not all, of the first 126 were addressed to one person—a man, not a woman—and the rest (except the last two) to the "dark lady" with whom this man and Shakespeare were both entangled. Among those who believe that the poems are mere "exercises of fancy," with no foundation in the personal experience of the author, are the poets Browning and R. H. Stoddard, with Staunton, Halliwell-Phillipps, Grant White, and Hudson—the two last, however, believing that some of the sonnets are personal. The autobiographical theory has received strong confirmation from the researches of Thomas Tyler (*Shakespeare's Sonnets*, 1890), who has proved quite conclusively that "Mr. W. H." was William Herbert, afterward Earl of Pembroke; and that the "dark lady" was probably Mary Fitton, maid of honor to Elizabeth, and a mistress of Herbert's, by whom she had a child. There are minor difficulties in this theory yet to be cleared up; but at present (1895) it seems more plausible than any other.

Was Shakespeare happy in his married life? After the birth of his children he lived for more than twenty years in London, visiting Stratford, tradition says, only once a year. While in London, if the *Sonnets* are autobiographical, he was captivated by the "dark lady." His will has no mention of his wife except in an interlined bequest of the "second-best bed," apparently inserted during his last sickness. But as soon as he was prosperous in London he bought a house in Stratford, and gradually made it the elegant home which must have been his ideal from the first. Did he look forward to sharing that home with a wife whom he did not love? How he repented of his relations with the "dark lady" the 129th sonnet clearly shows. As to the will, his wife was amply provided for by her rights of dower, which are seldom referred to in wills of the time; and the bequest of the bed was doubtless a token of affection, not the insult it would else have been. On the whole, it may be assumed that the marriage had its foundation in mutual love, and that, after any transient estrangement which may have occurred, it ended as happily as it had begun.

Shakespeare's dramas are unlike those of his predecessors, his contemporaries, and his successors, but their unlikeness is not in form or in purpose. He assumed the forms of comedy and tragedy, and of history or historical play, which had been established before he began to write, and he conformed in every external respect to the fashion of his time and the needs of the theater. His difference from other dramatists consists in his thought and his language, and in his power of dramatic characterization; in all of which he is unapproached by any writer who ever lived. No other writer ever united imagination, fancy, humor, knowledge of human nature, worldly wisdom, psychological insight, and creative power, as all these were united in him. The fertility of his mind appears to have been inexhaustible, the profundity of his thought illimitable. He throws away upon a minor personage and an unimportant situation poetical thoughts and philosophical reflections which other writers, if they could have originated them, would have carefully reserved for elaboration upon great occasions. His dramatic isolation from his creations appears to have been perfect; once evoked from his mind, they exist independently and altogether outside of it, and act and speak altogether according to the laws of their own being, not of his. He does not hesitate to show us that even both good and bad may, and often do, act from mixed motives, good and evil. It is in this inflexible justice, characteristic of only the very highest quality of intellectual and moral nature, that one of the chief evidences of his superiority is found.

Such of his plays as were published during his lifetime seem to have been given to the press entirely without his agency. They were written not to be read, but to be performed; and it was to the interest of all concerned in the theater that they should not get into print. But the publishers eagerly sought copies of them for publication, and obtained them surreptitiously; sometimes, it would seem, by corrupting persons connected with the theater, and sometimes, as the text which they printed shows, by sending shorthand-writers to the performance. Twenty of Shakespeare's plays were thus published during his lifetime. They are known as "the quartos" from the form in which they are printed. Most of them are full of errors, and, with one or two exceptions, they are all more or less imperfect; but they are nevertheless of great value in the formation of the text, and they have been freely used for that purpose. For the text of the remaining seventeen of the plays we are entirely dependent upon the folio edition of the whole thirty-six (not including *Pericles*), published by Isaac Jaggard and Edward Blount in 1623, under the authority—and, in some sort, the editorial supervision—of two of Shakespeare's fellow actors, John Heminge and Henry Condell. This edition, known as the "first folio," although greatly superior, as to the text of almost all the plays, to the quarto copies of the twenty plays before mentioned, is yet marred by so many and so great errors, and sometimes even by such important omissions, that it has required the labors of editors and commentators during 150 years to produce the text as now generally accepted.

The order in which the poems and plays were written is much disputed, and it is not likely that it can ever be fully settled; but in recent years certain facts have been pretty well established. If Shakespeare wrote *Titus Andronicus*, it was probably his first play, and produced before 1590; or whatever he did in revising that play and *1 Henry VI.* for the stage was probably done between 1588 and 1591. *Love's Labour 's Lost*, it is generally agreed, was his first original play (1590), followed by the *Comedy of Errors*, the *Two Gentlemen of Verona*, and *A Midsummer Night's Dream* between 1591 and 1594; to which period must also be assigned *2* and *3 Henry VI.* and *Richard III.* The first draft of *Romeo and Juliet* may have been as early as 1591 (revised 1596 or 1597). Then followed *Richard II.* (1594), *King John* (1594 or 1595), *The Merchant of Venice* (1596 or 1597), *1* and *2 Henry IV.* (1597–98), and *Henry V.* (1599). *As You Like It*, *Much Ado*, and *Twelfth Night* must have been written in 1599–1600, and *Julius Cæsar* by 1601. The *Merry Wives of Windsor* is to be grouped with the other Falstaff plays; and *The Taming of the Shrew* (not wholly Shakespeare's), the exact date of which is not easily fixed, must be put between 1594 and 1598. The first form of *Hamlet* is dated by some critics before 1600, but it may have been as late as 1602. The dates of the rest of the plays are probably as follows: *All 's Well*, 1602 (perhaps the revision of a draft ten years earlier); *Measure for Measure*, 1603; *Troilus and Cressida*, 1603 (? very difficult to date); *Othello*, 1604; *Lear*, 1605; *Macbeth*, 1606; *Antony and Cleopatra*, 1607; *Coriolanus*, 1608; *Cymbeline*, 1609; *The Tempest*, 1610; *Winter's Tale*, 1610–11. *Timon of Athens*, (1607–8 ?), *Pericles* (1608 ?), and *Henry VIII.* (1612–13 ?) are Shakespeare's only in part, and their history is perplexing. *Venus and Adonis* was probably written in 1592 or earlier, *Lucrece* in 1593 or 1594, and the *Sonnets* between 1595 and 1599, though some may have been several years later.

There are few traces, even in tradition, of any intercourse between Shakespeare and the eminent men of his time except Ben Jonson, Drayton, and the Earls of Pembroke and Southampton. Shakespeare and Bacon lived at the same time in the same city, then not a large one, passed each other in the street, and yet probably never interchanged one word. The reason was that one was a player and a poet, the other a statesman and a philosopher, and that each was absorbed in his own affairs. The notion that Shakspeare's plays were written by or in conjunction with Bacon—which has found a few ingenious advocates—is unworthy a moment's consideration by any reasonable creature.

There is a stone over Shakespeare's grave on which there is this inscription:

> Good frend for Iesus sake forbeare
> To digg the dust encloased heare:
> Blest be ye man yt spares thes stones,
> And curst be he yt moves my bones.

These lines, which may embody a wish expressed by Shakespeare, but which are hardly of his writing, have prevented the removal of the remains of the greatest Englishman to Westminster Abbey. Against the wall of Stratford church there is a monument to Shakespeare, with a laudatory inscription in Latin; but of far greater interest is the bust of the poet which forms part of the monument. It is coarse and rude in execution, but there is no reason for doubting that it gives at least a general idea of his personal appearance. According to this, he was at fifty-three a portly but not at all corpulent man, with a high forehead, a head somewhat bald, a small aquiline nose, and a well-formed mouth and chin. Aubrey, the antiquarian, who lived two generations after him, had heard that he was "a handsome, well-shapt man." An engraved portrait upon the title-page of the first collected edition of his works, which Ben Jonson,

in some verses almost as hard and expressionless as the engraving itself, assures us was a good likeness, has a general conformity in the features and the form of the head to the bust. The latter was originally colored after life, and had hazel eyes and auburn hair and beard. These traits were afterward obliterated by a coat of white paint. The bust and the engraved portrait in the folio are the only portraits of Shakespeare which are of undoubtable authentieity; but one known as the Chandos portrait has tradition of very respeetable antiquity in its favor. There is a very slight and vague tradition that Shakespeare "died a papist," but this is very improbable. His works favor no religious form, seet, or dogma. There was also a tradition in Stratford fifty years after his death that he, Drayton, and Ben Jonson had "a merie meeting, and it seems drank too hard, for Shakespeare died of a feavour there contraeted." This tradition has probably as little foundation as the other.

Although Shakespeare was aeknowledged as the greatest dramatist of his time, his reputation rather diminished than inereased during the century after his death. He had no followers or imitators; he established no school. Dramatie taste and dramatie writing steadily deelined after the Elizabethan age (about 1575 to 1625), and by the beginning of the eighteenth century Shakespeare was lightly thought of by the literary eritics, and mueh neglected by the aetors. There had been among the reading publie, however, a steady although not a large demand for his plays. The folio of 1623 was sueceeded by another folio in 1632, and a third edition was ealled for and published in 1664. In the last *Pericles* and six spurious plays whieh had been published in quarto in Shakespeare's lifetime, with his full name or his initials upon the title-page, were ineluded. A fourth edition, also in folio, appeared in 1685. Upon these four folios, and upon the existing old quarto edition of twenty of the plays, the readers of Shakespeare depended until Rowe's edition appeared in 1709 (see bibliography below). From the time of the appearance of this edition the fame of Shakespeare steadily grew until about the beginning of the nineteenth century he was acknowledged to be the first of poets and of dramatists, the most ereative mind, the greatest master of imagination and of language, that the world has known. The number of Shakespeare's commentators has much exceeded that of his editors. His text was left in sueh a condition by the printers of the old quartos and folios that, although it may be read even in those impressions with pleasure and with a full comprehension of its general meaning, there is to its perfeetion need of more critieal labor than is required by most old manuscripts; and of sueh there is none to eonsult, for of Shakespeare's writing not a line has come down to us—not even a word, except his own signature. It is safe to say that more critieal ability and learning has been displayed upon this subjeet than upon any other in the whole range of literature, the poems of Homer perhaps exeepted. The works written upon Shakespeare form a library in themselves, and a eomplete bibliography (unfortunately there is none sueh in existenee) would fill a good-sized volume.

Shakespeare, like so many other men of great eminenee, left little traee of his personality behind him. His only son, Hamnet, died at the age of twelve years. His two married daughters left ehildren, but the family, even on the female side, became extinct in the third generation. New Plaee, his residence upon his retirement from the theater, after passing through several hands was in 1759 razed to the ground by its last owner, the Rev. Franeis Gastrell, who was exasperated by a quarrel with the town authorities and by the perseeution of prying visitors to the home of the great poet. John Shakespeare's house, whieh stands in Henley Street, and in whieh it is probable that William was born, was a comfortable dwelling for that age. After falling into decay, it was bought by an assoeiation and restored for preservation as a memorial of the poet. More reeently, the grounds of New Plaee and the eottage at Shottery in which Ann Hathaway is supposed to have lived before her marriage have been bought for the same purpose.

Richard Grant White. Revised by W. J. Rolfe.

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Shak'opee: city; capital of Scott co., Minn.; on the Minnesota river, and the Chi., Mil. and St. P. and the Chi., St. P., Minn. and Omaha railways; 28 miles W. S. W. of St. Paul (for location, see map of Minnesota, ref. 10–E). It is in an agricultural region, and contains a steam flour-mill, wagon-factory, railway repair-shops, orphan asylum, a national bank with capital of $50,000, and two weekly newspapers. Pop. (1880) 2,011; (1890) 1,757; (1900) 2,047.

Shale [from Germ. *schale*, scale, shell, husk, thin layer; cognate with O. Eng. *scealu* > Eng. *shale*, husk, pod (nearly obsolete). The same Teuton. word coming viâ O. Fr. appears in Eng. as *scale*]: a laminated argillaceous rock resulting from the induration of mud or clay stratified in water. A shale containing much organic matter, sand, or calcium carbonate is characterized as bituminous, arenaceous, or calcareous. The shales are the most abundant of all stratified rocks, and are the most highly composite. From the mixed sediments washed down from the land by streams and deposited in the ocean, the larger grains are usually sorted out and separately deposited, giving rise to sandstones; the soluble matter, chiefly calcium carbonate, is also in the main separately deposited as limestone; and the residuum is deposited as mud, and eventually converted into shale. As these various rocks, being lifted into the land, are degraded by rains and streams, the sandstones and limestones, being relatively hard and resistant, come to constitute mountains and hills, while the shales are eroded into valleys. Economically the shales are of growing importance, being wrought for the manufacture of bricks, especially paving-bricks, and for mixture with other substances in the manufacture of hydraulic cement. G. K. G.

Shaler, Nathaniel Southgate, S. D.: geologist; b. near Newport, Ky., Feb. 22, 1841; graduated at Lawrence Scientific School of Harvard University 1862; during the civil war served for two years in the Union army with Kentucky volunteers as an artillery and staff officer; returned to the Lawrence School as assistant and afterward instructor in zoölogy and geology; professor in Harvard University since 1868, at first of Palæontology, afterward of Geology; dean of the Lawrence School since 1891; director of the Geological Survey of Kentucky 1873–80; geologist of the U. S. Geological Survey in charge of the Atlantic coast division since 1884; commissioner of the Commonwealth of Massachusetts for various periods on agriculture, topographic surveys, the gipsy-moth, and highways; president of the Geological Society of America 1895. Prof. Shaler is a prolific author and has entered many fields, but his favorite themes are those branches of geology and physical geography which bear most directly on the activities of man. Among his writings are the Kentucky Geological Reports and Memoirs (7 vols., 1876–82): *On the Nature of Intellectual Property and its Importance to the State* (1878); *Aspects of the Earth* (1889); *The Story of our Continent* (1892); *Nature and Man in North America* (1892); *The Interpretation of Nature* (1893); *Sea and Land* (1894); *The United States of America* (2 vols., 1894); and reports to the U. S. Geological Survey on *Marine Marshes*, *Freshwater Swamps*, *Soils*, *Harbors*, and the geology of Cape Ann, Martha's Vineyard, Nantucket, and Mt. Desert. G. K. G.

Shallot [from O. Fr. *eschalote*, an altered form of *escalone*, whence Eng. *scallion*]: an onion-like plant (*Allium ascalonicum*), native of the Old World, growing in cloves somewhat like the garlic. The cloves are set in the ground early, and become large enough for market two months before seedling onions are ripe. They much resemble onions in taste, and in the U. S. they are sold as such by market-gardeners. Both tops and bulbs are eaten.

Sha'manism [from Pers. and Hind. *shaman*, idolater]: the religion of a large number of primitive North Asiatic tribes, blended in Central Asia with Lamaism (*q. v.*). It has no idols, save perhaps some fetishes and charms and rude ancestral images. The Shaman is a combination of priest and wizard, who performs incantations and sacrifices, mainly for the two objects of procuring oracles and purifying houses of the defilement of the dead body. Although the

Supreme Being is good, yet so great are the power and desire of the king of the lower world to injure man that the principal worship conducted by the Shamans is intended to placate him. Hence the declaration that Shamanism is devil-worship. See Tylor's *Primitive Culture* (2 vols., 1871).

Sham'mai (shortened from Heb. *Shemáya*): one of the leaders of the Sanhedrin during the reign of Herod. He is always mentioned together with Hillel, from whom he is said to have differed greatly by his harshness of manner and his rigorous interpretation of the Law. The followers of these two teachers, who still existed in Jerome's days, preserved the traditions of their masters, though the freer interpretations of the Bēth Hillel prevailed over the more rigorous of the Bēth Shammai. Shammai is supposed to be identical with the Σαμέας (Josephus, *Ant.*, xiv., 9, 4) who alone dared to oppose Herod when he appeared before the Sanhedrin in 47 B. C., and who was spared by Herod on the taking of Jerusalem (*ib.*, xv., 1, 1). RICHARD GOTTHEIL.

Shamo, Desert of: See GOBI.

Shamokin: borough; Northumberland co., Pa.; on the Lehigh Valley, Northern Central, and Reading railroads; 19 miles S. E. of Sunbury, the county-seat (for location, see map of Pennsylvania, ref. 4–G). It is in the center of the anthracite coal region; contains iron-works, machine-shops, flour and planing mills, and other manufactories; 19 churches, 8 public-school buildings, public-school property valued at $200,000, a parochial school, gravity water-works, 2 electric-railway plants, 2 electric-light plants, a national bank (capital, $100,000), a State bank (capital, $50,000), and a guarantee trust and safe deposit company (capital, $250,000). It has 3 daily and 4 weekly newspapers, an assessed valuation (1895) of $1,004,020, and a local debt (1895) of $70,600. Pop. (1880) 8,184; (1890) 14,403; (1900) 18,202.

WM. F. HARPEL, SUPERINTENDENT OF SCHOOLS.

Shamrock: the national badge of Ireland, as the thistle is that of Scotland. It is a plant with trifoliate leaves, which was used by St. Patrick to illustrate the doctrine of the Trinity. The plant now generally called by the name is a hop clover (*Trifolium minus*). The wood-sorrel (*Oxalis acetosella*), the common white clover, and the black medick or nonesuch (*Medicago lupulina*) have each been identified with the original shamrock.

Shanghai, or **Shanghae**, shaang'hī': a hien or district city of the province of Kiangsu, China, and the most important emporium of foreign trade in the empire; on the west or left bank of the Hwang-pu, near its junction with the Wu-sung river, and 12 miles above its embouchure into the estuary of the Yangtse-kiang; lat. 31° 14′ 42″ N., lon. 121° 28′ 55″ E. (see map of China, ref. 6–L). In shape it is an irregular oval, surrounded by a wall 3½ miles in circuit and pierced with seven gates. Its principal native suburb lies between the east gate and the river, and opposite this is the anchorage for junks. Except in the foreign settlement, which lies outside the north gate and stretches N. and N. E. for 2 miles along the bank of the river, the streets, both within and without the walls, are narrow and dirty. The foreign settlement consists of three so-called "concessions," known as the French, the British, and the American concessions respectively. The first mentioned is a narrow strip bounded on the N. by a canal called the Yang-King-pang; thence for three-fifths of a mile to the Wu-sung river (or Soo-chow creek, as it is called by foreigners) stretches the British settlement (the first to be laid out). Beyond this lies Hon-Kew, called the "American" settlement by foreigners, because here the first U. S. consul took up his abode. In 1863 it was incorporated with the British for municipal purposes. The French settlement has its own municipal government. There is no restriction, however, as to the nationality of residents or land-renters in any of these concessions. So efficient has been the municipal management of both that Shanghai has earned the distinction of being the "Model Settlement" of the East. The streets are well made and well kept, and are lined with imposing buildings. Those parallel with the Yang-tse road, which runs along the river bank, and is known as *The Bund*, are named after Chinese provinces, while the cross streets are named after cities. Excellent roads constructed during the military occupation of Shanghai, when threatened by the Taipings, radiate from the settlement to the W. and S., and are much used for driving, while a complicated systems of creeks and canals, connecting with the Grand Canal, makes communication with the interior both easy and inexpensive.

The western half of the Settlement is occupied almost entirely by Chinese, for whose benefit a Mixed Court has been provided. In all civil, criminal, and political matters the subjects and citizens of the different treaty powers are, as elsewhere in China, subject to the jurisdiction of their own consuls, except in the cases of Great Britain and Germany, which have provided special courts.

Shanghai was first opened to foreign residence and trade in 1843, in accordance with the treaty concluded at Nanking in the preceding year, though its importance as a commercial center had long been recognized. In 1893, according to the reports of the imperial maritime customs, the gross value of the trade of the port amounted to 177,017,836 haikwan or custom-house taels (= $185,868,727 U. S. gold). In 1899 the imports were valued at 153,808,291 haikwan taels ($110,741,970), and the exports at 90,937,476 haikwan taels ($65,474,983); total trade 244,745,967 taels ($176,216,943). The chief foreign imports are opium, cotton and woolen goods, metals, coal, window-glass, indigo, machinery, matches, needles, sandal-wood, kerosene oil, paper, sugar, soap, planks, seaweed, silk, skins, stores, and ebony and other woods. The countries from which most of the commodities were received are:

Great Britain	26,896,967	taels.
Hongkong	20,524,125	"
India	16,729,415	"
Japan	6,296,517	"
United States	5,193,584	"
Continental Europe, excluding Russia	4,984,866	"

The articles of native produce exported to foreign countries include beans and bean-cake, chinaware, cloth, raw cotton, ground nuts, Chinese drills, hemp, medicines, oils, paper, rice, raw silk, rugs, straw-braid, sugar, tea, tobacco, wax, and wheat. The shipping statistics show that in 1893 2,822 steamers, aggregating 3,147,734 tons, and 343 sailing vessels (117 151 tons) entered port; and that 2,821 steamers (3,154,379 tons) and 331 sailing vessels (110,606 tons) cleared. The population of Shanghai is estimated at 400,000, of whom about 2,000 are foreigners. R. L.

Shan-hai-kwan [literally, mountain-sea-barrier]: a strongly fortified town of China, pleasantly situated on the shore of the Gulf of Peh-chih-li, at the eastern end of the Great Wall. It consists of three towns separated by strong walls and surrounded by one outer wall. The large inner city is the business center; the inclosure on the E. is occupied by official and soldiers, and that on the W. by tradespeople and soldiers. The place is said to be impregnable. It is a station on the Tientsin-Mukden Railway, complete for a few miles beyond Shan-hai-kwan.

Shannon: the largest river of Ireland. It rises in the county of Cavan at 256 feet above sea-level, flows first S. to Limerick, then W., and enters the Atlantic through an estuary 10 miles wide at its mouth. In its course, which is 254 miles in length, it forms several lakes, viz.: Loughs Allen, Boderg, Bofin, Forbes, Ree, and Derg. Vessels of 1,000 tons burden can ascend to Limerick, and small steamers to Athlone. The river is canalized between Limerick and Killaloe, and some distance below Athlone. The Inny, Brosna, Mulkear, Maigue, and Deel fall into the Shannon on the left, and the Suck and the Fergus on the right.

Shanny: a marine spiny-rayed fish of the genus *Pholis*, or a related genus, of the family *Pholididæ*. The common shanny (*Pholis pholis*), found in shoals on the coasts of England and France, is usually about 5 inches long, and is remarkable for the habit of creeping, by means of its ventral fins, out of the water into the crevices of the rocks, and there remaining until the return of the tide. It has been known to live thirty hours out of salt water, but soon dies in fresh water. The American radiated shanny (*Eumesogrammus subbifurcatus*) is found, though rarely, on the coasts of Massachusetts and New York.

Shans: Burmese name for the most numerous of the races of Indo-China, extending from Assam to Kwangtung, and from Yunnan to the Gulf of Siam, though not occupying all this territory. They form the chief race of the Siamese, and are represented among the Miautze communities farther N. in Chinese territory. They probably migrated from the mountains of Sze-chuen, and appeared on the upper waters of the Irawadi about 2,000 years ago. Their languages are very similar, and they are remarkably homogeneous in appearance, manners, and customs, though much divided geographically and politically.

Shansi, shaan'see': an inland province of China; bounded N. by the outermost part of the Great Wall, E. by Chih-li, S. by Honan and the Hwang-ho or Yellow river, and W. by the Yellow river. Area, 56,268 sq. miles. The surface is mountainous, and may be divided into seven great basins. It has no large rivers except the Hwang-ho. The mineral resources of the province are great; coal is found everywhere; iron of superior quality abounds and is worked; copper has been found in over 100 localities; tin is found at Mt. Ki and in several other places; silver, near Tai-yuen and elsewhere; sulphur is plentiful, and hot springs are numerous. Quantities of salt are produced from the salt-marshes in the southern part of the province. The cities and villages are numerous and the people everywhere civil. The men of Shansi are the bankers and pawnbrokers of the country. Besides the usual cereals, cotton is grown in the south. Pop. about 13,000,000. Capital, Tai-yuen-foo.

Shan States: semi-independent states occupied by peoples of Shan race, in the northern part of the Indo-Chinese Peninsula, S. of China, between Burma and Tonquin, and N. of Siam. From the seventh or eighth century they have warred with each other and with neighboring states with varying fortune. In the thirteenth century they formed a federation of nine states under the name of Muan Man, and reached their highest development. Later the northern states were permanently subjected by China, and the southern by Siam. The most of the remainder were under nominal Burmese protection at the time of its conquest, and passed with Burma under British. Those adjoining Tonquin are under nominal French protection, and a disputed central area, by agreement between France and Great Britain, is to be guaranteed independence as a "buffer" state between China, Siam, Burma, and Tonquin. See Hallett, *A Thousand Miles in the Shan States* (1890). M. W. H.

Shantung, shaan'toong' [literally, east of the mountain —that is, of Mt. *Tai*]: a maritime province of China, which, in the form of a mountainous promontory, juts out eastward into the Yellow Sea. It is bounded on the N. by the province of Chih-li and the Gulf of Peh-chih-li, E. by the Yellow Sea, S. by Kiangsu, and W. by Honan and Chih-li. Area, 65,104 sq. miles. Pop. about 36,000,000. The surface is diversified, but consists in the main of a very fertile plain along the western, southwestern, and northern borders of the great central mass of mountains, which, with its numerous spurs and secondary ridges and their ramifications, occupies the rest of the province eastward. The general trend of the mountains is from N. E. to S. W., but several important ridges run E. and W. The highest peak is Tai-shan, which is over 4,100 feet. Next in point of grandeur and height come the Lao-Shan, occupying a small peninsula on the south coast, lat. 36° 5′ to 36° 30′ N. and lon. 120° 10′ to 120° 45′ E., with peaks ranging from 2,500 to 3,500 feet; the Saw-teeth Mountains S. of Chefoo, 2,900 feet; and the Ai-shan Mountains S. W. of Chefoo, 2,065 feet. S. of Wei-hai-wei the highest elevation is 1,600 feet, while still farther to the E., near the city of Yung-ching, the highest is 1,860 feet. Mt. Tai, which, according to Chinese reckoning, is 15 miles high, is one of the five sacred mountains of China, and is much resorted to by pilgrims, for whose benefit paths have been made and steps cut in the rock clear up to the summit. The plain on the W. is traversed by the Grand Canal (to which many small but historic streams contribute their waters), and on the N. by the Yellow river, formerly called the Ta-tsin. There are no other rivers of importance, and yet Shantung is well watered.

The coast is deeply indented with good harbors. The best on the north coast are CHEFOO and WEI-HAI-WEI (*qq. v.*). On the southern side of the promontory there are Shih-tao, in lat. 36° 53′ N. and lon. 122° 23′ E., and Kin-Kia-Kow, near the important city of Kiao-Chow, in lat. 36° 16′ N. and lon. 120° 10′ E. The waters which surround Shantung are rich in fishes of all kinds and fishing is extensively carried on along the coast. The province is very fertile and produces wheat, barley, maize, millet, pulse, tobacco, hemp, and indigo; and medicines of many kinds are extensively produced. Very little rice is grown. Coal and iron abound, and are worked in several places, but extensively at Po-shan-hien, which is the "Black Country" of Shantung. Galena and copper have been found, and gold is obtained in considerable quantities from the sands of the rivers. Precious stones are found principally in the Lao-shan range; sulphur is obtained in several places, and there are many hot sulphur-springs which are resorted to for fever and skin diseases. The best known are those of Ai-shan, 40 miles S. W. of Chefoo; Wŭn-shih-t'ang, 25 miles S. of Tŭng-chow-foo: and Lung-chuen-t'ang, a few miles S. of Wei-hai-wei. Other natural products are asbestos, saltpeter, and insect wax. Cotton cloth of various kinds is woven; silk is produced, the best being in the plain lying W. of the mountain area, and silk-weaving is extensively carried on. The finest brocaded silk is made near Tsinan-foo, the capital, and the province is famous for its pongees. Straw-plaiting is also important.

On account of the destruction of a Catholic mission and the murder of two German missionaries in Shantung, a German squadron seized Kiao-Chow in Dec., 1897, and the next month Germany secured from the Chinese emperor a lease of that city and the surrounding district for 99 years. R. L.

Shark [of uncertain origin; usually regarded as derived through O. Fr. from Lat. *carcharus*, a shark, from Gr. καρχαρίας, deriv. of κάρχαρος, having jagged teeth; but the word does not occur in O. Fr. or M. Eng.]: any fish-like vertebrate of a group (*Squali*) of plagiostomous selachians distinguished from the *Raiæ* (rays and skates) by the gill-openings being at the sides of the body. The body also is elongated and more or less cylindrical, and passes gradually into the tail. The jaws are homologous with the lower jaw and with the palatal arch of higher vertebrates. The teeth are generally movably articulated with the jaws, and occur in several rows which are successively shed and renewed from behind forward. The outermost row generally is the only one functional, the rest being bent backward and downward. There are usually five gill-openings, though sometimes, as in the *Hexanchidæ*, six or seven. The integument never has scales, but is often developed into calcified papillæ, which, when small and closely set, constitute shagreen. The eggs of the oviparous species have a leathery investment as in rays, and in some of the viviparous species, as in certain species of *Galeus* and *Carcharinus*, the embryo is attached to the uterus by a placenta.

Sharks are found in all seas, but are most abundant in those of warm regions, while some enter fresh water, and one species is confined to Lake Nicaragua. They are mostly carnivorous and predatory, but some, as the basking shark and the whale-shark, have very small or weak teeth, and feed on small marine animals or are even herbivorous. Of the species that attack man the most formidable is the great white shark or man-eater, an isurid (*Carcharodon carcharias*), sometimes about 40 feet long. The fossil teeth of the larger extinct *Carcharodon megalodon* are found in great numbers in Tertiary beds of the South Atlantic coast of the U. S., where they are quarried and exported for conversion into artificial manure. Other formidable species are galeids or typical sharks, belonging to *Carcharinus*, the largest genus and one abundantly represented in all warm seas, and *Galeocerdo*. The great blue shark (*Carcharinus glaucus*) reaches the coast of both Europe and the U. S., and the tiger-shark (*Galeocerdo maculatus*), common in the Indo-Pacific, also reaches the Atlantic coast of the U. S. The sharp-nosed shark (*Scoliodon terræ-novæ*) is another galeid, common on the southern Atlantic coast of the U. S. The voracious gray shark or sand-shark (*Carcharias littoralis*), common on the Northern Atlantic coast of the U. S., is a wide-ranging species, about 6 feet long. The Greenland shark, nurse-shark, or sleeper is a scymnid (*Somniosus microcephalus*), about 15 feet long, noted among whalers for its voracity. The basking shark (*Cetorhinus maximus*), about 40 feet long, inhabits the open sea, and is named from its habit of floating on the surface in calm weather. Its liver yields from a ton to a ton and a half of oil. The whale-shark (*Rhinodon typicus*) exceeds a length of 50 feet. The HETERODONTIDÆ (*q. v.*), which are noted as being an archaic type, have broad flattened molar teeth arranged in oblique series, all functional at once and adapted for crushing molluscs and crustaceans. The tiger-shark, a ginglymostomid (*Stegostoma tigrinum*) of the Indian Ocean, attains a length of 15 feet, of which the blade-like tail makes one-half. The spinous shark (*Echinorhinus spinosus*) has its body studded with bony tubercles, each of which bears a thorn-like elevation. The existing cow-sharks, or *Hexanchidæ*, are represented by teeth in the Jurassic. *Chlamydoselachus anguineus* of Japan has an eel-like body 6 feet long. Each of its teeth consists of a slender median cusp separated from the two lateral ones by a small projection. The *Pristiophoridæ*, represented in Australian and Japanese seas, have the snout produced into a saw as in the sawfishes. The smaller littoral forms are known as dogfishes

and hounds. One of the commonest of these in the North Atlantic is *Squalus acanthias*, with a stout spine in each dorsal. Its liver is valued for its oil. The small-spotted dogfish (*Scylliorhinus canicula*) and the large-spotted (*S. catulus*) are found on the British coast.

The so-called false sharks are species of another group, HOLOCEPHALI (*q. v.*). Dr. Gill, in a revision of his *Arrangement of the Families of Fishes*, allocates the families to four orders: *Opistharthri*, including *Chlamydoselachidæ* and *Hexanchidæ* (*Notidanidæ*); *Prosarthri*, the *Heterodontidæ* (*Cestraciontidæ*); *Tectospondyli*, the *Echinorhinidæ*, *Oxynotidæ*, *Squalidæ*, and *Dalatiidæ* (*Scymnidæ*); and *Asterospondyli*, the remaining families.

See Müller and Henle, *Systematische Beschreibung der Plagiostomen* (Berlin, 1841); Hasse, *Natür System der Elasmobranchier* (Jena, 1879, and suppl., 1885); and Balfour, *A Monograph on the Development of Elasmobranch Fishes* (London, 1878). Also ANGEL-FISH, DOGFISHES, FOX SHARK, TOPE, and HAMMERHEAD. Revised by F. A. LUCAS.

Sharon: borough; Mercer co., Pa.; on the Shenango river, and the Erie, the Lake Shore and Mich. S., and the Penn. railways; 14 miles W. of Mercer, 41 miles S. S. W. of Meadville (for location, see map of Pennsylvania, ref. 3–A). It contains 2 national banks with combined capital of $250,000, a private bank, 4 public schools, public-school library (founded in 1877), Hall Institute (Baptist, chartered in 1888), and a daily and 4 weekly newspapers. It is principally engaged in mining coal and manufacturing iron and steel, having large rolling-mills, blast-furnaces, foundries and machine-shops, and nail-factories. Pop. (1880) 5,684; (1890) 7,459; (1900) 8,916. EDITOR OF "TELEGRAPH."

Sharon Springs: village; Schoharie co., N. Y.; on the Del. and Hudson Railroad; 20 miles E. N. E. of Cooperstown, 59 miles W. by N. of Albany (for location, see map of New York, ref. 5–I). It is a popular summer resort in a narrow valley, 1,100 feet above sea-level, surrounded by high hills, and has four noted mineral springs—chalybeate, magnesia, white sulphur, and blue sulphur—which, with a spring of pure water, flow into a small stream below a wooded bluff W. of the village, after a descent of 65 feet over a ledge of perpendicular rocks. Pop., permanent (1880), 627; (1890) 622; (1900) 567.

Sharp, GRANVILLE: abolitionist; b. at Durham, England, Nov. 10, 1734; studied law, and for several years was a clerk in the ordnance office; was the chief patron of the slave Somerset in suing for his freedom, which resulted in the famous decision against the legality of slavery in England (1772); resigned his post in the ordnance office on account of opposition to the American war Apr., 1777; devoted himself thenceforth to philanthropic objects, especially the overthrow of slavery and the slave-trade; was the first chairman of the Association for the Abolition of Negro Slavery in 1787; was the principal promoter of the colony of Sierra Leone; opposed the impressment of seamen; advocated parliamentary reform, and favored the claims of Ireland. D. in London, July 6, 1813. He was the author of sixty-one publications, chiefly pamphlets, in advocacy of the causes to which he devoted his life, philologieal tracts in favor of Trinitarianism, and millenarian interpretations of biblical prophecies. See his *Memoirs*, by Prince Hoare (1820) and by Charles Stuart (1836).

Sharp, JAMES, D. D.: archbishop; b. in the castle of Banff, Scotland, May 4, 1618; educated at the University of Aberdeen, where he figured among the students who declared against the Solemn League and Covenant 1638; became Professor of Philosophy at St. Leonard's College, St. Andrews 1643; minister of Crail, in Fifeshire, 1648; was the representative of the Presbyterians sent to Cromwell 1656, to Monk and to Charles II. 1660; was appointed king's chaplain for Scotland and Professor of Divinity in St. Mary's College, St. Andrews; consecrated Archbishop of St. Andrews and Primate of Scotland upon an Episcopalian foundation Dec., 1661; was regarded as a tool of Charles in the persecution of the Covenanters, and consequently assassinated by "a band of nine enthusiasts" on Magus Muir, St. Andrews, May 3, 1679. Revised by S. M. JACKSON.

Sharp, JOHN, D. D.: archbishop; b. at Bradford, Yorkshire, England, Feb. 16, 1644; educated at Christ's College, Cambridge, on leaving which he became chaplain to Sir Heneage Finch, then attorney-general, through whom he obtained the archdeaconry of Berkshire 1672; a prebend at Norwich 1675; the rectorship of St. Bartholomew, London, 1676; of St. Giles-in-the-Fields 1677; and the deanery of Norwich 1681. He became chaplain to Charles II. and James II., was deprived of his preferments by James for preaching against his policy 1686. He became Dean of Canterbury 1689, and Archbishop of York 1691. D. Feb. 2, 1714. Seven volumes of his *Sermons* were published in 1709.

Sharp, WILLIAM: See the Appendix.

Sharpe, SAMUEL: Egyptologist; b. in London, Mar. 8, 1799. Though a London banker, he was best known on account of his accomplishments in the study of the Oriental languages, Hebrew, Coptic, and the Egyptian hieroglyphics. He was also a careful writer on historical subjects connected with his linguistic studies. Of his numerous works, the following are the most notable: *The Holy Bible Translated, being a Revision of the Authorized English Version* (1880); *The New Testament, Translated from Griesbach's Text* (1840; 5th ed. 1862); *History of the Hebrew Nation and its Literature* (1869; 4th ed. 1882); *Texts from the Holy Bible Explained by the Help of the Ancient Monuments* (1866; 2d ed. 1869); *Hebrew Scriptures Translated* (3 vols., 1865); *The Chronology of the Bible* (1868); *Short Hebrew Grammar* (1877); *Inquiry into the Age of the Moabite Stone* (1879); *The Epistle of Barnabas* (1880); *History of Egypt from the Earliest Times till the Conquest by the Arabs in A. D. 640* (1846; 6th ed. 2 vols., 1876, combining three publications in their second revision, viz.: *Early History of Egypt*, 1838; *Egypt under the Ptolemies*, 1838; and *Egypt under the Romans*, 1842); *Alexandrian Chronology* (1857); *Egyptian Mythology and Egyptian Christianity* (1863); *Egyptian Inscriptions from the British Museum* (several series, 1837–56); *Vocabulary of Egyptian Hieroglyphics* (1837); *The Triple Mummy-case of Aroeri-ao* (1858); *Egyptian Hieroglyphics: being an attempt to Explain their Nature, Origin and Meaning* (1861); *Egyptian Antiquities in the British Museum Described* (1862); *The Decree of Canopus* (1869); *The Rosetta Stone* (1871); and *Hebrew Inscriptions from the Valleys between Egypt and Mt. Sinai* (2 parts, 1875–76). D. in London, July 28, 1881. C. R. GILLETT.

Sharpless, ISAAC: See the Appendix.

Sharpsburg: borough; Allegheny co., Pa.; on the Allegheny river, and the Penn. and the Pitts. and West. railways; 5 miles N. E. of Pittsburg (see map of Pennsylvania, ref. 5–B). It is in a coal-mining region, and contains rolling-mills, blast furnaces, foundries, a State bank, and two weekly newspapers. Pop. (1890) 4,898; (1900) 6,842.

Sharpsburg: a village in Washington co., Maryland; lying between the Antietam and Potomac rivers (see map of Maryland, ref. 2–D). It was the scene of the battle of Antietam, Sept. 17, 1862. Pop. (1890) 1,163; (1900) 1,030.

Sharpsville: borough (organized in 1874); Mercer co., Pa.; on the Shenango river, and the Erie, the Penn., and the Sharpsville railways; 3 miles N. E. of Sharon (see map of Pennsylvania, ref. 3–A). It is in a coal-mining region, is engaged in the manufacture of pig iron, and has 7 churches, 2 public-school buildings, a private bank, and a weekly newspaper. Pop. (1880) 1,824; (1890) 2,330; (1900) 2,970. EDITOR OF "ADVERTISER."

Shah-shih, or **Sha-szĕ**: a river-port in the province of Hupeh, China; opened to foreign trade Sept. 26, 1896. It is situated on the left bank of the Yang-tse, nearly midway between the entrance to the Tung-ting Lake and the treaty-port of ICHANG (*q. v.*).

Shasta, Mount: See ROCKY MOUNTAINS.

Shas'tra [from Sanskr. *çāstra-*, order, command, saered book, deriv. of *çās-*, order, instruct, govern]: an authoritative book of the Hindus upon religion and civil and religious law. The principal works of this class are collectively called *Dharma-s'âstra*, or "Law Shastra."

Shattuck, AARON DRAPER: See the Appendix.

Shaw, ALBERT, Ph. D.: journalist and author; b. at New London, O., July 23, 1857; graduated in 1879 at Iowa College, Grinnell, Ia.; became a journalist in Iowa; also studied at Johns Hopkins University; in 1883 became connected with the Minneapolis *Daily Tribune* as an editorial writer, but completed his work at Johns Hopkins, and received from that institution in 1884 the degree of Ph. D.; returned to Minneapolis and became chief of the editorial staff of the *Tribune*, which position he held until 1891, with the exception of a year and a half (1888–89) in Europe, which was devoted largely to the study of municipal government. He declined professorships in several colleges, and in 1890 became the founder and editor of the American edition of

The Review of Reviews, the first number of which appeared in 1891. He has lectured at Johns Hopkins University and Wisconsin State University. Among his works are *Co-operation in a Western City* (Baltimore, 1886) and *Icaria: a Study of Communistic History* (New York, 1884). He edited *National Revenues* (Chicago, 1888), and has contributed to the *Chautauquan Magazine* and other periodicals, but is perhaps most widely known by his articles in *The Century Magazine* on the government of European cities. An outcome of these is *Municipal Government in Great Britain* (New York, 1895). C. H. THURBER.

Shaw, ANNIE CORNELIA: See the Appendix.

Shaw, CHARLES LEWIS: See the Appendix.

Shaw, EDWARD RICHARD: See the Appendix.

Shaw, GEORGE: naturalist; b. in Bierton, Buckinghamshire, England, Dec. 10, 1751; graduated at Oxford 1769; took orders in the Church of England 1774; studied medicine at Edinburgh and Oxford, taking the degree of M. D. 1787, after which he settled in London as a scientific lecturer; became librarian and assistant keeper of natural history at the British Museum 1791, and principal keeper 1807. D. in London, July 22, 1813. He was the author of *The Naturalist's Library* (24 vols., 1790–1813); *Zoölogy of New Holland* (1794); *General Zoölogy, or Systematic Natural History* (11 vols., 1800–19); *Zoölogical Lectures at the Royal Institution* (2 vols., 1809).

Shaw, GEORGE BERNARD: See the Appendix.

Shaw, HENRY WHEELER: humorist; b. in Lanesborough, Mass., Apr. 21, 1818; entered Hamilton College about 1832, but did not remain long; resided for twenty-five years in various parts of the Western States, where he was successively farmer and auctioneer; settled at Poughkeepsie, N. Y., in the latter capacity about 1858; began to write humorous sketches signed *Josh Billings* 1863; became popular as a writer and as a lecturer; published several volumes of humorous sketches, and edited an annual *Allminax*. His *Complete Works* were published in 1877. D. in Monterey, Cal., Oct. 14, 1885.

Shaw, LEMUEL, LL. D.: jurist; b. at Barnstable, Mass., Jan. 9, 1781; graduated at Harvard 1800; became assistant editor of the Boston *Gazette*; studied law, and was admitted to the bar in New Hampshire Sept., 1804: sat in the Legislature 1811–16 and in 1819, and in the State Constitutional Convention 1820; was State Senator 1821–22 and 1828–29; and chief justice of the Massachusetts Supreme Court from Aug. 31, 1830 (previous to which he had held no judicial office), to Aug., 1860. His reported decisions form a large part of more than fifty volumes, and his judicial reputation in Massachusetts was second only to that of Theophilus Parsons. The city charter of Boston was drafted by him in 1822. He was a member of the American Academy, of the Massachusetts Historical Society, and for twenty-seven years one of the corporation of Harvard College. He published a few orations, addresses, and judicial charges, the most important being his charge to the jury in the celebrated trial before him of Prof. John White Webster, who was convicted of the murder of Dr. George Parkman (1850). D. in Boston, Mar. 30, 1861. Revised by F. STURGES ALLEN.

Shaw, THOMAS: professor of agriculture; b. at Niagara-on-the-Lake, Ontario, Canada, Jan. 3, 1843; educated in public schools; made farming his profession; also taught school for more than ten years; edited *The Canadian Live Stock and Farm Journal* 1883–88; Professor of Agriculture at Ontario Agricultural College 1888–93; became Professor of Animal Husbandry at Minnesota agricultural experiment station Oct., 1893. He has published *The First Principles of Agriculture* (1890) and *Weeds and how to Eradicate them* (1893).

Shawa'no: city; capital of Shawano co., Wis.; on the Wolf river, at the head of navigation, and the Chi. and N. W. Railway; 38 miles W. N. W. of Green Bay City, 58 miles N. of Oshkosh (for location, see map of Wisconsin, ref. 4–E). It is in an agricultural and lumbering region, and has a State bank, capital $30,000, and three weekly newspapers. Pop. (1880) 890; (1890) 1,505; (1900) 1,863.

Shawano Indians: See ALGONQUIAN INDIANS.

Shawl [: Fr. *châle*; Germ. *schahl*: Arab. and Hind. *shāl*, from Pers. *shāl*, shawl, mantle]: a kind of loose garment worn on the shoulders or around the waist, manufactured by the different nations of different materials, as the Kashmir shawl of goat's hair, the Chinese of silk, the barège of wool, etc., and in different patterns, as the palm pattern of India, the plaid pattern of Scotland, etc. The most celebrated kind is the Kashmir shawl, famous over the whole world as early as the sixteenth century. Its manufacture was then under the supervision of the Government, and each shawl which issued from the looms received a separate description in the royal registers. The manufacture is still flourishing in Kashmir, though it is imitated extensively in France, Germany, and Great Britain. In Europe shawls are mostly made of wool, of cotton, or of mixed cotton and silk.

Shaw-Lefevre, -*le*-fev'r, GEORGE JOHN, M. P.: statesman; b. in 1832; son of Sir John George Shaw-Lefevre, of Mapperly Hall, Nottingham, England; educated at Eton and Cambridge; called to the bar 1856; entered Parliament as a Liberal and retained his seat to 1885; returned as a Gladstonian Liberal in 1886; civil lord of the admiralty May–July, 1866; secretary to the Board of Trade 1868–71; secretary to the admiralty 1871–Feb., 1874, and again Apr.–Nov., 1880; first commissioner of works 1880; succeeded Mr. Fawcett as Postmaster-General Nov., 1884: first commissioner of works again in 1892. He is the author of several statistical works, mainly on the English and Irish land questions.

Shawnee': village; Perry co., O.; on the Balt. and Ohio and the Col., Sandusky and Hocking railways; 43 miles S. by E. of Newark (for location, see map of Ohio, ref. 6–G). It is in an agricultural and coal-mining region, has several iron-foundries, sawmills and planing-mills, a private bank and two weekly papers. Pop. (1890) 3,266; (1900) 2,966.

Shawnee or **Shawano Indians**: See ALGONQUIAN INDIANS.

Shaw'neetown: city; capital of Gallatin co., Ill.; on the Ohio river, and the Balt. and O. S. W. and the Louisv. and Nashv. railways; 182 miles S. E. of Springfield (for location, see map of Illinois, ref. 11–F). It is in a coal-mining and lead region, is a shipping-point for coal and farm products, has pork-packing and manufacturing interests, and contains a national bank with capital of $50,000, a private bank, and two weekly newspapers. Pop. (1880) 1,851; (1900) 1,698. EDITOR OF "NEWS."

Shays, DANIEL: insurgent; b. at Hopkinton, Mass., in 1747; attained the rank of captain during the war of independence, after which he resided at Pelham (now Prescott); took part in an insurrectionary movement in Western Massachusetts directed against the State government 1786, and, though not at first a leader, became ultimately so prominent that the movement is generally known as "Shays's rebellion," the pretexts of which were the high salary paid the Governor, the aristocratic character of the Senate, the extortions of lawyers, and the pressure of taxation—grievances which were to be met by the removal of the general court from Boston and the issue of paper-money. In Dec., 1786, he led a considerable force of insurgents to Springfield to capture the arsenal (Jan., 1787), but was repulsed by the militia under Gen. William Shepard (Feb. 4, 1787). His forces were surprised and completely dispersed by Gen. Lincoln, and Shays fled to New Hampshire; was pardoned in June, 1788, by the Massachusetts Legislature, and removed to Sparta, Livingston co., N. Y., where he received a pension for his Revolutionary services, and survived until Sept. 29, 1825. See Minot's *History of the Insurrection* (Boston, 1810) and Holland's *History of Western Massachusetts* (Springfield, 1855).

Shea, JOHN DAWSON GILMARY, LL. D.: historian; b. in New York, July 22, 1824; educated at the grammar school of Columbia College; studied law, and was admitted to the bar, but devoted himself to literature, and rendered great service in illustrating the obscure early annals of French colonization and Jesuit missions. He published *The Discovery and Exploration of the Mississippi Valley* (New York, 1853); *History of the Catholic Missions among the Indian Tribes of the United States* (1854); *The Catholic Authors of America* (1858); *Early Voyages up and down the Mississippi* (Albany, 1862); *Novum Belgium, an Account of New Netherlands in 1643–44* (New York, 1862); *The Operations of the French Fleet under Count de Grasse* (1864); translated, with extensive notes, Charlevoix's *History and General Description of New France* (6 vols. 8vo, 1866–72); edited from the MSS. the Cramoisy series of *Memoirs and Relations concerning the French Colonies in North America*, embracing documents on the early history of Canada and Louisiana (24 vols., 1857–68); Alsop's *Maryland* (1869); published *Library of American Linguistics*,

fifteen volumes of grammars and dictionaries of Indian languages (1860–74); edited *The Historical Magazine* (1859–65); and published *The Catholic Church in Colonial Days* (1883); *The Hierarchy of the Catholic Church in the United States* (1886); *Life and Times of Archbishop Carroll* (1888); and three of five projected volumes on *The History of the Catholic Church in the United States*. D. at Elizabeth, N. J., Feb. 22, 1892.

Sheaffe, Sir Roger Hale: soldier; b. in Boston, Mass., July 15, 1763; obtained a commission in the British army, 1778, through Earl Percy, whose headquarters had been at his mother's house in Boston three years before; served in Holland 1799, and in the expedition to the Baltic 1801; served in Canada 1802–11, and again 1812–13; had risen to the rank of major-general in 1811; took command of the British forces at the battle of Queenstown, after the death of Gen. Brock, and succeeded in inflicting a serious defeat upon the American invaders, for which service he was made a baronet Jan. 16, 1813; defended York (now Toronto) against the attack of Apr., 1813; became full general in 1828, and colonel of the Thirty-sixth Regiment in 1829. D. in Edinburgh, July 17, 1851.

Shearman, Thomas Gaskell: lawyer and writer on economic subjects; b. in Birmingham, England, Nov. 25, 1834. His parents removed to New York when he was nine years of age; he was educated privately; was admitted to the bar in 1859; practiced law for many years in New York and Brooklyn; was counsel for Henry Ward Beecher in his trials; Republican in politics from 1856–80; after 1880 devoted most of his time, outside of business, to propagation of free-trade ideas, declining office. D. Sept. 29, 1900. He was joint author of *Law of Practice and Pleadings* (1861–65); *Law of Negligence* (four editions, 1870–88); and author of *Talks on Free Trade* (1881); *Does Protection Protect?* (1883); *Pauper Labor of Europe* (1885); *Distribution of Wealth* (1887); *The Single Tax* (1887); *Henry George's Mistake* (1889); *Who Own the United States?* (1889); *Crooked Taxation* (1890); *Natural Taxation* (1891).

Shearwater: any one of several birds of the genus *Puffinus*, and the family *Procellariidæ*. The greater shearwater (*Puffinus major*) is from 18 to 20 inches in length, and the Manx shearwater (*P. anglorum*) about 15. They are often seen hundreds of miles from land. The majority are brown or cinerous above and white below; but the sooty shearwater (*P. fuliginosus*) is an almost uniform sooty brown; the tail is rather long and rounded; the feet large; the tarsus shorter than the middle digit; the nasal tubes are short, flat, and obliquely truncated, instead of being pronounced, as in the true petrels. See Procellariidæ.

Revised by F. A. Lucas.

Sheathbill: any bird of the family *Chionididæ*. Only two species are known, and both are inhabitants of the southern hemisphere—one, *Chionis alba*, being native to the Falkland islands, etc., and the other, *Chionis* or *Chionarchus minor*, peculiar to Kerguelen's island. Much difference of opinion has prevailed among naturalists respecting the relations of these birds to others in the class, some having regarded them as waders (*Grallæ*), others as swimmers (*Longipennes*), and others still as gallinaceous forms. They are now generally placed with the waders, near the peculiar plover-like *Glareola*, but they also have undoubted affinities with the gulls. In their economy and habits they strongly resemble pigeons and fowl; according to Kidder, who studied the species of Kerguelen's island in life, the "observer is first struck by the strong resemblance which *Chionis* bears to the pigeons in general appearance, gait, and mode of flight. The general shape of the body is of an ordinary columbine character, the head being notably small, as usual in that group, the neck short and full, and the body plump; the tail, moreover, having but twelve rectrices." "The feet, in almost every particular, are thoroughly gallinaceous, even to the character of the marginal fringe of the toes." In color, however, they recall rather the characteristics of the gulls than of either gallinaceous or columbine forms. "On the other hand, the bird's omnivorous diet, habits under confinement, easy domestication, dislike of water, entire inability to swim, and many other points in its habits are strongly gallinaceous characteristics, by so much removing it from the vicinity of either grallatorial or natatorial birds." Nevertheless, the indications furnished by the skeleton outweigh all such superficial correspondences, and conclusively prove that the birds in question are derivatives from gull-like (and therefore primarily natatorial) types, but modified for terrestrial life. They are omnivorous in diet, feeding upon vegetable substances (seaweeds, etc.), molluscs, and eggs. *Chionis alba* has a total length of 17 inches or more, and *C. minor* about 14 or 15 inches. They are called white paddy by whalers.

Revised by F. A. Lucas.

Sheathing: a covering for a ship's bottom, made of sheet copper, and first introduced about 1800. It not only serves to protect wooden ships from boring-shrimps, teredos, and other small destructive animals, but to a great extent it prevents the fouling of the bottom by seaweeds and barnacles.

Sheba, or **Saba** [from Heb. *Sh'bhā'*, or *Shebhā'*; cf. *shebhā'*, seven]: the name of three persons in the Old Testament: (1) A great-grandson of Ham (Gen. x. 7), who appears to have settled somewhere on or near the shores of the Persian Gulf. (2) The tenth of the thirteen sons of Joktan (Gen. x. 28), who settled in Southern Arabia, and gave his name to the kingdom of the Sabæans, whose queen visited Solomon in Jerusalem (1 Kings x. 1–13). (3) A grandson of Abraham and Keturah (Gen. xxv. 1–3), whose descendants were nomads, in close connection with the descendants of the Hamitic Sheba mentioned above. The same name in a slightly different form occurs in the Old Testament as that (4) of the Benjamite who revolted against David, was defeated by Joab, and beheaded by the people of Abel-Beth-maachah, where he had taken refuge; (5) of a Gadite (1 Chron. v. 13); and (6) of a town in Simeon.

Revised by S. M. Jackson.

Sheboy'gan: city (settled in 1836, chartered as a village in 1846, incorporated as a city in 1853); capital of Sheboygan co., Wis.; on Lake Michigan, at the mouth of the Sheboygan river, and on the Chi. and N. W. Railway; 52 miles N. of Milwaukee, and 137 miles N. of Chicago (for location, see map of Wisconsin, ref. 6–F). It has an excellent harbor and a large lake commerce, particularly in lumber, coal, and tan bark. A line of steamers connects the city with Milwaukee, Chicago, and other points on the lake, and the railway and its branches make the city the trade-center of a large and rich agricultural region. There are two public parks, one of which, Fountain, contains an artesian well whose waters are strongly impregnated with mineral salts and form an important article of commerce. The city is lighted by gas and electricity, derives its supply of water from the lake, is well sewered, and has an efficient street-railway service. Among the public institutions are 18 churches, high, grammar, intermediate, and primary schools, kindergartens, Roman Catholic and Lutheran parochial schools, Day School for the Deaf, hospital, insane asylum, and Home for the Friendless. In connection with the public schools is a library of 3,000 volumes. There are 2 State banks with combined capital of $300,000, and 3 daily and 7 weekly newspapers. The assessed valuations in 1892 aggregated $5,415,980. Sheboygan is particularly noted for its manufacture of chairs and other furniture. There are 5 chair-factories, which employ about 2,000 persons and turn out 7,000 chairs per day. About 40,000 feet of lumber are used daily in the manufacture of furniture. The various manufacturing industries employ about 5,500 persons, who receive in wages about $225,000 per month. Other important establishments are 2 manufactories of enameled ware, 2 boot and shoe factories, 3 foundries and machine-shops, 2 tanneries, 2 carriage-factories, 2 breweries, and manufactories of toys, office and hotel furniture and fixtures, veneer, folding-beds, venetian-blinds, wire-mattresses, and excelsior bottle-wrappers. There are also dry docks, brick-yards, lime-kilns, a ship-yard, and 5 large cheese-warehouses. Pop. (1880) 7,314; (1890) 16,359; (1900) 22,962. J. E. Riordan.

Shechem: See Nablus.

Shechi'nah [from Late Heb. *shekhīnāh*, dwelling, presence, deriv. of *shākhan*, dwell]: a name which first appears in the Jerusalem Targum to designate the Divine Presence wherever it exists in a special manner, but more particularly as manifested in the holy of holies within the ancient sanctuary of Israel.

Shedd, William Greenough Thayer, D. D., LL. D.: theologian; son of a clergyman; b. at Acton, Mass., June 21, 1820; graduated at University of Vermont in 1839, and at Andover Theological Seminary in 1843; was pastor of the Congregational church in Brandon, Vt., 1844–45; Professor of English Literature in the University of Vermont 1845–52; Professor of Sacred Rhetoric and Pastoral Theology in Auburn Theological Seminary 1852–53; Professor of Ecclesiastical History and lecturer on pastoral theology in Ando-

ver Theological Seminary 1853–62; pastor of the Brick church (Presbyterian), New York, 1862–63, and Professor of Biblical Literature in Union Theological Seminary, New York, 1863–74, when he was transferred to the chair of Systematic Theology in the same institution, which office he held until 1890. D. in New York, Nov. 17, 1894. Besides editing the *Works* of Coleridge (7 vols., 1853) and the *Confessions* of Augustine (1860), he published *Outlines of a System of Rhetoric*, from the German of Theremin (1850); *Lectures upon the Philosophy of History* (1856); *Discourses and Essays* (1856); Guericke's *Church History* (2 vols., 1857, 1870); *A History of Christian Doctrine* (2 vols., 1863); *Homiletics and Pastoral Theology* (1867); *Sermons to the Natural Man* (1871); *Theological Essays* (1877); *Literary Essays* (1878); *Commentary on St. Paul's Epistle to the Romans* (1879); *Sermons to the Spiritual Man* (1884); *Endless Punishment* (1886); a treatise on *Dogmatic Theology* (3 vols., 1889–94); and *The Proposed Revision of the Westminster Standards* (1890). Revised by G. P. Fisher.

Shediac': town of Westmoreland County, New Brunswick; on the Point du Chêne branch of the Intercolonial Railway; 106 miles from St. John, and on the border of an estuary of Northumberland Strait (for location, see map of Quebec, etc., ref. 5–I). It is celebrated for its oysters. Pop. 6,250. M. W. H.

Shee, Sir Martin Archer, D. C. L.; painter and author; b. in Dublin, Ireland, Dec. 23, 1770; studied painting at the school of the Royal Dublin Society; was introduced in 1788 by Edmund Burke to Sir Joshua Reynolds, under whose patronage he entered as a pupil in the Royal Academy; became an exhibitor in the following year; was elected an associate of the academy 1798 and a member 1800, and was chosen successor to Lawrence as president of that institution in 1830, on which occasion he was knighted. He was especially successful in portrait-painting, and in a long career preserved the lineaments of many illustrious men. He retained the presidency of the academy through life; was an effective orator on public occasions; published *Rhymes on Art, Alasco, a Tragedy*, and a novel. D. at Brighton, Aug. 19, 1850. See the *Life* by his son (2 vols., London, 1860).

Sheeahs: same as Shiites (*q. v.*).

Sheep [M. Eng. *scheep* < O. Eng. *scēp, scēap*: O. H. Germ. *scāf* < Mod. Germ. *schaf* < Teuton. *skēpo-*; cf. Sanskr. *chāga-*, goat (?)]: animals constituting the genus *Ovis*, although some writers claim that they form a group of genera. They are hollow-horned ruminants, and belong to the artiodactyl, or pair-toed, section of the ungulate, or hoofed, mammals. In nearly all the wild breeds horns are present in both sexes, but in many of the domestic breeds they are entirely absent. The tail is usually short, though in some of the domestic breeds it is unusually developed. Sheep are further distinguished by a covering of wool, which varies in length, color, and strength and fineness of fiber, with variations under different climatic and other conditions.

Geographically, the wild breeds are or were distributed over some of the islands of the Mediterranean, in Europe, the greater portion of the temperate highlands of Asia, nearly the whole of the Rocky Mountain ranges of a certain altitude in North America, and throughout some of the upland regions of the Andes in South America. More than twenty different species have been described. Of these, *O. montana* is the bighorn or Rocky Mountain sheep.

The origin of many of the breeds of sheep under domestication can not be traced with certainty. Some suppose that the originals from which these sprang are descendants of the musimon of Corsica or the argali of Asia. They are to be found wherever there is a settled agriculture, but are best adapted to the temperate zones. In North America they are reared only for their meat and wool, but in some countries they are also kept for their milk.

North American Breeds.—The recognized breeds in North America are all of European origin. They are enumerated in the classification given below:

Fine-wooled breeds: Merino, and sub-varieties of the Merino, of which there are several.

Medium-wooled breeds: Southdown, Dorset Horn, Suffolk, Shropshire, Hampshire Down, Oxford Down, Cheviot.

Coarse-wooled breeds: Leicester, Lincoln, Cotswold, Black-faced Highland.

The above classification is based on variations in the character of the wool, which, in going down the list, gradually increases in coarseness; but there is a slight difference of opinion as to the order in which some of the breeds should stand, as in a few instances the character of the wool found on different parts of the body varies in some of the breeds, and in other instances it also differs materially in certain families and sub-families of the same breed.

Care of Sheep.—Adaptation should be carefully considered. The various wild species never frequent swamps, exposed plains, or dense forests from choice. In the management of sheep under domestication these preferences should always receive recognition. The smaller the breed the higher and more rugged may the pastures be, and the larger the breed the richer and more level should they be. The pastures in summer, and also the fodder in winter, should be characterized by variety and fineness of herbage, and where practicable the sheep should be frequently changed from one pasture to another. Sheep kept for breeding uses should be given the largest liberty practicable both winter and summer, but where they are being fattened they will bear close confinement for a time under suitable conditions. Except at the lambing season, they only require to be protected from storms, as they are not easily injured by low temperatures. In circumscribed pastures, and with the larger breeds, the flocks should be small, summer and winter, but with the smaller breeds, and ample foraging-grounds, they may run up even into the thousands. Where sheds are necessary in winter, it is imperative that they should be built on ground dry naturally, or made so, and the aim should be to admit plenty of morning and forenoon sunlight. They should be entirely free from draughts, and should be divided by feeding-racks, or otherwise into small compartments. Each compartment requires a door leading into an inclosed yard. These doors should be low and wide to prevent crowding, and should be kept open day and night except in time of storms. It is also important that the yards be kept dry by littering or otherwise.

In winter it is not necessary to cut the fodder or to grind the grain for sheep. After going into winter quarters, breeding ewes require only a moderately generous diet until the lambing season. A variety of fodders, a small quantity of roots or corn ensilage, and sometimes a little grain, preferably oats, will be found very suitable. But as soon as the lambs are a few days old their dams require most liberal feeding, until they are put upon pastures succulent and abundant. The food factors which are best adapted to produce an abundant flow of milk should predominate, such as early-cut and well-cured grasses, roots or corn ensilage, and oats and bran. Emaciation in the dams may be prevented by adding such foods as corn or peas, and oilcake. The lambs also should be given early and continued access to free supplies of grain, fed at first in the ground form, and in a place inaccessible to the dams. Docking should receive attention within a few days of birth, and castration in a few weeks. When pastures are fresh and abundant, sheep or lambs do not usually require any grain until the latter are weaned. This period arrives when they are from four to five months old. As soon as weaned the lambs should get a grain supplement to build up the frame or to fatten it, according to the object sought. Sheep and lambs thrive much better when plentifully supplied with salt and pure water, at all seasons.

For autumn fattening the Dwarf Essex rape is very suitable where it can be profitably grown. Sheep and lambs will fatten quickly when pastured upon it, and without any supplement of grain. Young clover, mixed grasses, and rye are also suitable, but grain is required in addition. In winter fattening the ration may be the same in kind as that already mentioned as being suitable for breeding ewes after the lambing season, but with the difference that more, relatively, of the concentrated foods, such as corn, peas, or oilcake, should be given. Lambs of the mutton breeds, which average about 100 lb. live weight, will usually gain from 6 to 10 lb. per month in winter, while being fattened on a daily ration of 1½ to 2 lb. hay, 4 lb. corn ensilage or 5½ lb. roots, and 1¼ to 1¾ lb. grain.

In breeding sheep for the block females of mixed blood, though variously bred, will be found suitable. To cross upon these, rams should be chosen successively from the same pure breed, rather than from breeds alien in blood. In choosing them adaptation in size, form, feeding, and mutton qualities, and the needs of the market should be considered. It is pretty generally conceded that stimulating food fed to rams and ewes at the mating season tends to increase the number of the lambs, and also to shorten the duration of the lambing period. Early maturity is much

sought for in all the mutton breeds. Medium-sized lambs of quick development, compact build, and good quality stand high in favor in the markets, and they can be raised at a minimum of cost. It is generally considered more profitable to dispose of them before they pass the age of one year. THOMAS SHAW.

Sheepshead: a well-known fish (*Archosargus probatocephalus*) of the family *Sparidæ*, found along the Atlantic coast of the U. S. south of Cape Cod, but most abundant in the warmer waters. The name is given in allusion to a fancied resemblance of the head to that of a sheep, produced by the form and color as well as the cutting teeth of the jaws. The body is deep and robust with the back arched; the dorsal fin has twelve spines and eleven rays, and is preceded by a recumbent spine; the anal fin has three spines and ten rays; the color is gray, with about seven blackish bands; the front teeth are broad and incisor-like, the lateral teeth molars, and in several rows. The sheepshead sometimes exceeds 2 feet in length, although averaging less. It is one of the most esteemed fishes found in American waters, and on account of the delicacy of its flesh has been likened to the English turbot. It is also highly regarded as a game-fish. It feeds chiefly on molluscs and crustaceans, and its molar teeth and stout jaws are eminently adapted for breaking shells. The fresh-water drum (*Haplodinotus grunniens*) is among the fishes loosely called sheepshead in the U. S.

Sheep-tick: a wingless parasitic insect (*Melophagus ovinus*) of the order *Diptera* and family *Hippoboscidæ*, often extremely annoying to sheep. There are various arsenical washes which will destroy them; a solution of carbolic acid is also recommended for the purpose.

Sheeraz: See SHIRAZ.

Sheerness': a strongly fortified seaport in Kent, England; on the right bank of the Medway, at its junction with the Thames; 52 miles by rail E. of London (see map of England, ref. 12–L). The harbor is safe and commodious, and, being almost at the mouth of the Thames estuary, is often crowded with vessels. The Government dockyard, with wet and dry docks, storehouses, etc., covers 60 acres. The principal trade is due to the oyster-fisheries. Sheerness is also a favorite summer resort. Pop. (1891) 13,841.

Sheffield: town; in the West Riding of Yorkshire, England; at the junction of the Sheaf and the Don; 41 miles E. of Manchester and 165 miles N. N. W. of London (see map of England, ref. 7–H). It is situated at the foot and on the slopes of a range of hills, and is generally well built, a street-improvement scheme having been carried out after 1875. Noticeable among its public buildings are the parish church of St. Peter, erected in the reign of Henry I.; St. Mary's Roman Catholic church (1850); the Cutlers' Hall, the Albert Hall, the new market-hall (1851), and the new town-hall, crowned with a statue of Vulcan. Among educational institutions are the Firth College (1879), with thirteen professors or lecturers, the Technical School, the Wesley College, and the Free Grammar School. The St. George's Museum, founded by Ruskin in 1890, contains a collection of engravings, minerals, etc., and the Mappin Art Gallery has a fine collection of pictures. There are several public parks and extensive botanical gardens. The cutlery business of Sheffield dates from very early times. The Sheffield whittle of Chaucer was the common knife used by those whose social rank did not permit them to carry a sword. The Cutlers' Company was founded in 1624, but Sheffield was of little importance up to the middle of the eighteenth century. Sheffield Castle, rebuilt in 1270, was the place of imprisonment of Mary Queen of Scots (1572–86). It was taken by the parliamentary army in 1644, and shortly afterward was demolished. Sheffield is the center in England of the manufacture of knives, files, saws, carriage-springs, boilers, stoves, grates, buttons, and all kinds of agricultural, mechanical, medical, and optical instruments. Silver-plating and britannia metal were both invented here, and have given rise to a comprehensive manufacturing industry. Since 1871 rails, railway-springs, tires, steel blocks for naval and military artillery, and armor-plates have been largely manufactured. Sheffield returns five members to Parliament. Pop. (1891) 324,243; (1901) 380,717. R. A. ROBERTS.

Sheffield: city (founded in 1884); Colbert co., Ala.; on the Tennessee river, and the Birm., Shef. and Tenn. Riv., the Louisv. and Nashv., and the Memphis and Charleston railways; 2 miles W. of Tuscumbia, the county-seat (for location, see map of Alabama, ref. 1–B). It is in an agricultural region, and contains 8 church organizations, several public schools, 5 blast-furnaces, and 2 weekly papers. Pop. (1890) 2,731; (1900) 3,333. EDITOR OF "REAPER."

Sheffield, JOHN, Duke of Buckinghamshire and Normanby: statesman and poet; b. in England in 1649; succeeded his father as Earl of Mulgrave 1658; served in the Dutch wars of 1666 and 1672; became privy councilor and lord chamberlain in 1685; favored the revolution of 1688; was made Duke of Normanby in 1694, lord privy seal and Duke of Buckinghamshire in 1703, and built in St. James's Park the residence now known as Buckingham Palace and belonging to the crown. He was said to have been an early lover of Queen Anne; was author of some poems which enjoyed fame during his own generation, and was a friend of Dryden, to whose memory he erected a monument in Westminster Abbey. D. Feb. 24, 1721. Besides minor poems he wrote a metrical *Essay on Satire* and an *Essay on Poetry*. His poetical works were first printed in 1723.

Shehâb-Eddin: See CHEHAB-EDDIN.

Shehr, or **Sahar**: town; in South Arabia, on the Gulf of Aden; manufactures coarse cotton cloth, and carries on a brisk general trade, though it has no harbor, but only an open roadstead. Pop. probably 5,000. Four miles E. are remains of another town of the same name, once important, but now a decayed fishing-village. E. A. G.

Sheik [from Arab. *sheikh*, *shaykh*, elder, venerable old man, chief, deriv. of *shākha*, grow old, be old]: a title, among Arabs applied to the head of a tribe. Among Mussulmans in general it is prefixed to the name of a religious dignitary, or one versed in theology, or a reputed saint.

Sheikh-ul-Islam: See MUFTI.

Sheil, RICHARD LALOR: patriot and orator; b. at Drumdowney, Tipperary, Ireland, Aug. 17, 1791; was educated at the Jesuit College, Stonyhurst, England, and graduated at Trinity College, Dublin, 1811; studied law at Lincoln's Inn; was called to the bar at Dublin 1814; wrote several successful dramas; contributed *Sketches of the Irish Bar* to Campbell's *New Monthly Magazine*, republished in the U. S. by R. S. Mackenzie (New York, 2 vols., 1854); became an effective popular orator in the agitation for Roman Catholic emancipation; was chosen by the Catholic Association, in conjunction with O'Connell, to represent that body at the bar of the House of Lords 1825; was active in promoting the election of O'Connell to Parliament in 1828; was himself chosen member for Milburne Port shortly after the passage of the Relief Act 1829; was returned for the county of Louth 1831, and later for Tipperary and Dungarvan; became noted as a brilliant and effective parliamentary orator, and aided O'Connell for several years in his campaign for the repeal of the Union, until 1838, when he accepted the sinecure post of commissioner of Greenwich Hospital. He subsequently became vice-president of the Board of Trade, member of the privy council 1839, and judge-advocate-general 1841; was master of the mint 1846–50, and was appointed minister to Tuscany 1850. D. in Florence, May 23, 1851. His *Memoirs* were written by W. Torrens McCullagh (2 vols., 1855); a collection of his *Speeches* was published in London, 1845, and his *Speeches, Legal and Political*, in 1855. —His younger brother, Sir JUSTIN SHEIL, became major-general and minister to Persia, and aided his wife in the preparation of a valuable work, *Glimpses of Life and Manners in Persia* (1856). Revised by H. A. BEERS.

Shekel [from Heb. *shegel*, shekel (liter., a weight), deriv. of *shāqal*, weigh; cf. Gr. *σίγλος*, shekel]: a standard weight among the ancient Israelites, and also a coin of gold, silver, or copper, originally of a shekel's weight. The shekel of the sanctuary (Ex. xxx. 13; Num. iii. 47) was made of silver and was equal to 20 gerahs (Ezek. xlv. 12), or about 54 cents. There were other kinds of shekels. The gold shekel was worth about $5.69; the copper shekel, a little more than 3 cents. Revised by S. M. JACKSON.

Shel'burne: a seaport; capital of Shelburne County, Nova Scotia; 141 miles S. W. of Halifax (see map of Quebec, etc., ref. 3–B). It has a very fine harbor. Shelburne Lights, on Cape Roseway, are in lat. 43° 38·5′ N., lon. 65° 15·5′ W. There is excellent water-power, afforded by the river Roseway. Fishing, commerce, and ship-building are extensively pursued, and the port is one of the best in the province. The place has lost greatly in importance. During the war for American independence it was the center of loyalist influence, and then had about 12,000 inhabitants. Pop. 2,500. Revised by M. W. HARRINGTON.

Shelburne, William Petty Fitz-Maurice, Earl of, afterward Marquis of Lansdowne: b. in Dublin, Ireland, May 20, 1737; was educated at Christ Church, Oxford; entered the army in 1757, and served with honor; was elected to Parliament for Chipping Wycombe early in 1761, but before taking his seat succeeded to the earldom, by the death of his father May 10, 1761; became president of the Board of Trade and privy councilor in the Grenville ministry Apr., 1763; opposed the policy which led to the enactment of the Stamp Act and other measures oppressive to America; became a personal friend of Benjamin Franklin; was dismissed from office Sept. 8, 1763; separated from Bute and Fox, attaching himself to Pitt; declined entering the Rockingham ministry 1765; became Secretary of State for the Southern Department in Pitt's administration July, 1766; resigned his post Oct., 1768; visited Italy and France; became Secretary of State in the Foreign Department in the Rockingham cabinet Mar., 1782, and Premier on the death of Rockingham July, 1782; negotiated the preliminaries of peace with the U. S.; resigned Feb. 21, 1783, giving place to the coalition of Fox and North; was created Marquis of Lansdowne 1784, and passed the remainder of his life in political retirement. D. in London, May 2, 1805. His valuable collection of historical MSS. was sold to the Government, and is in the British Museum. See his *Life*, by his grandson, Lord Edmond Fitz-Maurice (London, 1875–76).

Shelburne Falls: village in Shelburne and Buckland townships, Franklin co., Mass.; on the Deerfield river, and the N. Y., N. H., and Hart. Railroad; 13 miles W. of Greenfield, the county-seat, 119 miles W. by N. of Boston (for location, see map of Massachusetts, ref. 2–E). The river here has a picturesque fall of 47 feet, affording excellent power for manufacturing, which is utilized by a silk-mill, a peg-shop, and cutlery and hardware factories. There are 6 churches, the Arms Academy, 2 village schools, a national bank with capital of $100,000, a savings-bank, and a weekly paper. The town was founded in 1755, and incorporated in 1768. Pop. of Shelburne township (1880) 1,621; (1890) 1,553; (1900) 1,508. Editor of "Deerfield Valley Echo."

Shelby, Isaac: first Governor of Kentucky; b. near Hagerstown, Md., Dec. 11, 1750; son of Gen. Evan Shelby; received a common-school education; became a surveyor in Western Virginia; served as lieutenant in a company under his father's command at the battle of Point Pleasant 1774; became captain 1776; was commissary of the frontier 1777; major and member of Virginia House of Delegates 1779; colonel 1780; rendered distinguished service at King's Mountain Oct. 7, 1780; served under Marion 1781, and under Greene with 500 mounted volunteers 1781–82, in which years he sat in the North Carolina Legislature, from which he received a vote of thanks and a sword; settled in Lincoln co., Ky. (then Virginia), 1788; was a member of the constitutional convention 1791; Governor of Kentucky 1792–96 and 1812–16; joined Gen. Harrison in Canada with 4,000 Kentuckians raised by proclamation; took part in the victory of the Thames, for which Congress voted him a gold medal; declined the post of Secretary of War 1817, and was commissioner with Gen. Jackson in negotiating a treaty with the Chickasaw Indians 1818. D. at Traveler's Rest, Lincoln co., Ky., July 18, 1826. His services are commemorated in the names of counties in nine of the Western and Southern States and in the name of a college at Shelbyville, Ky.—His son, James, b. 1784, served as major in the war of 1812, became general of militia, and died in Sept., 1848.

Shelbyville: city; capital of Shelby co., Ill.; on the Kaskaskia river, and the Chi. and E. Ill. and the Cleve., Cin., Chi. and St. L. railways; 23 miles W. by S. of Mattoon, 32 miles S. by E. of Decatur (for location, see map of Illinois, ref. 7–E). It is in an agricultural, lumbering, and coal-mining region, and contains a foundry, several large flour-mills, woolen-mill, agricultural-implement works, and other manufactories, a national bank with capital of $75,000, and a daily, a monthly, and five weekly papers. Pop. (1880) 2,939; (1890) 3,162; (1900) 3,546. Editor of "Union."

Shelbyville: city; capital of Shelby co., Ind.; on the Big Blue river, and the Cleve., Cin., Chi. and St. L., and the Pitts., Cin., Chi. and St. L. railways; 24 miles N. N. E. of Columbus, 27 miles S. E. of Indianapolis (for location, see map of Indiana, ref. 7–F). It is in a rich farming region, and has saw, planing, and flour-mills, furniture, carriage, ice, and barrel factories, etc., and a large general trade. There are 12 churches, 5 public-school buildings, 9 building and loan associations, 2 national banks with combined capital of $200,000, a private bank, and a monthly, 2 daily, and 2 weekly papers. Pop. (1880) 3,745; (1890) 5,451; (1900) 7,169. Editor of "Democrat."

Shelbyville: town; capital of Shelby co., Ky.; on the Louisv. and Nashv. and the Southern railways; 20 miles W. of Frankfort, 30 miles E. of Louisville (for location, see map of Kentucky, ref. 3–G). It is in an agricultural, stock-raising, and tobacco-growing region, and contains 3 State banks with combined capital of $100,000, 2 weekly newspapers, Science Hall School (Methodist Episcopal South, opened in 1825), Stuart Female College (opened in 1839), and Shelbyville Male Academy (1881). Pop. (1880) 2,393; (1890) 2,679; (1900) 3,016.

Shelbyville: town; capital of Bedford co., Tenn.; on the Duck river, and the Nashv., Chat. and St. L. Railway; 40 miles E. S. E. of Columbia, 63 miles S. by E. of Nashville (for location, see map of Tennessee, ref. 7–F). It is an important grain and mule market; contains Shelbyville Female College (non-sectarian, opened in 1853), a national bank with capital of $100,000, a State bank with capital of $28,000, and a monthly and three weekly newspapers; and has 5 churches, extensive lead-pencil factory, large lumber-yards, iron-foundries and machine-shops, cotton and woolen mills, and flour, saw, and planing mills. It is a shipping point for telegraph and telephone poles, and pencil-cedar. The town and its vicinity were the scene of important military operations in the civil war (June, 1863). Pop. (1880) 1,869; (1890) 1,823; (1900) 2,236.
Editor of "Bedford County Times."

Sheldon: town; O'Brien co., Ia.; on the Chi., Mil. and St. P., the Chi., St. P., Minn. and Omaha, and the Ill. Cent. railways; 36 miles W. of Spencer, 58 miles N. N. E. of Sioux City (for location, see map of Iowa, ref. 2–D). It is in an agricultural, dairying, and stock-raising region, has important manufactories, 3 State banks (combined capital $150,000), a national bank (capital $50,000), and 2 weekly papers. Pop. (1880) 730; (1890) 1,478; (1900) 2,282.

Sheldon, Edward Austin, A. M., Ph. D.: educator; b. at Perry Center, N. Y., Oct. 4, 1823; educated at Hamilton College, Clinton, N. Y.; superintendent of schools at Syracuse, N. Y., 1851–53, and at Oswego, N. Y., 1853–69; principal of Oswego State Normal and Training-school from 1862 till his death, at Oswego, Sept. 16, 1897. Author of *Manual of Elementary Instruction* (1862); *Lessons on Objects* (1875); and a number of school text-books. C. H. T.

Sheldon, Edward Stevens, Ph. D.: philologist; b. at Waterville, Me., Nov. 21, 1851; studied one year in Colby University; graduated at Harvard 1872; studied in Berlin, Leipzig, and Paris 1874–77; instructor in modern languages at Harvard 1877–84: Assistant Professor of Romance Philology at Harvard 1884–94; appointed full professor 1894; secretary of the American Dialect Society since its organization, 1889. His work lies chiefly in the field of phonetics and historical phonology, particularly as relates to the French element in English. He has also done much to stimulate the investigation of the living English of America. Author of *A Short German Grammar* (1879); *Some Specimens of a Canadian French Dialect Spoken in Maine*, in *Transac. Mod. Lang. Assoc.* (1887); etymologies in *Webster's International Dictionary* (1890); *Origin of the English Names of the Letters* in *Harvard Studies* and *Notes* (i. and ii., 1892; 1893); also various articles in the *Modern Language Notes*, the *Transactions of the Modern Language Association of America* and *The Dialect Notes*. B. I. W.

Sheldon, Gilbert, D. D.: archbishop; b. at Staunton, Oxfordshire, England, July 19, 1598; graduated at Oxford 1617; became fellow of All Souls' College 1622; obtained the vicarage of Hackney 1633, and the rectories of Ickford and Newington; was appointed warden of All Souls' and chaplain to Charles I., May, 1635; was ejected from the wardenship and imprisoned for loyalty to the royal cause 1647–48; lived in seclusion until the Restoration; became Bishop of London 1660, Archbishop of Canterbury 1663, and chancellor of Oxford University 1667, and built for that institution, at a cost of £16,000, the famous Sheldonian theater, opened 1669. D. at Lambeth Palace, Nov. 9, 1677.

Sheldon, Henry Clay, D. D.: minister and educator; b. at Martinsburg, N. Y., Mar. 12, 1845; educated at Lowville Academy, Yale College (A. B. 1867), Boston University (S. T. B. 1871), and Leipzig University (one year); joined Maine Conference of the Methodist Episcopal Church 1873; was agent of Maine Wesleyan Seminary 1874–76; assistant

professor (1876–82) and Professor (since 1882) of Historical Theology in Boston University. He has published *History of Christian Doctrine* (2 vols., New York, 1886) and *History of the Christian Church* (5 vols., 1894). A. O.

Sheldrake, or **Shieldrake** [*sheldrake* is from Eng. *sheld*, variegated, spotted + *drake*; cf. O. N. *skjoldungr* (< *skjöldr*, a patch); *shieldrake* is identified with the secondary meaning of *skjöldr*, shield, given in allusion to the markings on the breast]: a river-duck of either of the genera *Tadorna* and *Casarca*. The common sheldrake (*Tadorna tadorna* or *cornuta*) is about the size of a goose, and has a red bill with a basal protuberance, head and neck green, with a white collar below, and a brown belt extending across the upper portion of the back. The shoulders and a median abdominal stripe are black, the speculum is green, and the rest of the plumage is white. It is found on sandy seacoasts in the Old World, making nests lined with down

The common sheldrake of Europe.

in abandoned rabbit-burrows. The ruddy sheldrake or Brahminy duck (*Casarca rutila*) is found mostly in Southeastern Europe and in Asia. *Casarca tadornoides* and *C. variegata* inhabit Australia and New Zealand respectively, and are plain-colored. The so-called sheldrakes of North America are mergansers.

Shellac, or **Shell-lac**: See Lac.

Sheller, Aleksandr Mikhaïlovich: author; b. in St. Petersburg, Russia, July 30, 1838; educated at the university in that city; interested himself in questions of popular education, and founded a school for the poor which, at first very successful, incurred the suspicions of the Government and came to an end in 1863. In the same year he published his earliest verses, and in 1864 *Gnilyïa Bolota* (Dank Marshes), a novel that had numerous successors, among the best of which are *Khleba i Zrelistch* (Bread and Amusements); *Des rubïat-Stchepki letïat* (When Wood is cut Splinters fly); and *Chuzhie Grekhi* (The Sins of Others). In 1877 he became editor of the *Zhivopisnoe Obozrenie*; he has also written on questions of religion and sociology, and is especially known for a *History of Communism*.

Shelley, Harry Rowe: See the Appendix.

Shelley, Mary Wollstonecraft (*Godwin*): author; daughter of William Godwin and Mary Wollstonecraft; b. in London, England, Aug. 30, 1797; educated in accordance with the peculiar social theories of her parents; married the poet Shelley Dec. 30, 1816, after having lived with him two years previously to the death of his first wife. She was the author of *Frankenstein, or the Modern Prometheus* (1818), a singular novel, displaying great power, of *Valperga* (1823), *Lodore* (1835), and other less successful romances; contributed to *The Cabinet Cyclopædia* a series of biographies of eminent literary and scientific men of France, Italy, and Spain, and edited the works of her husband, with biographical prefaces and notes (1839–40). D. in London, Feb. 21, 1851. See the *Life* by Mrs. Julian Marshall (2 vols., 1889).

Revised by H. A. Beers.

Shelley, Percy Bysshe: poet; b. at Field Place, near Horsham, Sussex, England, Aug. 4, 1792. His grandfather, Bysshe Shelley (b. at Newark, N. J., 1731), acquired a large fortune, was made a baronet in 1806, and died Jan. 6, 1815. His father, Timothy, b. Sept., 1753, married, in 1791, Elizabeth, daughter of Charles Pilfold, of Effingham, Surrey. The domestic surroundings of the poet were unfortunate, neither of his parents having given him suitable training or inspired him with affection—a circumstance to which much of the waywardness of his career may be attributed. He received his early education at a school taught by the parish clergyman at Warnham; entered at the age of ten Sion House School, Brentford, where he was noted rather as an insatiable reader than as a successful student; entered Eton College in 1805; was addicted to experiments in chemistry; read much upon ghosts and the "occult sciences"; was careless of his tasks, but translated half of Pliny's *Natural History* for his own satisfaction; wrote an incredible amount of fragmentary verses, mostly "poor stuff," as he afterward perceived; composed, with his cousin Medwin, one or more plays and novels, and with another cousin, Harriet Grove (of whom he was deeply enamored), a romance entitled *Zastrozzi*, which was printed in 1810, and, strange to relate, brought him £40; printed also a volume of poems, "by Victor and Cazire," which he quickly withdrew from circulation, and of which no copy is known to be extant, and another romance, *St. Irvyne*, all within the same year (1810) in which he entered University College, Oxford; published under the pseudonym of *Margaret Nicholson* a volume of burlesque poems; was expelled from his college Mar. 25, 1811, for having printed a pamphlet entitled *The Necessity of Atheism*; went to London with his friend Hogg, who was also expelled in connection with the same affair; was left without support by his offended father, but received occasional supplies from the savings of his sisters, then at school; eloped to Scotland with one of their schoolfellows, Harriet Westbrook, the beautiful daughter of a retired innkeeper, and married her in Edinburgh, Sept., 1811; effected a settlement with his father, by which he received a small annuity; traveled with his wife to York and Keswick, where he met Southey and perhaps De Quincey; proceeded to Dublin, Feb. 12, 1812, where he printed three revolutionary pamphlets, addressed one or more political meetings, and fancied that he had been requested by the police to leave the city; went to the Isle of Man, to North and South Wales, Devonshire, and Carnarvonshire, making but brief residences at any point; after flying visits to Dublin and Killarney, finally settled in London, May, 1812; printed early in 1813 *Queen Mab*, his first poem of real literary merit, a production strongly tinctured with anti-religious fanaticism. His first child, Ianthe, was born in June, 1813. Shelley was remarried in London, Mar. 24, 1814, but soon found his married life uncongenial; separated from his wife, settling upon her nearly all his disposable income, and about this time conceived a passion for Mary Godwin (daughter of William Godwin and Mary Wollstonecraft), which was fully returned. As neither of them had any respect for the marriage bond, they saw no difficulty in consulting their own inclinations, and proceeded to Switzerland, traveling as man and wife; returned to England at the close of 1814. In consequence of the death of his grandfather he obtained an annuity of £1,000 and his father's succession to the baronetcy (Jan., 1815); studied surgery during the winter of 1815–16, and daily walked a London hospital; wrote in 1815 his second poem of permanent interest, *Alastor, or the Spirit of Solitude*, published, with other poems, in 1816; proceeded to the Lake of Geneva in the spring of 1816; resided there some months in daily intercourse with Byron; returned to London in the autumn; legalized his connection with Mary Godwin by marriage Dec. 30, 1816, Harriet having shortly before (Nov. 10) drowned herself in the Serpentine; conducted an unsuccessful chancery suit against Mr. Westbrook (Harriet's father) for the custody of his two children, decision being given against him by Lord Eldon on the ground of atheism Aug. 23, 1817; settled at Great Marlow, Buckinghamshire, where he played the part of a country gentleman; made about this time the acquaintance of Keats and the brothers James and Horace Smith, and became very intimate with Leigh Hunt; published in 1818 *The Revolt of Islam* (originally called *Laon and Cythna*), a grandly conceived, sublime, and highly original poem, but with many inequalities and blemishes; suffered much from pulmonary disease, which led him in Mar., 1818, to leave England for the last time; traveled with his early friend Hogg to Italy, residing successively at Milan, Pisa, Leghorn, and the Bagni di Lucca; visited Byron at Venice, remaining there some weeks; completed *Rosalind and Helen* (published 1819), a poem of little value; translated, or rather abridged, the *Symposium* of

Plato; wrote at Byron's villa, near Este, *Julian and Maddalo*, one of his poetical masterpieces, not published during his life; proceeded to Rome in November, and to Naples, Dec., 1818; spent the winter at the latter and the spring of 1819 at the former city; proceeded to Florence, Oct., 1819; made in each of the Italian capitals an assiduous study of their works of art; wrote, chiefly at Florence, during this year, his two greatest works, the tragedy *Prometheus Unbound* and the tragedy *The Cenci*, both of which, as well as *Œdipus, the Tyrant*, a burlesque drama, were published in London in 1820; removed to Pisa, Jan., 1820; wrote in this year his *Witch of Atlas*, not published till 1824; in 1821 *Adonais*, a beautiful monody on the death of Keats, *Epipsychidion*, and *Hellas*, a noble drama inspired by the insurrection in Greece; made a long visit to Byron at Ravenna Aug., 1821; was joined by the latter at Pisa during the ensuing winter (1821–22); began his poem *The Triumph of Life*, which was never finished; took a summer residence Apr., 1822, in the Villa Magni, at Lerici, a village on the Genoese coast; went frequently upon boating excursions with his friends, Capt. Trelawney and Lieut. Williams, and was drowned, along with the latter, in the Bay of Spezia, July 8, 1822, owing to their boat having capsized in a squall, while returning from a visit to Leigh Hunt at Leghorn. The bodies were cast upon the shore ten days later, and, in the presence of Byron and Leigh Hunt, were burned, in accordance with the quarantine laws of Tuscany. The ashes were buried by Trelawney in the Protestant burial-ground at Rome, near the tomb of Keats. Shelley's posthumous poems were edited by his widow in 1824, and *The Mask of Anarchy* by Leigh Hunt in 1832. Mrs. Shelley published a collection of his works in prose and verse in 1839 and 1840, and again in 1845. His daughter-in-law, Lady Shelley, collected the *Shelley Memorials* in 1859. Of recent editions the best have been those edited by William M. Rossetti in 2 vols., in 1870, and by H. Buxton Forman, in 8 vols., 1876–80. The earliest *Life* was that of Medwin, in 1847. Trelawney's *Records of Shelley and Byron* appeared in 1858, and Hogg's fragmentary *Life of Shelley* in the same year. J. A. Symonds published a *Life* in 1878, and Prof. E. Dowden another in 1886. D. F. McCarthy issued *Shelley's Early Life* in 1872. Dr. Richard Garnett's *Relics of Shelley* dates from 1862. Revised by EDMUND GOSSE.

Shell-heaps: artificial deposits constituting a leading feature of the aboriginal remains of North America, and occurring more or less plentifully in all habitable countries.

Nature and Extent.—These heaps are the kitchen middens of mollusc-eating peoples, and their contents vary with the nature of the food-supply. Oysters, clams, mussels, and numerous varieties of univalves yield a very large percentage of compact and durable refuse. In some cases the shape and height of the heaps were modified for domiciliary and defensive purposes, and when the sites became places of sepulture the shells were utilized in building mounds; but they are studied here only as accumulations of refuse inclosing in their mass reliable records of the food-supply, the customs, arts, industries, and movements of the people. Some of these heaps cover areas 10, 20, or even 40 acres in extent. On the shores of some of the Atlantic bays and rivers the deposits are practically continuous for many miles, and reach back from the water for distances varying from a few rods to half a mile or more according to the nature of the ground. It is estimated that in the State of Maryland alone the oyster-banks cover an area of upward of 100,000 acres. The deposits are heaviest where favorable dwelling-sites occurred near prolific shallows, and it is not exceptional to find them from 10 to 25 feet deep. A depth of 40 feet is occasionally reported, and certain deposits in Brazil are said to be 100 feet deep. The shells on decomposing yield a dark rich marl, and where decay is well advanced the fields covered are exceedingly fertile. In many places the shells are calcined in kilns and employed as a fertilizer. At Pope's Creek, Md., a single midden has yielded upward of 200,000 cubic feet of oyster-shells for this purpose.

History and Age.—In the main the shell-banks of the Atlantic coast are so nearly homogeneous that they must be regarded as representing a simple and rather brief period of occupation, but examples in Florida, especially the fresh-water deposits, show successive depositions as well as more advanced decomposition in the lower beds, indicating distinct periods of occupation and considerable lapse of time. Dr. Dall found very decided indications of the greater antiquity of the lower beds of the Alaskan middens. In some cases mounds composed of marine forms are found far back from the present salt-water shore-lines, and long periods are assumed to have passed since their accumulation, but the rates of silting and of land-oscillation are not so well determined as to make such data of great value as time-measures. In some localities the forms of life utilized by the ancient inhabitants have changed in character, or have greatly decreased in abundance or size, or have entirely disappeared. These changing conditions are an index of age, but not a definite or valuable one. In the main the species of animals whose remains occur in these artificial deposits are identical with or vary but little from the living or historic species of the regions in which they occur.

Art and Peoples.—The American natives who resorted to the shores of the sea in search of food were not a peculiar people, and did not belong to a particular period of time or stage of culture. Some of the more advanced native peoples occupied the interior of the country and took no part in the marine fisheries, but nearly all grades of culture are represented in the art of these deposits. In some regions the tribes resorted to the fisheries at stated seasons only, and in such cases the relics left do not fully represent the art of the people. The utensils and implements were to a large extent prepared for temporary and local use, and are exceptionally rude; but in passing along the coast from Maine to Mexico the artificial contents of the shell-banks of each section represent somewhat fully the art-remains of the adjacent regions. For example, rude cord-marked pottery is found in the northern middens, stamped wares in southern, painted wares in those of the Gulf States, and highly elaborated and artistic wares in the deposits of the western and southern Gulf shores. The art and people represented by the relics these heaps contain are those of which knowledge has been obtained through other sources.

AUTHORITIES.—Atlantic coast: Wyman, *Fresh-water Shell-mounds of Florida*, in *Memoirs of the Peabody Academy of Sciences*, vol. i., No. 4 (1875); Brinton, *Artificial Shell-deposits of the United States*, in *Smithsonian Institution Report* (1866); Rau, *Artificial Shell-deposits of New Jersey*, in *Sm. Inst. Rept.* (1864). Pacific coast: Schumacher, *Kjokenmoddings of Oregon*, in *Bulletin Geol. Survey of Territories*, vol. iii., No. 1; Dall, *Tribes of the Extreme Northwest*, in *Contributions to North American Ethnology*, vol. i. Interior: White, *Congrès International d'Anthropologie* (Boulogne, 1871). W. H. HOLMES.

Shells, in artillery: See PROJECTILES.

Shells, in natural history: See MOLLUSCA.

Shelly's Case: a celebrated case at law, decided in 1591, and reported in the first part of Lord Coke's *Reports*. It constitutes one of the landmarks of the English law of property, and established a technical rule of real property law, known as the Rule in Shelly's Case, which may be stated as follows: When a person takes an estate for life, under a deed or will, and in the same instrument there is a limitation by way of remainder to his heirs or to the heirs of his body as a class of persons, the limitation to the heirs merely operates to enlarge the estate of the person to whom the life-estate is given; if the remainder be to the heirs of his body, he takes an estate in fee tail; if to his heirs generally, an estate in fee simple. The rule had no application, however, to the limitation of a remainder to any particular person, who might, nevertheless, be the heir of the life-tenant. Thus a limitation of a life-estate to A, with remainder to his eldest son and the heirs of the latter, was not within the rule. The rule itself has been abrogated by statute in New York and many other States, and in such jurisdictions a limitation of the kind affected by it would now take effect according to the terms of the conveyance. See ESTATE, FEE, PROPERTY, REMAINDER, and consult text-books on real property, especially Leake and Williams, and the *Commentaries* of Blackstone and Kent. GEORGE W. KIRCHWEY.

Shelter Island: island and town; Suffolk co., N. Y.; between the Peconic and Gardiner's Bays, near the eastern extremity of Long Island (for location, see map of New York, ref. 8–G). It is reached by ferry from Greenport on the Long Island Railroad; is about 14 miles long and 4 miles wide; contains several pretty bays and small fresh-water lakes; is a popular summer resort and a Methodist camp-meeting place; and has two large hotels and choice facilities for boating and fishing. The island belonged originally to the Manhasset Indians; was acquired by Lord Stirling; and for many years was under the jurisdiction of Connecticut. Pop. (1880) 732; (1890) 921; (1900) 1,066.

Shema'kha (anc. *Kamachia*): town of Russia; in Transcaucasia; on the Pirsaghut, at an elevation of 2,230 feet. It is fortified, and has large and well-stocked bazaars and manufactures of silk and cotton stuffs. Much wine and fruit are produced in the vicinity. Pop. (1892) 22,139.

Shemitic Languages: same as Semitic Languages (*q. v.*).

Shenando'ah: town (founded in 1870); Page co., Ia.; on the Nishnebotne river, and the Burlington Route, the Humeston and Shen., and the Omaha and St. L. railways; 19 miles N. E. of Hamburg, 40 miles S. E. of Council Bluffs (for location, see map of Iowa, ref. 7–D). It is the center of a rich agricultural region, and contains 12 churches, the Western Normal College (opened in 1881), 3 public-school buildings, 2 national banks with combined capital of $115,000, a private bank, and a semi-weekly and 3 weekly newspapers. The vicinity includes among its industries some of the largest wholesale nurseries in the West. Pop. (1880) 1,387; (1890) 2,440; (1900) 3,573. Editor of "Sentinel."

Shenandoah: borough; Schuylkill co., Pa.; on the Lehigh Val., the Penn., and the Phil. and Read. railways; 13 miles N. by E. of Pottsville, the county-seat, and 105 miles N. W. of Philadelphia (for location, see map of Pennsylvania, ref. 5–H). It is in the heart of the richest coal district in the anthracite region, the development of which has given it rapid growth. Six of the largest collieries in the coal region are within the borough limits, and eight others, equally productive, are within the radius of a mile. The borough has gas and electric-light plants, an electric railway connecting adjoining towns and villages, 2 national banks with combined capital of $200,000, 3 building and loan associations, each local and serial, and a daily and 2 weekly newspapers. There are 18 churches, 7 public-school buildings (valued at $60,000), a public library connected with the schools, 2 parochial schools, a brewery, 2 hat and cap factories, and other industries. Shenandoah was laid out in 1862, and incorporated as a borough in 1866. Pop. (1880) 10,147; (1890) 15,944; (1900) 20,321.

M. E. Doyle, editor of "Sunday Morning News."

Shenandoah River: a stream which rises in Augusta co., Va., and flows N. E. 170 miles to the Potomac at Harper's Ferry, W. Va. The north fork joins the main stream at Front Royal. The Shenandoah affords great water-power. During the civil war its valley was the scene of many military operations, and was laid waste by Gen. Sheridan in 1864.

Shen'di: town of Nubia, on the Nile, in lat. 16° 38′ N.; was a place of some commercial importance before the Mahdist revolt. Almost the entire population of the town and district perished of famine in 1889. C. C. A.

Shenshin, Afanasiĭ Afanasievich: poet, who has written under the name of Fet (that of his mother by a first marriage); b. in the government of Orel, Russia, Nov. 23, 1820; studied in the University of Moscow, and from 1844 to 1856 served in the army, after which he settled in the country. His first volume of verses was published in Moscow in 1840. As a writer Fet belongs to the school of pure art. His short poems, though at times lacking in warmth, are characterized by perfect form and delicate grace. He has also made excellent translations of the whole of Horace and Juvenal, Goethe's *Faust*, Shakspeare's *Julius Cæsar* and *Antony and Cleopatra*, etc. A. C. Coolidge.

Shensi, shen'sec' [literally, western defiles]: a province of China, bounded N. by Mongolia, E. by the Hwang-ho (which separates it from Shansi) and Honan, S. by Hupeh and Szechuen, and W. by Kansuh. Area, 67,400 sq. miles. S. of the Tsing-ling range it is mountainous and well wooded; N. of it the Loess (*q. v.*) formation prevails, and everything is yellow. The houses are made of yellow earth, vegetation is covered with yellow dust, and even the atmosphere is seldom free from a yellow haze. The chief rivers are the Wei (a long, shallow affluent of the Hwang-ho), which flows E. along the northern base of the Fu-niu and Tsing-ling ranges (some of whose peaks reach an elevation of 11,000 feet), and the Hankiang (*q. v.*). Iron and coal abound, but are not much worked, except near the upper waters of the Han. Being a loess region, Northern Shensi is unfit for rice cultivation. Wheat, barley, pulse, millet, maize, ground-nuts, poppy, hemp, tobacco, and cotton are extensively grown. Wheat is the staple. Capital, Si-ngan-foo. Pop. about 8,500,000. R. L.

Shenstone, William: poet; b. at the Leasowes, near Halesowen, Shropshire, England, in Nov., 1714; studied at Pembroke College, Oxford, and passed his life in retirement on his hereditary estate, writing elegies, ballads, odes, and pastorals which had considerable popularity. The Spenserian poem entitled *The Schoolmistress* (1742), the *Pastoral Ballad* (1743), and the well-known stanzas *Written in an Inn at Henley*, are the only ones remembered. D. at the Leasowes, Feb. 11, 1763. His *Works* and *Letters* were collected in 3 vols., 1764–69. An edition of his *Poems*, by Gilfillan, with a memoir, appeared at Edinburgh in 1854, and his *Essays on Men and Manners* were republished at London in 1868. Shenstone was also one of the best amateur landscape-gardeners of his time. Revised by H. A. Beers.

She'ol: the transliterated Hebrew word, meaning a hollow place, a cave, used in the Revised Version of the Bible to denote the place of departed spirits. It therefore corresponds with Hades in classical Greek literature. In the Authorized Version it is translated by pit, grave, hell. S. M. J.

Shepard, Charles Upham, M. D., LL. D.: geologist; b. at Little Compton, R. I., June 29, 1804; graduated at Amherst College 1824; studied botany and mineralogy at Cambridge under Nuttall; taught those branches at Boston; was for two years assistant in the laboratory of Prof. Silliman at New Haven, and for one year lecturer at the Brewster Scientific Institute at New Haven; employed on a Government commission to investigate the methods of sugar-culture and manufacture in the Southern States 1832–33; lecturer on Natural History at Yale College 1830–47; associate of Dr. James G. Percival in the geological survey of Connecticut 1835; Professor of Chemistry and Natural History at Amherst 1845–52, and in the Medical College at Charleston, S. C., 1854–61; afterward became again Professor of Natural History at Amherst; was author of a *Treatise on Mineralogy* (1832; 3d ed. enlarged, 1855), and of a *Report on the Geology of Connecticut* (1837). D. May 1, 1886. —His son, Charles Upham Shepard, Jr., M. D., born at New Haven, Oct. 4, 1842, graduated at Yale College 1863, and in medicine at Göttingen, Germany, 1867; became Professor of Chemistry at the Medical College of Charleston, S. C., in 1867. He wrote many papers on mineralogy, and has been active in the development of the phosphate industries of South Carolina and Florida. Revised by G. K. Gilbert.

Shepard, Elliott Fitch, LL. D.: lawyer; b. at Jamestown, Chautauqua co., N. Y., July 25, 1833; was educated at the University of the City of New York; was admitted to the bar in 1858. During the civil war he raised the 51st New York Volunteer Regiment, which was called in his honor the Shepard Rifles. He was one of the founders of the New York State Bar Association, and founded the American Sabbath Union. He was owner and editor of the New York *Mail and Express*. D. in New York, Mar. 24, 1893.

Shepard, Irwin: See the Appendix.

Shepard, Thomas: clergyman; b. at Towcester, Northamptonshire, England, Nov. 5, 1605; graduated at Cambridge, 1627; became a preacher at Earle's-Colne, Essex; was silenced for nonconformity in 1630. He emigrated to Massachusetts, arriving at Boston, Oct. 3, 1635; succeeded Thomas Hooker as pastor of the church at Cambridge, Feb., 1636; was influential in founding Harvard College; published *New England's Lamentation for Old England's Errors* (London, 1645); *The Sound Believer* (1645); *The Clear Sunshine of the Gospel breaking forth upon the Indians in New England* (London, 1648; reprinted New York, 1865); *Theses Sabbaticæ* (1649); and other theological works. After Hooker's death he was esteemed the most learned and skillful exponent of Puritan theology in New England. D. at Cambridge, Aug. 25, 1649. He left numerous works in MS., some of which were published in England, especially *Subjection to Christ* (1652), to which was prefixed a *Life* of Shepard by Samuel Mather and William Greenhill; *The Parable of the Ten Virgins Opened and Applied* (London, folio, 1660; new eds. 1839, Aberdeen, 1838 and 1853); and various collections of *Sermons*. He left an *Autobiography*, first printed at Cambridge (1832) for the Shepard Congregational Society. A collected edition of his *Works* appeared at Boston (3 vols., 1853), with a memoir by Rev. Horatio Alger, of Cambridge. A memoir by Cotton Mather may be found in the *Magnalia Christi Americana* (best ed. Boston, 1855, 2 vols.). Revised by S. M. Jackson.

Shepardson College: See Denison University.

Shepherd-dog: any one of the breeds of domestic dogs which are trained to assist in attending the flocks of sheep. Of all strains of shepherd-dogs the Scotch collie is the most celebrated. It is one of the most sagacious and docile of dogs. A good Scotch collie should have a long, narrow

head; small, semi-erect ears, set high on the head; long, straight fore legs, placed well under the body; long and thick, but not woolly, hair. The color is extremely varied, but is more usually black and tan, or black, tan, and white, or yellow and white. F. A. Lucas.

Shepherd Kings: certain rulers of Egypt, known also as Hyksos (*q. v.*).

Shepherdstown: town; Jefferson co., W. Va.; on the Potomac river, the Chesapeake and Ohio Canal, and the Norfolk and Western Railroad; 8 miles W. of Harper's Ferry, 60 miles W. of Washington, D. C. (for location, see map of West Virginia, ref. 5–N). It contains Shepherd College (one of the State normal schools), large cement-mills and flour-mills, machine-shops, a savings-bank, and a weekly newspaper. Pop. (1880) 1,533; (1890) 1,515; (1900) 1,184.
H. L. Snyder, publisher of "Register."

Shepley, Ether, LL. D.: jurist; b. at Groton, Mass., Nov. 2, 1789; graduated at Dartmouth College 1811, in the same class with Amos Kendall, Joel Parker, and Daniel Poor; became a lawyer at Saco, and subsequently at Portland; sat in the Massachusetts Legislature 1819, and in the Maine constitutional convention 1820; was U. S. district attorney for Maine 1821–33; U. S. Senator 1833–36; became a justice of the Supreme Court of the State Sept. 23, 1836; was chief justice 1848–55. He was a man of great constructive ability, and was appointed sole commissioner to prepare the Revised Statutes of Maine (1856–57). D. Jan. 15, 1877. —John Shepley, his brother (b. 1787; d. 1857), reported and published *Maine Reports*, the decisions of the Supreme Court of Maine 1836–49. Revised by F. Sturges Allen.

Shepley, George Foster: soldier and lawyer; b. at Saco, Me., Jan. 1, 1819; graduated at Dartmouth College in 1837, and at Dana Law School, Cambridge, 1829; admitted to the bar of the supreme judicial court, Bangor, Me., 1840; in 1844 removed to Portland; was appointed U. S. attorney for Maine district in 1848, and reappointed in 1853 and 1857, subsequently devoting himself exclusively to a very extensive and general practice of his profession, in the course of which he was called upon to argue several cases of great importance in the U. S. Supreme Court, until Sept. 21, 1861, when he was commissioned colonel of the Twelfth Maine Volunteers; commanded a brigade in Gen. Butler's expedition against New Orleans, and on the occupation of that city was appointed military commandant and acting mayor, charged with the administration of civil affairs in the city, and was also assigned to the command of the defenses of New Orleans. On July 17, 1862, he was commissioned brigadier-general of volunteers by President Lincoln, who appointed him military governor of Louisiana June 3, 1862. In 1864 he commanded the military district of Virginia and North Carolina; served with the Army of the James 1864–65; entered Richmond with the Twenty-fifth Army-corps Apr. 3, 1865, and was appointed military governor of that city. Resuming his profession at the close of the war, he declined the appointment of judge of the Supreme Court of Maine, but in 1869 accepted that of U. S. circuit judge for the first judicial circuit. His decisions are reported in Shepley's *Circuit Court Reports*. D. at Portland, July 20, 1878. Revised by James Mercur.

Sherbrooke: *chef-lieu* of Sherbrooké County, Quebec, Canada, and by courtesy called The Capital of the Eastern Townships (see map of Quebec, ref. 6–C). It is a flourishing town situated on both sides of the river Magog at its confluence with the St. Francis, one of the large tributaries of the St. Lawrence. It is a station on the Grand Trunk Railway which has its terminus in Portland, Me., being 94 miles from Montreal. The Canadian Pacific Railway also passes through it on the line between Montreal and New Brunswick. The Quebec Central Railway has its head office here, and with the Boston and Maine Railroad connects Quebec with the railway systems of the U. S. Sherbrooke has a splendid water-power, and on both sides of the Magog are several large and important factories, the largest being the Paton woolen and worsted mills. The town possesses several fine buildings, including the post-office, the Eastern Townships Bank, and several churches. The Magog and the St. Francis are spanned by bridges. There are three weekly newspapers, one of which is printed in the French language. Pop. (1881) 7,227; (1891) 10,110, mostly French-Canadians. J. M. Harper.

Sherbrooke: a seaport of Guysborough County, Nova Scotia; at the head of navigation of the beautiful St. Mary's river, 12 miles from its mouth (see map of Quebec, etc., ref. 2–C). Ship-building, the lumber-trade, gold-mining, and quartz-milling are carried on. Pop. 1,600, mostly Scotch.

Sherbrooke, Viscount: See Lowe, Robert.

Shere Ali, sheer-aa'lĕĕ: Ameer of Afghanistan; b. in 1825; succeeded his father in 1863, and seemed at first to be open to British influence, introducing numerous reforms after British models, but was subsequently compelled by a revolt of the conservative party, headed by his own son, Yakoob Khan, to change his policy completely and submit to the Russian influence. As he declined to receive a British embassy, though a Russian embassy lived in Cabul in great state, the British invaded the country in the last months of 1878. Shere Ali fled across the frontier, and died suddenly at Mezaricheff, a place under Russian authority, Feb. 21, 1879.

Sheribon: See Cheribon.

Sheridan, Frances (*Chamberlaine*): novelist and dramatist; b. in Ireland in 1724; wrote at the age of fifteen a romance, *Eugenia and Adelaide*, which was dramatized by her daughter long afterward, and successfully acted at Dublin; made the acquaintance of Sheridan, the theatrical manager, during the controversies in which he was involved, by the publication of a pamphlet in his favor; married him about 1748; wrote two popular novels, *Sidney Biddulph* (3 vols., 1761) and *Nourmahal* (1788), and two comedies, *The Discovery* (1763) and *The Dupe* (1764), and left an unpublished play, *The Trip to Bath*. D. at Blois, France, Sept., 1766. Revised by Brander Matthews.

Sheridan, Philip Henry, LL. D: soldier; b. at Albany, N. Y., Mar. 6, 1831; graduated from the U. S. Military Academy, and assigned to the First Infantry as brevet second lieutenant July 1, 1853. After a brief term in barracks he was ordered to Texas; transferred to the Pacific coast in 1855, serving in Washington and Oregon Territories until the fall of 1861, at which date he was captain in the Thirteenth Infantry. In December he was assigned to the army of Southwest Missouri as chief quartermaster. After the battle of Pea Ridge (Mar., 1862) he was relieved, and in the Corinth campaign accompanied Gen. Halleck as quartermaster until May 25. On this date he was appointed colonel of the Second Michigan Cavalry; three days later was off on a raid to Booneville, and May 30 in pursuit of the Confederates retreating from Corinth. On July 1, in command of a cavalry brigade, he defeated a superior cavalry force at Booneville, and was commissioned brigadier-general of volunteers from that date. Transferred to the Army of the Ohio, he commanded a division at the battle of Perryville (Oct. 8), where "he held the key of our position, and used the point to its utmost advantage." At the battle of Murfreesboro (Dec. 31) Sheridan's division held the left of the right wing. An attack on his front had been met and the enemy driven back, when by the giving way of the two divisions on his right his flank became exposed to the advancing foe. Hastily forming a new line under cover of a charge, he made a brave resistance for an hour, when he was again compelled to take up a new line, this time connecting with Negley of the center. The two divisions repulsed three desperate assaults by four divisions of the enemy, when, Sheridan's ammunition giving out, he ordered a bayonet charge and withdrew his lines from the field; but by his obstinate resistance priceless time had been gained for Rosecrans to make his new dispositions. Sheridan's commission as major-general of volunteers followed, dating from this battle. With the exception of skirmishes with Forest and Van Dorn, little of interest occurred until late in June, 1863, when Rosecrans advanced against Bragg, who fell back into Georgia. The battle of Chickamauga took place Sept. 19–20, where Sheridan fought with great gallantry, rescuing his division from a perilous position. Grant superseded Rosecrans in October, and on Nov. 24–25 was fought the battle of Chattanooga, where, on the 25th, Sheridan, by his fearless assault at the head of his division upon the center of the enemy's line on Missionary Ridge, gained additional renown. The march to Knoxville, where Burnside was besieged, next followed. Upon Grant's promotion to be lieutenant-general (Mar., 1864) he applied for the transfer of Sheridan to the East, and appointed him chief of cavalry of the Army of the Potomac. In the campaign of 1864 the cavalry covered the front and flanks of the infantry through the battles of the Wilderness until May 8, when the greater part of it was withdrawn, and next morning Sheridan started on a raid against the enemy's lines of communication with

Richmond. On the 25th he rejoined the army, having destroyed the dépôts, trains, and track at Beaver Dam and Ashland stations, liberated 400 Union men, and defeated the enemy's cavalry at Yellow Tavern, where their cavalry leader, J. E. B. Stuart, was mortally wounded. The outer line of works around Richmond was taken, but the second line was too strong to be carried. Resuming the advance, the battle of Hawes's Shop was fought May 28; Cold Harbor was occupied on the 31st, and held until the arrival of the infantry. On June 7 Sheridan, with two divisions, started around the left of Lee's army and destroyed the Virginia Central Railroad in the rear. The Richmond and Fredericksburg railroad was struck at Chesterfield, and the Virginia Central was again cut at Trevilian's, where he routed Wade Hampton (June 11); next day he tore up the railway nearly to Louisa Court-house, when, on the advance toward Gordonsville, an indecisive engagement took place; not hearing from Hunter, who was to meet him here, he withdrew, rejoining the army June 19. On Aug. 7 the Middle Department and departments of West Virginia, Washington, and Susquehanna were constituted "the Middle military division," and Sheridan assigned to command of the same. Numerous severe cavalry skirmishes occurred during August and early in September, but no general engagement, although the two armies lay in such position—the Confederates under Gen. Early on the west bank of Opequan Creek, covering Winchester, and Sheridan in front of Berryville—that either could bring on a battle at will. The imperative necessity of having the unobstructed use of the Baltimore and Ohio Railroad and the Chesapeake and Ohio Canal led Grant to take the initiative, although Sheridan's defeat would have exposed Maryland and Pennsylvania to invasion; but before giving orders to attack he visited Sheridan (Sept. 16), the latter expressing such confidence of success that Grant gave him but two words of instruction: "Go in!" Three days later, at the crossing of the Opequan, he attacked Early, whom he routed after a vigorous battle, and captured 3,000 prisoners and 5 guns. Early rallied his army at the strong position of Fisher's Hill, where, on the 22d, he was again defeated, with heavy loss, and pursued to the mountains. Sheridan devastated the valley on his return, rendering it untenable for an enemy's army. He was then (Sept. 20) appointed a brigadier-general in the regular army. On Oct. 19 Early, after surprising the Union army in the morning, was disastrously defeated, owing to the arrival of Sheridan from Winchester. (See CEDAR CREEK.) The thanks of Congress were bestowed upon Sheridan and his army, and Nov. 8 he was appointed major-general in the regular army. On Feb. 27, 1865, starting out with 10,000 cavalry, he destroyed the Virginia Central Railroad, the James River Canal, and immense quantities of supplies, and defeated Early again at Waynesboro, rejoining Grant before Petersburg Mar. 27. Sheridan had now a force of about 9,000, and in subsequent operations was under the immediate orders of Gen. Grant. He commanded at the battle of FIVE FORKS (*q. v.*) with his customary vigor. The loss of this battle compelled Lee to evacuate Petersburg. Sheridan pursued the flying army to Sailor's Creek, where he captured 16 guns and 400 wagons. When the Sixth Corps came up a combined attack resulted in the capture of upward of 6,000 prisoners. On Apr. 8 four supply-trains were captured at Appomattox Station, and at Appomattox Court-house the advance of Lee's army was resisted until dark. On the morning of the 9th the enemy endeavored to break through his dismounted command, but abandoned the attempt when Sheridan, moving aside, disclosed the infantry behind. Mounting his men, Sheridan was about to charge when the white flag betokening surrender was displayed in his front. In June, 1865, he was placed in command of the military division of the Southwest, of that of the Gulf in July, of the department of the Gulf, Aug., 1866, and of the fifth military district (Louisiana and Texas) Mar., 1867. In Sept., 1867, he was transferred to the department of the Missouri, continuing in command until Mar. 4, 1869, when he was promoted to be lieutenant-general, and assigned to command of the division of the Missouri, headquarters at Chicago, assuming command Mar. 16. In 1870 he visited Europe and witnessed the Franco-German war. During the political disturbances in Louisiana in 1875, Gen. Sheridan was sent to New Orleans, returning to Chicago on quiet being restored. He assumed command of the army Nov. 1, 1883; was appointed general June 1, 1888. D. at Nonquitt, Mass., Aug. 5, 1888. See his *Personal Memoirs of P. H. Sheridan* (1888); and Davies, *General Sheridan* (Great Commanders Series, 1895). JAMES MERCUR.

Sheridan, RICHARD BRINSLEY BUTLER: dramatist; son of Thomas Sheridan, actor and author, and Frances Chamberlaine, author; b. in Dublin, Ireland, Sept., 1751; educated in Dublin and at Harrow School; published a rhymed translation of Aristænetus, Aug., 1771; married Miss Linley, a beautiful oratorio singer, of Bath, in 1773; brought out his first comedy, *The Rivals*, at Covent Garden, Jan., 1775; followed it in November with an opera, *The Duenna*, for which his father-in-law composed the music, and which was acted seventy-five nights the first season; became part-purchaser of Garrick's half of Drury Lane theater in June, 1776; produced *A Trip to Scarborough* Feb., 1777, altered from Vanbrugh's *Relapse*; and in May followed it with *The School for Scandal*, the most successful comedy of manners in the English language; became owner of one-half of Drury Lane 1778; wrote *Monody on Death of Garrick* 1779; brought out the farce of *The Critic, or a Tragedy Rehearsed*, Oct., 1779. Elected a member of The Club, he became a friend of the leading wits and statesmen of the time; was elected to Parliament from Stafford 1780; was Secretary of the Treasury 1782; cultivated oratory with great success; crowned his fame as a public speaker by two great speeches against Warren Hastings, one in bringing charges in Parliament, Feb., 1787, and one on the trial at Westminster Hall, in June of same year; held his own in debate even against Pitt; revised Thomson's adaptation from Kotzebue, *The Stranger*; rebuilt Drury Lane 1794; produced in 1799 his patriotic play, *Pizarro*, also an adaptation from Kotzebue; became treasurer of the navy and a privy councilor in 1806; was ruined by the burning of Drury Lane 1809; made his last speech in Parliament 1812. Having fallen into habits of dissipation and carelessness in money matters, his last years were harassed by the importunities of creditors, pursuing him even to his deathbed. D. July 7, 1816, and was buried in Westminster Abbey. His *Life* was written by Thomas Moore (1825), who also edited his plays, admitting one piece, *The Camp*, which he did not write. His *Speeches* have been collected in five volumes (1816). The *Rivals* and *The School for Scandal* were published in 1884, with biography, introductions, and notes, by the present writer. BRANDER MATTHEWS.

Sheridan, THOMAS: actor and author; b. in 1721 at Quilca, near Dublin, Ireland (the residence of Dean Swift); educated at Trinity College, Dublin; became an actor 1743; played tragedy at Covent Garden theater 1744 and at Drury Lane 1745; was by some considered a rival of Garrick; was manager of the Dublin theater 1746–55; was ruined by a wanton riot; withdrew temporarily from the stage; became a successful teacher of elocution at London, Oxford, and Cambridge, and in Scotland and Ireland; returned to the stage 1760; was pensioned by George III.; was acting manager of Drury Lane 1776–79, after his son obtained control of that theater; published several works on elocution; edited the works of Swift (1784); wrote his *Life*, and was author of a *General Dictionary of the English Language* (1780) of considerable phonetic value.. D. at Margate, England, Aug. 14, 1788. Revised by BRANDER MATTHEWS.

Sherif, she-reef' [Arab. *sherif*, noble]: a title; applied by Mussulmans to descendants of Fatima, the daughter of the prophet Mohammed. The Sherif of Mecca is the guardian of the KAABA (*q. v.*), and chief dignitary of the city. E. A. G.

Sheriff [M. Eng. *shereve* < O. Eng. *scīr-gerēfa*; *scīr*, shire + *gerēfa*, reeve, officer]: a county officer with administrative and generally also judicial functions.

In England, Ireland, and Wales the sheriff is the chief officer of the crown, in every county or shire, who does all the sovereign's business in the county, the custody of the county being committed to him alone by letters patent of the crown. The office of sheriff is one of the most ancient and honorable known to the English law. The custody of the county is said to have formerly been committed to the earl or (Lat.) *comes*, and anciently the sheriff, whose Latin title is *vicecomes*, was his deputy. The earls in time became unable to transact the business of the county, and the burden was laid on the sheriff, who is now entirely independent of the earl.

Sheriffs were formerly chosen by the inhabitants of the several counties, but now by statute they are annually appointed by the crown (on nomination by the judges and the great officers of the crown) on Nov. 12, and the person appointed must have sufficient land within his county or bailiwick to answer the crown or the people. The discharge of the office is compulsory, and within one month after a

person's appointment is gazetted he must nominate a fit person for his under-sheriff. Until 1888 the citizens of London had the right to elect the sheriffs for Middlesex and London, but now the crown appoints the sheriffs for the county of Middlesex and the (newly created) county of London, and the city elects sheriffs for the city of London only.

The sheriff was formerly a judicial officer before whom might be held the trial of disputed facts in certain cases; but now he is relieved of this burden, except that he is charged with the assessment of damages (by the aid of a jury) and of compensation in certain cases, and that he is bound to hold a county court whenever the holding of such court is required for the purpose of election or any other specific purpose only. He is charged also with certain other duties, as a returning officer, etc., in regard to parliamentary elections.

As the keeper of the king's peace he is the first man in the county, and superior in rank to any nobleman therein during his term of office. He may apprehend and commit any one who breaks the peace, or attempts to break the peace; and may bind any one in a recognizance to keep the peace. He is bound to pursue all traitors, murderers, and other law-breakers, and commit them to jail. He is also to defend his county against any of the king's enemies, and for this purpose, as well as for the purpose of keeping the peace, or of apprehending offenders, he may command all the people of the county to attend him. See Posse Comitatus.

The sheriff, as an officer of court, is also bound to execute processes issuing from the high court of justice, and to attend on the judges when they come into the county at the assizes. In civil causes he may serve all processes by which actions are begun, unless he is a party (when service is to be made by the coroner); he must, upon a proper order, arrest and take security from the defendant (where the defendant is liable to arrest); he executes mesne process by levying attachments, etc.; and in any action or cause he must, when the case comes to trial, summon and return the jury; and when the case is determined he must see the judgment or sentence of the court carried into execution. In these matters he is liable, like other ministerial officers, to an action for the negligent or improper discharge of his duties. To protect himself against liability for mistake he may, in cases of doubt, require from the proper party a bond of indemnity.

In executing criminal process the sheriff may break open the outer door of any dwelling-house or other building, but in executing civil process he can not force an entrance into a dwelling-house, although when once admitted he may break an interior door; and he may break the outer doors of buildings which are not dwellings. It is also the sheriff's business as the bailiff to preserve the rights of the crown within his county, or, as it is often called in his writs, his bailiwick. He must seize escheated lands, levy fines and forfeitures, and seize waifs, wrecks, estrays, etc.

Although the sheriff's authority extends in general over the whole county, there are many liberties exempt from his jurisdiction, in which, by ancient crown grants, the execution of legal process, etc., is bestowed upon other persons. These liberties, though still recognized, are now partly subjected to the surveillance and control of the sheriff.

The sheriff, for the better execution of the duties imposed upon him, has under him many inferior officers—an under-sheriff, a deputy, and bailiffs; and these under-officers may not buy, sell, nor farm their offices on forfeiture of £500; and the sheriff himself is forbidden to "let to farm" his county or any part of it. The under-sheriff, deputies, and bailiffs of the sheriff are in all respects his agents, and may perform in his name only acts which are purely administrative in their nature, and not any which are judicial. Their acts are his acts; he is responsible for all their defaults done under color of office, even when willful and intentional trespasses or violations of law. To protect himself he can take from them bonds with sureties for their good behavior.

In Scotland the sheriff is the chief local judge of the county. His jurisdiction in civil matters extends to all personal actions on contract, bond, or obligation, to the greatest extent; to actions for rent; to possessory actions; and generally to all civil matters not especially committed to other courts; his criminal jurisdiction in general extends to the trial of all crimes which do not involve as a punishment death or banishment from Scotland; and he may fine, imprison, banish from the county, and generally even inflict corporal punishment without a jury.

In the several States of the U. S. the sheriff is the chief administrative officer of each county, and his general duties and powers are essentially the same as in England in matters pertaining to the execution and enforcement of the law, whether civil or criminal. He is *ex officio* the administrative organ of all the superior courts sitting within his county, charged with the duty of carrying into effect their judgments and orders. He is wholly a State official, and has never been incorporated into the executive branch of the U. S. Government. He is generally elected by popular vote for a fixed term (usually three years); but in a few States the ancient practice of appointment by the Governor is still retained. Of his common-law judicial functions the only one retained is the assessment of damages, by the aid of a jury, in certain classes of cases in which defendants have made default.

For a full treatment of the subject, see the statutes of the jurisdiction in question and Stephen's *Commentaries on the Laws of England*; Churchill and Bruce's *Law of the Office and Duties of Sheriffs* (London, 1879); Erskine's *Principles of the Law of Scotland*; Tytler's *History of Scotland*; Bell's *Dictionary of the Law of Scotland*; Binmore's *Instructions for Sheriffs, Coroners, and Constables* (Chicago, 1894); and Crocker's *Duties of Sheriffs, Coroners, and Constables* (3d ed. New York, 1890). F. Sturges Allen.

Sherlock, Thomas, D. D.: bishop and author; son of Dean William Sherlock; b. in London, England, in 1678; educated at Eton; graduated at Cambridge 1697; was master of the Temple forty-nine years (1704–53); was made a prebendary of London 1713, vice-chancellor of Cambridge 1714, dean of Chichester Nov., 1715, prebendary of Norwich 1719, Bishop of Bangor Feb. 4, 1728, of Salisbury 1734, and of London 1748, having declined in 1747 the Archbishopric of Canterbury. He took an active part in the Bangorian controversy in opposition to Dr. Hoadly (1716), wrote several controversial works on Christian evidences, of which the most celebrated were *The Use and Intent of Prophecy* (1725) and *Tryal of the Witnesses of the Resurrection of Jesus* (1729), and published four volumes of his *Discourses at the Temple Church* (1754–58), which gained him a high reputation as a pulpit orator. D. in London, July 18, 1761. His *Works* were edited by T. S. Hughes, D. D. (London, 5 vols., 1830). Revised by S. M. Jackson.

Sherlock, William, D. D.: clergyman and author; b. in Southwark, London, England, 1641; educated at Eton; graduated at Cambridge 1660; took orders in the Church of England; became rector of St. George's, Botolph Lane, London, 1669, prebendary of St. Paul's 1681, master of the Temple 1684, and dean of St. Paul's 1691, in which year he at first refused to take the oaths of allegiance to William and Mary, but subsequently took them; published a pamphlet in justification of his course, *The Case of Allegiance Due to Sovereign Powers Stated* (London, 1691), which caused a great sensation and elicited many replies. D. at Hampstead, June 19, 1707. Author of over sixty publications, chiefly theological and controversial, of which the *Vindication of the Doctrine of the Trinity* (1690), directed against Dr. South, and the *Practical Discourse concerning Death* (1689; n. ed. 1883) made a great impression at the time, but are now little read. Other works are *The Judgment* (1692) and on *The Divine Providence* (1694; edited by T. O. Summers, Nashville, Tenn., 1853; 3d ed. 1875).

Sherman: city; capital of Grayson co., Tex.; on the Hous. and Tex. Cent., the Mo., Kan. and Tex., the St. L. S. W., and the Tex. and Pac. railways; 13 miles S. of the Red river, and 67 miles N. of Dallas (for location, see map of Texas, ref. 2–I). It is in a wheat, corn, cotton, and fruit region, and within 50 miles of the great Ardmore coal-fields, and has large manufacturing and shipping interests. It contains one of the largest cottonseed-oil mills in the South, a cotton-gin (cost about $250,000, and said to be the largest in the world), several flour, saw, and planing mills, foundries and machine-shops, marble-works, cigar, furniture, carriage, broom, and mattress factories, and brick-yards. There are 7 churches, Austin College for boys (Presbyterian), St. Joseph's Academy (Roman Catholic), Sherman Institute, the North Texas Female College, a commercial college, improved water-works, electric street lights and railway, a national bank with capital of $600,000, a State bank with capital of $300,000, and 2 daily and 3 weekly newspapers. The city has an altitude of about 1,000 feet above sea-level. Pop. (1880) 6,093; (1890) 7,335; (1900) 10,243.

Sherman, Frank Dempster: poet; b. at Peekskill, N. Y., May 6, 1860. He was educated at Columbia College and

Harvard University; became a fellow of Columbia in 1887, and afterward instructor in the Columbia School of Architecture. He has published *Madrigals and Catches* (1887); *Lyrics for a Lute* (1890); and, with John K. Bangs, *New Waggings of Old Tales* (1888). H. A. B.

Sherman, John: clergyman; grandson of Roger Sherman; b. at New Haven, Conn., in 1772; graduated at Yale College 1792; was pastor of the First Congregational church at Mansfield, Conn., from Nov., 1797, to Oct., 1805, when he left that post on account of having adopted Unitarian principles; was for a short time pastor of a Unitarian church at Trenton Falls, N. Y., where he established and conducted an academy. D. at that place Aug. 2, 1828. He was the author of *One God in One Person Only* (1805), the first elaborate defense of Unitarianism that appeared in New England; and *Philosophy of Language Illustrated* (1826).
Revised by G. P. Fisher.

Sherman, John: statesman; b. at Lancaster, O., May 10, 1823; brother of Gen. W. T. Sherman; was admitted to the bar 1844; was a delegate to the Whig conventions of 1844 and 1848; sat in Congress 1855–61; was Republican candidate for the Speakership 1859, but was defeated after a prolonged contest; became chairman of the House committee of ways and means; was re-elected to Congress 1860, but before taking his seat was chosen U. S. Senator; re-elected 1866 and 1872; was long the chairman of the Senate committees on finance and on agriculture; took a prominent part in debates upon finance and the conduct of the war, was one of the authors of the reconstruction measures adopted 1866–67, and was appointed Secretary of Treasury Mar. 7, 1877. He was again U. S. Senator from Ohio 1881–97; president *pro tem.* of the U. S. Senate from Dec., 1885, till Feb., 1887. In 1888 he was a prominent candidate for the presidential nomination, which was finally awarded to Harrison. From Mar., 1897, till Apr., 1898, he was Secretary of State under President McKinley. Author of *Recollections of Forty Years* (2 vols., Chicago, 1895). D. Oct. 22, 1900.

Sherman, Roger, M. A.: signer of the Declaration of Independence; b. at Newton, Mass., Apr. 19, 1721; was in childhood apprenticed to a shoemaker, and followed that occupation until 1743, when he settled at New Milford, Conn., and joined an elder brother in keeping a small store; studied privately law, politics, and mathematics; was chosen county surveyor 1745; made for several years the astronomical calculations for an almanac issued in New York; studied law; was admitted to the bar 1754; sat for several years in the colonial assembly; removed to New Haven in 1761; was assistant governor nineteen years (1766–85), judge of common pleas and of the superior court twenty-three years; treasurer of Yale College 1766–76; sat in Congress from 1774 until his death; was one of the five members of the committee to draft the Declaration of Independence 1776; served on many important committees on the board of war and ordnance and on the treasury board; assisted in codifying the laws of Connecticut 1783; was one of the framers of the original Articles of Confederation 1777, and an active member of the Federal constitutional convention 1787; U. S. Senator 1791–93; and mayor of New Haven from 1784 till his death in that city July 23, 1793.

Sherman, Thomas West: soldier; b. at Newport, R. I., Mar. 26, 1813; graduated at the U. S. Military Academy July, 1836, when he was assigned to the artillery as second lieutenant and sent to Florida, where he served against the Indians until 1842; was subsequently employed in recruiting and in garrison until 1846; was promoted captain in May, 1846. In the war with Mexico he commanded his battery at Buena Vista, and was breveted major; again in garrison and on frontier duty 1848–61, in April of which latter year he attained a majority in his corps, and was assigned to guard the Philadelphia and Baltimore Railroad and to restore communications with Washington. On May 14 he was promoted to be lieutenant-colonel, and three days later appointed brigadier-general of volunteers. In the Port Royal expedition (Oct., 1861) he commanded the land-forces, which he had organized, continuing in command in South Carolina until the end of Mar., 1862, when he was assigned to the Army of the Tennessee as division commander, participating in the Corinth campaign (April to June). Transferred to the department of the Gulf, he commanded a division in the vicinity of New Orleans until May, 1863, when he joined the expedition to Port Hudson, and in the investment of the place commanded the second division Nineteenth Corps, forming the left wing of the besieging army. In the assault of May 27 he lost a leg while leading the assaulting column. Colonel of artillery June 1, 1863. Returning to duty in Feb., 1864, he held various commands in Louisiana until 1866, when he was mustered out of the volunteer service. He was breveted brigadier-general and major-general for gallantry, and Dec. 31, 1870, was retired from active service with the full rank of major-general. D. at Newport, R. I., Mar. 16, 1879. Revised by James Mercur.

Sherman, William Tecumseh, LL. D.: soldier; b. at Lancaster, O., Feb. 8, 1820; son of Judge Charles R. Sherman. From 1829, when his father died, he was reared in the family of the Hon. Thomas Ewing; in July, 1836, he was appointed a cadet at the U. S. Military Academy, and in July, 1840, he graduated and was appointed a second lieutenant in the Third Artillery; first lieutenant Nov., 1841. He served in Florida until 1842; was in garrison at Fort Moultrie, S. C.; in 1846 he was ordered to California, serving as acting assistant adjutant-general of the department of California until Feb., 1849, when he was transferred to San Francisco on similar duty on the staff of Gen. Persifor F. Smith, commanding the division of the Pacific. Ordered to New York in Jan., 1850, as bearer of dispatches, he was married on May 1 to Ellen, daughter of Thomas Ewing, then Secretary of the Interior. In September of that year he was transferred to the commissary department, with the rank of captain, and stationed at St. Louis and New Orleans until Mar., 1853, when, after a six months' leave of absence, he resigned from the army Sept. 6, 1853, to engage in the banking business in San Francisco; removed to New York in 1857, in which year the affairs of his firm were closed. In 1858 he removed to Leavenworth, Kan., where he practiced law until July, 1859, when he was elected superintendent of the proposed military academy in Louisiana. The institution was opened Jan. 1, 1860, as the Louisiana State Seminary of Learning and Military Academy, and Sherman remained at its head until Jan. 18, 1861, when he addressed a letter to the Governor asking to be relieved "the moment the State determined to secede." His request was soon after granted, and in the latter part of February he left for St. Louis, where for a short period he held the presidency of a street-railway. On May 14, 1861, he was appointed colonel of the Thirteenth Regular Infantry, and soon after his arrival in Washington was placed in command of a brigade in Tyler's division, which he led at the battle of Bull Run July 21. On Aug. 3 his commission of brigadier-general of volunteers was issued, to date from May 17, and Aug. 24 he was ordered to duty in the department of the Cumberland under Gen. Anderson, succeeding to the command of that department Oct. 8, 1861, but was relieved in November and sent to Missouri. After a brief service on inspection duty he was (Dec. 23) placed in command of the camp of instruction and post of Benton Barracks, whence in Feb., 1862, he was transferred to Paducah, Ky., to aid in the operations then in progress on the Tennessee river. Here he organized the division which he subsequently commanded at the battle of Shiloh (Apr. 6–7), where his conduct did much to check disorder and overcome the shock of the unexpected onset. Gen. Halleck reported that Sherman's firmness on the 6th saved the day. Grant officially announced that he was indebted to Gen. Sherman for the success of the battle. The advance upon and siege of Corinth next followed, resulting in the evacuation of that place May 29. In the meanwhile (May 1) he had been promoted to be major-general of volunteers. In July, having been assigned to command the district of Memphis, he occupied that place on the 21st, where he remained until called upon in December by Gen. Grant to take command of the expedition for the capture of Vicksburg. As this movement was intended to be a surprise, the preparations were hastily executed. Embarking his troops Dec. 21, a landing was effected on the 26th at Johnston's Landing, some 12 miles up the Yazoo. On the 29th the attempt to carry the position by assault was bravely made, but without success, and, owing to the surrender of Holly Springs, which overthrew Gen. Grant's plan of co-operation, re-enforcements were arriving to the enemy. Sherman returned to Milliken's Bend, where Gen. McClernand took command Jan. 4, 1863. Sherman was assigned to the Fifteenth Corps, which took a leading part in the assault and capture of Arkansas Post (Fort Hindman) on the 11th.

In the Vicksburg campaign which succeeded, Sherman bore a prominent part with his command—in the expedition up Steele's Bayou to the Yazoo (March); the feint upon Haines's

Bluff (Apr. 29–May 1); movement to Grand Gulf (May 1–6); capture of Jackson (May 14); the occupation of Walnut Hills; and subsequent assaults upon the land-defenses of Vicksburg (May 19 and 22), in each attempt the colors of the corps being planted on the enemy's works; and in the siege which resulted in the surrender of the city July 4, 1863. Sherman with a detached command was at once ordered to pursue Johnston, who with a relieving force had been lying E. of the Big Black, but retreated hastily on the news of the surrender, being eventually driven behind the intrenchments of Jackson. On the night of the 16th Johnston succeeded in escaping. After destroying the railways in all directions Sherman fell back to the W. of the Big Black, along which he lay when summoned (Sept. 22) to the relief of Rosecrans's beleaguered army at Chattanooga. Meanwhile he had been appointed brigadier-general in the regular army, to date from July 4. On Sept. 27 the last of his command were embarked at Vicksburg, reaching Memphis Oct. 4, whence he marched eastward, repairing the railway as he proceeded, until the 27th, when orders reached him at Tuscumbia from Gen. Grant, who had superseded Rosecrans, to abandon all work and hasten on to Chattanooga. On Nov. 15 Sherman arrived at that place, and, after viewing the situation, hastened back to his command, which by forced marches was in position on the 23d, and at 3 P. M. the next day had carried the north end of Missionary Ridge, which position he strongly fortified during the night. At sunrise on the 25th, by orders, Sherman attacked Bragg's right so furiously as to weaken the Confederate center, on which Gen. Thomas was thrown at 3 P. M., and by midnight Bragg's army was in full retreat. Sherman and Hooker pursued at daylight (26th) the routed army, the former turning back on the 29th to take command of the force for the relief of Burnside, besieged at Knoxville and reported to be unable to hold out later than Dec. 3. He moved rapidly, making the last 84 miles in three days, and Longstreet was compelled to raise the siege and retreat to Virginia, whereupon Sherman returned to Chattanooga and ordered his command into winter quarters. Since Oct. 27 Sherman had commanded the department of the Tennessee, though retaining command of troops in the field.

The following year (1864), on Feb. 2, Sherman moved out from Vicksburg with four divisions, and, making his way to Meridian, the great railway center of the Southwest and chief source of supplies for the Confederate army in that region, destroyed the railways in every direction, bridges, locomotives, etc.; but, owing to the failure of the cavalry division of Smith to perform its part, the expedition was obliged to return (Feb. 26). Gen. Grant having been promoted to be lieutenant-general, he named Sherman as his successor in command of the military division of the Mississippi, composed of the departments of the Ohio, the Cumberland, the Tennessee, and the Arkansas. Assuming this command about the middle of Mar., 1864, Sherman at once entered upon the task of organizing his army and enlarging his communications preparatory to the spring campaign, which was to be directed against Atlanta, Ga., and to begin simultaneously with the opening of the Richmond campaign by Grant. Accordingly, on May 6, Sherman set forth with his army from the winter quarters about Chattanooga. To oppose him was the army of Johnston, lying about Dalton and numbering not far from 45,000. Sherman's force numbered 98,797 men of all arms, with 254 guns. Johnston was compelled, by Sherman's flank movement, to abandon Dalton May 13, and fall back upon Resaca, which in turn he evacuated after a severe battle (May 15), and retreated to Allatoona Pass. Without attempting to force this strong position in front, Sherman, on the 23d, by a circuit to the right, marched on Dallas. Johnston took up a strong position about New Hope Church, where severe fighting occurred May 25–28. On June 1 Allatoona was occupied by Sherman and made a secondary base of supplies; on the 4th Johnston retreated to the strong positions of Kenesaw, Pine, and Lost Mountains. From June 10 to July 2 almost constant fighting occurred, when, after two unsuccessful assaults on Kenesaw (June 27), Sherman began (July 2) another flank movement by the right. That night Kenesaw was abandoned by Johnston, and by July 10 the latter had fallen back across the Chattahoochee and taken up a line covering Atlanta. Here he was superseded in command (July 17) by Hood. On this day Sherman completed his crossing of the Chattahoochee, and on the 19th and 20th the battle of Peach-tree Creek was fought, resulting in the withdrawal of the enemy to the intrenchments of Atlanta. On the 22d Hood, by a night march, had gained the left of Sherman's line, which he attacked furiously, a fierce battle ensuing, the enemy finally retiring to their defenses. A movement to flank Hood out of Atlanta by cutting the railways in his rear was in progress when (July 28) Hood made a vigorous attack, but was repulsed with great loss. On Aug. 12 Sherman was made a major-general in the regular army. Sending Kilpatrick out to destroy the railways in the rear, he swung around to the S. W., and by Aug. 28 his entire army, excepting the Twentieth Corps, was behind Atlanta, busily engaged in destroying the only railways by which that city was supplied. During the night of Sept. 1 Hood evacuated Atlanta, after destroying everything that could be used, and on the 2d Slocum with the Twentieth Corps entered the city. Sherman's losses from Chattanooga amounted to 31,687; the Confederate loss was near 35,000. Hood had been re-enforced from time to time, and had yet an effective force of 40,000. Sherman received in June Blair's Seventeenth Corps, numbering 13,000. Hood then drew off to about Lovejoy's, uniting with Hardee, while Sherman gave his army a much-needed rest. On Sept. 28 Hood resumed operations by crossing the Chattahoochee and operating against Sherman's communications, appearing before Allatoona Oct. 5, held by a garrison of 1,944 men. The repeated assaults of the Confederates were of no avail, and were finally abandoned, but not until 707 of the little band had fallen, while the loss of the enemy was not less. Hood then moved N. W., Sherman following as far as Galesville, Ala., when, becoming convinced that Hood's only design was to draw him out of Georgia, he abandoned further pursuit, and detaching the Fourth and Twenty-third Corps to re-enforce Thomas at Nashville, and leaving the latter to defend Tennessee against Hood, he ran back all the surplus property and supplies to Chattanooga, broke up the railway, destroyed Atlanta, and, cutting the telegraph behind him Nov. 12, started on the 15th upon his famous "march to the sea." The history of this march is well known. On Dec. 10 Sherman was before Savannah; Fort McAllister was carried on the 13th; and on the night of the 20th Savannah was evacuated while Sherman was on his way to Hilton Head to arrange for making this very step impossible. Returning to Savannah, he entered the city on the 23d. His loss from Atlanta was 809, including 103 killed, 428 wounded, and 278 missing. By resolution of Jan. 10, 1865, the thanks of the people and of the Congress of the U. S. were tendered to Gen. Sherman and his command. After resting at Savannah and refitting his army he moved northward Feb. 1. Columbia was occupied on the 17th; Cheraw, Mar. 3; Fayetteville, Mar. 11; the battle of Averysboro was fought Mar. 16; that of Bentonville, Mar. 19–20; Goldsboro was occupied Mar. 22; Raleigh, Apr. 13; and Apr. 18, at Durham Station, Sherman accepted the surrender of Johnston's army on a basis of agreement which was rejected by the Government, but on the 26th received the surrender on the terms accorded to Lee by Grant. Resuming his march, Washington was reached May 24, 1865, where, after the grand review, his army was dissolved. On June 27, 1865, he was appointed to command the military division of the Mississippi; was promoted to be lieutenant-general July 25, 1866, and Aug. 11 assigned to command the military division of the Missouri. On the accession of Gen. Grant to the presidency he became general (Mar. 4, 1869). In 1871–72 he made an extended tour in Europe and the East. In Oct., 1874, the headquarters of the army were removed from Washington to St. Louis, but in Apr., 1876, were re-established at Washington. He published in 1875 *Memoirs of General W. T. Sherman, by himself* (revised edition, 1886). Retired Feb. 8, 1884. D. in New York, Feb. 14, 1891. Revised by JAMES MERCUR.

Sherry Wine: SEE WINE AND WINE-MAKING.

Sherwood, MARY E. (*Wilson*): See the Appendix.

Sherwood, MARY MARTHA (*Butt*): author; b. in Stanford, Worcestershire, England, May 6, 1775; married Capt. Sherwood of the army 1803, with whom she lived in India 1804–18, settling on her return in Wickwar, Gloucestershire, where they lived many years. Her husband died in 1849; she died in Twickenham, Sept. 22, 1851. She was the author of 90 vols., chiefly with a moral object, and many for juvenile readers. The best-known are *Little Henry and his Bearer*, *Henry Milner*, *Ermina*, *Roxobel*, and *The Lady of the Manor*. A *Memoir*, with an autobiography, was published by her daughter, Mrs. Sophia Kelly (London, 1854), and an edition of her works appeared in New York about 1852.

Sherwood, WILLIAM H.: See the Appendix.

Sherwood Forest: a hilly region in the west of Nottinghamshire, England, between Nottingham and Worksop, about 25 miles in length by 8 in breadth. It was once a royal hunting-forest, and known to legend as the scene of Robin Hood's exploits. It is divided into farms, and it includes the town of Mansfield, several villages, and many parks and gentlemen's country-seats. The soil is gravelly and usually unproductive.

Shetland (or **Zetland**) **Islands**: a group of about 100 islands, of which 23 are inhabited, in the Atlantic Ocean between lat. 59° 50′ and 60° 52′ N., and belonging to Scotland. Area, 551 sq. miles. Pop. (1901) 27,755. The largest island is Mainland, with the town of Lerwick; among the others are Yell, Unst, Barra, and Foula. They are all treeless, high, and rocky, presenting steep, abrupt, and bold coasts, with fine natural harbors, and a rugged, wild surface in the interior. In the valleys some oats, barley, and potatoes are cultivated. The climate is mild and damp. Many cattle and sheep are reared, but the principal occupation of the inhabitants is fishing, especially for cod and herrings, giving employment to 7,500 men and 300 boats. Eggs form an important article of export. See Hibbert, *A Description of the Shelland Islands* (new ed. 1892).

Shevchen'ko, Taras Grigorovich: the greatest of Little Russian writers; b. Feb. 25, 1814. He was the son of the serf of a German landed proprietor in the government of Kiev, and from his childhood was exposed to brutal treatment, but picked up the rudiments of an education, early showing a talent for song and also for painting, which caused him to be apprenticed to a house-decorator in order to learn that business. In 1832, with his master, he moved to St. Petersburg, where he attracted the interest of the poet Zhukovskiĭ and others, who bought his freedom. At first all went well with him, but in 1847, owing to some of his writings and to his participation with Kostomarov (*q. v.*) in a society of which the Government disapproved, he was banished as a common soldier to the Asiatic frontier of the empire. In this vicinity he passed the next ten years, part of the time in prison and forbidden to write or paint. After the accession of Alexander II., the intercession of powerful friends procured his pardon, but although he began to compose again his health was broken and he died in St. Petersburg, Feb. 26, 1861. Shevchenko's *Kobzar*, a volume of lyrics in the Little Russian dialect, appeared in 1840 (new ed. 1860), and achieved great popularity. The deep poetic sympathy for the life of the people in these pieces made their author the idol of his countrymen, while the hopeless sadness and pessimism of his tone were the natural result of his own experiences. In 1841 he brought out *Haidamaki*, a Cossack epic, also the only Russian one with claims to greatness, and this was followed by *Hamalia*, *Maiak*, and other pieces. See article in the *Revue des Deux Mondes* (1874), and *The Peasant Poets of Russia*, by W. K. Morfill, in *The Westminster Review* (July, 1880). A. C. Coolidge.

Shib'boleth [from Heb. *shibbōleth*, ear of corn, stream, deriv of **shābhal*, increase, flow]: a test or password by which one's rank in society is indicated. It is recorded in Judges xii. that after Jephthah's victory over the Ephraimites the men of Gilead detected their fugitive enemies by requiring them to pronounce the word *shibboleth*, which the Ephraimites called *sibboleth*, and thus betrayed their origin; whereupon they were put to death.

Shield [O. Eng. *scield*: O. H. Germ. *scill* (> Mod. Germ. *schild*): Icel. *skjöldr*: Goth. *skildus*]: a buckler, a broad defensive weapon carried upon the arm to protect the body from blows and missiles. Most savage nations employ shields of some form, and all the nations of antiquity used them, as in mediæval Europe, down to the general introduction of gunpowder in warfare. The shield is of great importance in heraldry. For practical use, shields were of leather, wood, basketwork, etc. See Heraldry.

Shieldrake: See Sheldrake.

Shields: the name of two towns of England, about 8 miles from Newcastle, opposite to each other on the Tyne, near its entrance into the North Sea—North Shields on the northern bank, in the county of Northumberland; South Shields on the southern, in the county of Durham (see map of England, ref. 4–I). North Shields has two docks—the Northumberland, of 55 acres, opened 1857, and the Albert Edward, of 24 acres, opened 1884. There are large exports of coal and coke and imports of timber, grain and esparto-grass. North Shields forms part of the borough of Tynemouth (*q. v.*). The total tonnage entered and cleared at both ports, exclusive of that coastwise, was, in 1893, 3,540,869. South Shields is an old town, but is well built in its modern part. It has a town-hall, public library and museum, marine school, etc., and a park of 45 acres. The south pier, a breakwater nearly a mile in length, was begun in 1854, and is not yet completed (1895). The Tyne docks of the North Eastern Railway, covering 50 acres, are chiefly used for shipping coal and coke. The harbor is lined with ship and boat yards, and alkali, glass, and iron works. On an eminence overlooking the harbor are the remains of a Roman station where coins, portions of an altar, etc., have been dug up. South Shields sends one member to Parliament. Pop. (1891) 78,431.

Shields, Charles Woodruff, D. D., LL. D.: educator; b. at New Albany, Ind., Apr. 4, 1825; graduated at Princeton College (1844) and Theological Seminary (1847); pastor of Presbyterian churches at Hempstead, Long Island, 1849–50, Philadelphia, 1850–65; since 1865 Professor of the Harmony of Science and Revealed Religion in Princeton College; ordained priest in the Protestant Episcopal Church May 28, 1899. He has published *The Presbyterian Book of Common Prayer according to the Revision of the Westminster Divines* (New York, 1864; 4th ed. 1886); *Liturgia Expurgata* (Philadelphia, 1864; 3d ed. New York, 1884); *Philosophia Ultima, or Science of the Sciences* (vol. i., New York, 1877; 3d ed. 1889; vol. ii. 1889); *Order of the Sciences* (1884); *Religion and Science in their Relations to Philosophy*; *Essays on Church Unity* (1891); *The Historic Episcopate* (1894); and *The Question of Unity* (1894).

Shi-Hwang-Ti: See Chi-Hwang-Ti.

Shi'ïtes [Arab. *shiah*, sect]: the most numerous of Mussulman heretical sects. Their main characteristics are rejection of the Sunna (see Sunnites) and extravagant devotion to Ali, the son-in-law of the prophet Mohammed and the fourth caliph. The most advanced maintain that the revelation of the Koran was intended by God for Ali, but given to Mohammed through an error of the archangel Gabriel. The majority, however, are content with denouncing the first three caliphs, Abubekir, Omar, and Othman, as usurpers, and asserting that Ali was the rightful successor of Mohammed. The memory of the tragic death of Ali by murder, and of his two sons, Hassan and Housseïn, by poison and murder, inflames the Shiïtes to this day beyond conception and is annually commemorated with bloody rites. The bitterness of hatred between the Sunnites and Shiïtes has never been equaled even in the most envenomed wars of Christendom. To kill one Shiïte is declared by the Sunnites more acceptable in the sight of God than the slaughter of seventy Christians. In the treaties imposed by the Ottomans on Persia the first clause has commonly stipulated that the Persians, who are Shiïtes, should not hereafter curse the memories of the first three caliphs. The Shiïtes are found mainly in Persia, India, and among the Tartars. They number probably not more than 18,000,000, and are divided into many minor and hostile sects. E. A. Grosvenor.

Shikarpur': town; in the Presidency of Bombay, British India; in a low, level, regularly inundated, but fertile and not unhealthful plain; in lat. 27° 57′ N., lon. 68° 45′ E.; 15 miles W. of the Indus, with which it communicates by a canal (see map of N. India, ref. 5–A). It is an entrepôt for transit trade between the Bolan Pass and Karachi. Pop. (1891) 42,004.

Shiko'ku: the third in importance of the islands forming the empire of Japan: between lon. 132° and 135° E. and lat. 32½° and 34½° N.; area, 6,855 sq. miles. The mean temperature is about 59° F. The island comprises the provinces of Tosa, Awa, Sanuki, and Iyo. The surface is hilly, and there is no mountain over 4,600 feet high. The chief towns are Kochi, Matsuyama, Takamatsu, and Tokushima. Pop. (1891) 2,827,397. J. M. D.

Shil'laber, Benjamin Penhallow: humorist; b. in Portsmouth, N. H., July 12, 1814; entered a printing-office at Dover 1830; was a compositor at Demerara, Guiana, 1835–37, and in the office of *The Boston Post* 1840–47; was editorially connected with the latter paper 1847–50, acquiring celebrity by his "sayings of Mrs. Partington"; was printer and editor of *The Pathfinder* 1850–52; proprietor and editor with Charles G. Halpine ("Miles O'Reilly") of *The Carpet-bag* 1850–52; returned to the *Post* 1853–56, and was one of the editors of *The Saturday Evening Gazette* 1856–66: retired to his home at Chelsea, Mass., and devoted himself to

literature. He published several very successful volumes, among which were *Rhymes with Reason and Without* (1853); *Poems* (1854); *Life and Sayings of Mrs. Partington* (1854); *Knitting-work* (1859); *Partingtonian Patchwork* (1873); *Ike and his Friends* (1879); and *Wide Swath*, a volume of collected verse (1882). D. at Chelsea, Nov. 25, 1890. H. A. B.

Shilling [O. Eng. *scilling*: O. H. Germ. *scilling*: Icel. *skillingr*: Goth. *skilliggs*, possibly deriv. of *skellau*, ring]: a British coin containing 87·27272 grains of silver, ·925 fine, and equal to $\frac{1}{20}$th of a pound sterling, or to 24·3 cents U. S. Prior to Henry VII. the shilling was a money of account equal to a certain number of silver pennies, fixed at twelve by the Conqueror. When the decimal system was introduced in the U. S. the shilling had a value ranging from $\frac{1}{8}$th of a dollar in New York to $\frac{3}{14}$ths in Georgia.

Shi'loh [from Heb. *Shīlōh*, liter., tranquillity, rest]: an ancient town of Palestine; the present *Seilun*; 20 miles N. of Jerusalem. It was the seat of the ark of the covenant from the last days of Joshua to the time of Eli, but sank into total insignificance when the ark was carried away by the Philistines. Some insignificant ruins of a Roman town are found on the spot, but none of Jewish origin. A large fountain is in the neighborhood.

Shiloh: a locality in Hardin co., Tenn.; about 2 miles W. of Pittsburg Landing: on Tennessee river, taking its name from a rude log chapel there known as Shiloh Church. During the civil war and after the fall of Forts Henry and Donelson Gen. Grant moved by transports up the Tennessee, and by the middle of Mar., 1862, his army lay stretched out from Shiloh Church to Pittsburg Landing, the latter a mere steamboat landing, as its name implies. The division of Lewis Wallace was stationed at Crump's Landing, some 8 miles lower down and nearly opposite Savannah, at which last-named place Gen. Grant established his headquarters and dépôt of supplies. Gen. Buell, then on his way from Nashville, was to join with Grant at this point, when a general advance was to be made. Meanwhile Gen. Beauregard had assembled at Corinth, an important railway center 92 miles E. of Memphis, all the available forces from the Mississippi valley, where he was joined on Mar. 22 by the command of Gen. A. S. Johnston from Kentucky and Middle Tennessee, who assumed control of the combined forces of between 40,000 and 50,000 men; the order giving the detailed organization of the army was dated Mar. 29. Aware of Buell's approach, it was decided on the 2d to attack Grant before Buell could join him. The attack was arranged for the morning of the 5th, and on the 3d the Confederate army moved out from Corinth. A heavy rain and other causes delayed the attack until the 6th, when at an early hour the blow was struck, taking the Union army by surprise, and their front line was driven out of its camps, excepting two of Sherman's brigades, whose position outreached the first line of battle. These brigades resisted stubbornly, and by the personal efforts of Sherman a gallant stand was made, but their flank becoming exposed they were compelled to give ground and take position on McClernand's right, which was held until afternoon, when both divisions were forced back. Grant had arrived on the field at 8 A. M., and ordered Lewis Wallace to hasten up with his division, while he set to work to reform his troops and repair his lines. The divisions of Hurlbut and W. H. L. Wallace next received the enemy's attention, assault after assault being delivered along the whole line, but these were each time repulsed, until at about 4·30 P. M. Hurlbut's exhausted division fell back, thus compelling Wallace to retire half an hour later. At this moment that heroic leader, whose gallant defense had been the admiration of all, received a mortal wound. The road taken by Lewis Wallace's advance not leading him to the point where Grant wished him to go, he was compelled to countermarch, and did not reach the field till nightfall. The Union army was then crowded back nearly to the river, with all their encampments, some sixty guns, and 3,000 prisoners in possession of the enemy. During the brief interval, while the enemy halted in attack after the withdrawal of W. H. L. Wallace, the remaining Union artillery was hastily assembled by Gen. Webster, chief of Gen. Grant's staff, advantageously posted on a commanding ridge covering Pittsburg Landing, so that at 6 P. M. a renewal of the attack was successfully resisted, and, two gunboats adding their fire, the enemy withdrew. Buell's advance had reached Savannah on the evening of the 5th, but it was after 6 P. M. of the 6th when Ammen's brigade crossed—just at the close of the day's battle. By next morning all of Nelson's, Crittenden's, and McCook's divisions had crossed, and, with Lewis Wallace's, some 25,000 fresh troops were now available. The Confederate leader, Gen. Johnston, had fallen at 2·30 P. M. on Sunday, the command devolving upon Beauregard, by whom the plan of operations was prepared and carried out. At daylight on Monday Grant attacked along the whole line, but was gallantly resisted, a stubborn battle continuing until 4 P. M., when the Union lines of the day before and thirty guns were regained, and the Confederate army was in full retreat for Corinth; but pursuit was not pressed. Beauregard reported a loss of 1,728 killed, 8,012 wounded, and 959 missing. Grant's loss was 1,735 killed, 7,882 wounded, and upward of 3,000 in prisoners. The armies were about equal in strength on the first day, but on the second the Confederates were largely outnumbered. Revised by JAMES MERCUR.

Shimo'da: a port of Japan; situated at the extremity of the Idzu Peninsula, and interesting as being the earliest port opened for U. S. shipping (see map of Japan, ref. 7–D). It was first visited by Commodore Perry and the U. S. squadron in 1854, and became in 1857 the residence of Townsend Harris, the first U. S. representative in Japan, and it continued to be his residence until the substitution of Kanagawa (now Yokohama) in 1859. A frightful earthquake in 1857, accompanied by a tidal wave, devastated the town and injured the harbor, leaving a slippery rock-bottom. From Shimoda is shipped most of the stone used in Yokohama and the capital; the quarries are at Kisami in the neighborhood. Pop. (1890) 7,000. J. M. DIXON.

Shimonosek'i: town of Japan; at the southwestern extremity of the main island; in lat. 33° 56′ N. It was formerly the entrepôt for European goods coming from Nagasaki and destined for the interior of Japan; is now a port of entry (see map of Japan, ref. 7–A). It commands the Strait of Shimonoseki, which forms the western entrance from the open ocean to the Inland Sea. Pop. (1890) 12,000. During the summer of 1863 three vessels, U. S., Dutch, and French, were fired upon from batteries on the north shore of the Shimonoseki Strait, and the next year this insult was avenged by a combined fleet of these powers, acting along with Great Britain, which bombarded and destroyed the town. In a subsequent convention the sum of $3,000,000 was demanded by these four powers in compensation for "damages resulting to the interests of treaty powers" and for expenses of the expedition. The final installments of this indemnity were paid by the Japanese Government in 1874. The U. S. Government afterward refunded its share. Revised by J. M. DIXON.

Shiner: any one of several small North American freshwater cyprinoid fishes, with a compressed body and shining, silvery color. *Notemigonus chrysoleucus*, a form allied to the breams (*Abramis*) of Europe, but smaller, is one of the most abundant species in the streams of the Eastern and Middle States. The name is also loosely applied to various other silvery fishes, as the dollar-fish.

Shing-king: the most southerly province of Manchuria, sometimes called *Liao-tung* (which properly denotes only the part E. of the Liao river), and sometimes *Kwan-tung*, i. e. the region "east of the *kwan* or barrier," at the end of the Great Wall. It forms an irregular triangle, with the apex pointing southward into the Gulf of Peh-chili, and consists of a fertile alluvial plain in the S. W. and an elevated mountainous country in the N. and E. The chief ports are NIU-CHWANG (*q. v.*), Taku-shan, on the Ta-yang river, 12 miles from the Yellow Sea, and Pi-tse-wo, with a shallow but well-protected harbor, lat. 39° 18′ N., lon. 122° 18′ E. Capital, Mukden.

Shingles (a disease): See HERPES.

Shinn, GEORGE WOLFE: See the Appendix.

Shinn, WILLIAM POWELL: civil engineer; b. at Burlington, N. J., May 4, 1834. At the age of sixteen he was a rodman on an engineer corps of the Ohio and Pennsylvania Railroad (now Pittsburg, Fort Wayne and Chicago Railway), and a year later became assistant engineer. For twenty years following he was engaged as engineer, manager, and agent for important railways, involving trusts of great responsibility. He had charge, during 1873–79, of the buildings and operating of the Edgar Thomson steel-works at Braddock, Pa. From 1881 to 1886 he was vice-president of the New York Steam Heating Company, and from 1886 to 1891 he was vice-president and general manager of the New York and New England Railway Company. He published many papers on railway transportation, accounts, and economics.

which are regarded as of great value. He was elected president of the American Institute of Mining Engineers in 1880, and president of the American Society of Civil Engineers in 1890. D. at Homewood, Pa., May 5, 1892.

Shinshiú, or **True Doctrine** (known also as *Ikko-* or *Monto-shiu*): a powerful sect of Japanese Buddhists, having their headquarters at Kioto, in the great *Nishi* (West) *Hongwanji* temple. Its founder was a man of good family, Shinran Shonin (1173–1262 A. D.), who studied as a lad at Hiyeizan. (See Kioto.) The Shinshiu sect finds salvation in the "extinction of passion," a doctrine at once the cause and effect of salvation, which salvation is called Nirvâna. The doctrine of "help from another" is also taught, and Amita, or "the boundless" Buddha, is relied upon for the completion of merits and a rebirth into paradise. In this sect there is less difference than in any other between laymen and priests, the latter being allowed to marry and to eat flesh and fish.

J. M. Dixon.

Shinto (liter., Way of the Gods): the ancient cult of the Japanese, which has scarcely a title to be classed among religions, having no moral system and no eschatology. It has passed through three phases: the early stage, when it was part and parcel of the national life, and was as much political as religious; the second stage, when it had to struggle with the powerful and profound system of Buddhism, which almost swallowed it entire; and the modern stage, when a brilliant band of literary men sought to rescue it from the obscure condition into which it had fallen. These strove to identify it with a reformed patriotism and a restored imperialism, and their views finally triumphed in the restoration of 1868. The first period may be considered to have lasted until about A. D. 550, and its history is told in the *Kojiki* and the *Nihongi*, written a century and a half later —books which may be called the Japanese scriptures, in so far as they are concerned with the creation of the race and its early history from a religious standpoint.

Probably about the year 400 A. D. the ancestral worship out of which Shinto developed was so far organized that the home was no longer deemed sufficient, and a separate temple was erected. Over it was placed as custodian, or chief priestess, a daughter of the Mikado. When Buddhism arrived from the West in the sixth century it seems to have adopted wholesale the Shinto pantheon, and all that remained distinctive of the old ritual was the *gohei*. From this era is to be dated the term *Shinto*, way of the gods, in contrast with *Butsudo*, or way of Buddha, both Chinese terms. The *gohei* (liter., august cloth or present) was originally a piece of hempen cloth hung on the sacred *sakaki* (*Cleyera Japonica*) in honor of the gods. The material was changed successively to cotton, silk, and finally to paper. In modern temples all that is visible to the eye of the worshiper is a mirror and a bundle of these zigzag paper-cuttings attached to a rod. The paper is usually white, but on occasion a succession of *gohei* may be seen—yellow, red, black, white, blue—in honor of the gods of wood, fire, earth, water, and metal respectively. The wand plays a considerable part in the divination with which Shinto became associated during the thousand and odd years of its eclipse. The god was supposed to come in answer to the worshiper's call and to possess the wand, and through it the *gohei*, the whole rite resembling closely the Shamanism of Northern Asia. The priests of Shinto seem to have made clever use of the phenomena of water boiling on mountain heights at a low temperature, and of the heat-absorbing qualities of salt, in their ordeals of water and fire. See *Esoteric Shinto*, by Percival Lowell, in vols. xxi.–xxii. of the *Transactions of the Asiatic Society of Japan*.

The Tokugawa shogunate strongly favored Buddhism, with its gorgeous ritual and magnificent temples; but a reaction toward the simplicity of early Japanese life and customs set in among native scholars, Mabuchi (1697–1769), Motoori (1730–1801), Hirata (1776–1843) being the most prominent. This movement is known as the revival of pure Shinto, and was directly hostile to the dual rule under the shogunate. Satsuma, always less Buddhistic than the rest of Japan, led the restoration movement in 1868, and the result was altogether favorable to Shinto, which became the only state religion. Buddhist temples were stripped, "purified," and handed over to Shinto keeping. The revived religion, however, proved entirely too feeble to supplant Buddhism and quickly lost ground. "Pure Shinto," indeed, was largely the fad of scholars, for Buddhism had appropriated and assimilated almost everything that was dear to the people in their old religion.

The Shinto temple proper (*yashiro* or *jinja*) differs from the Buddhist *tera* (monastery or temple) in being thatched, destitute of furniture, smaller, and usually double. The inner shrine (*honsha*) at the back contains, carefully inclosed in a succession of boxes, the sword (if a male deity), or mirror (if a female), which is jealously guarded as the sacred treasure of the place. With this mirror the mirror exposed to view in the outer shrine or oratory (*haiden*) has nothing whatever to do, being a loan from Buddhism. Worshipers ascend the steps in front, strike the temple-gong with a rope provided for the purpose, smite or rub their hands together, and then depart after throwing some coins on the floor. At the entrance to the temple is a torii, or sacred arch. Shinto morality is practically a Rousseau-like following of natural impulses, and proclaims neither heaven nor hell; its priesthood is not a caste, nor wholly devoted to a religious life; it is largely a form of hero-worship, and intensely national, and its chief deity is Amaterasu, goddess of the sun, from whom the Mikado traces his descent.

Other deities are Susano, a kind of Mars, presiding over the moon; and his daughter Uga-no-mitama, popularly worshiped as Inari, the goddess of rice. Most of the deities appear to be deified human beings. See article on Ise; for Japanese mythology, the *Introduction to the Kojiki*, *Transactions of the Asiatic Society of Japan* (vol. x., supp.), and various articles in these *Transactions* by Ernest Satow.

J. M. Dixon.

Ship-building: naval architecture, or the art of designing and constructing vessels for navigation, and more particularly the larger vessels, or those which carry masts, whether intended for war or for commercial purposes. It is impossible to state with any degree of accuraey the time or the portion of the globe in which ship-building originated. Among razor-knives found in Denmark, belonging to the "bronze age" in Europe, are several with representations thereon of galleys which compare favorably with those of ancient Rome. The Phœnicians were the greatest commercial people of ancient history, and, instructed by the Egyptians, seem to have been the first to make material progress in the construction of vessels. Among the paintings in the tomb of Rameses the Great is a representation of a naval combat between the Egyptians and a people, supposed to be Phœnicians, whose ships are propelled by sails. A biblical reference to the power of Tyre, capital of Phœnicia, describes its vessels and their construction; the planking being made of the fir-trees of Senir (Hermon), the masts of cedars of Lebanon, the oars of the oaks of Bashan, the rowing-benches of ivory, and the sails of fine linen of Egypt. Reference is also made to mariners, pilots, calkers, and men of war, showing the progress made in the arts of ship-building and navigation. A peculiar feature in the construction of the ships of the Egyptians was the planking, which was about 3 feet square, and was laid overlapping, like shingles upon a roof, being fastened to the ribs or frames by wooden tree-nails. According to Herodotus the Nile vessels were fitted with rudders at the stern, thus antedating the application of that invention to seagoing vessels by several centuries. The vessels of the Phœnicians served as models to the Greeks, whose ships, at the height of their civilization, show a marked resemblance to those of the dwellers in Tyre.

Ship-building in Europe.—The nations of the north of Europe developed a class of vessels which, from specimens found buried in mounds in Scandinavia and Denmark, show a remarkable knowledge of the forms of least resistance, together with the strength of materials and their proper distribution, and suggest that the influence of the Phœnician ship-builders had in some way penetrated to the north of Europe.

Cæsar, in his history of the campaign against the Veneti in the year 54 B. C., states that their ships were built entirely of oak, and designed to endure the force and violence of the tempests; the rowers' benches were fastened by iron spikes; instead of cables, they secured their anchors with chains of iron. A Roman ship of the time of Trajan, sunk in Lake Ricciola, was raised after more than 1,300 years: the planking was of pine and cypress, covered on the outer side with sheets of lead fastened with copper nails.

The Greeks and Romans had a peculiar method of girding their vessels with long hempen cables, which, passing through holes at the stern-post, continued all around the vessel fore and aft immediately under the wales; also the hulls were undergirded transversely in the same manner.

The ropes were tightened by levers, and by shrinking when wet drew the members of the vessel closely together, after the fashion of hoops upon a barrel. The hulls were thus strengthened to resist the violence of heavy seas and for ramming.

The sailing vessels of the early Roman empire, such as those engaged in the corn-trade with Egypt, were the direct precursors of the large sailing vessels which superseded the galleys propelled by oars.

In the fifteenth century the Spaniards and French made great progress in the art of ship-building, the French being the first to apply the principles of mathematics to the design and construction of vessels. The English availed themselves of the researches of the French, and adopting the forms of the French vessels captured by them soon acquired renown as builders of fast and powerful vessels.

Ship-building in America.—The great forests of North America enabled the English colonists to take the lead in the production of vessels at small cost. For many years the models and methods of the English and French were followed, but the impetus given by the fitting out of privateers during the latter part of the seventeenth century and the beginning of the eighteenth did much to create a new era in American ship-building. As has been well stated, "there was assembled in New York between the year 1685 and the year 1700 such a swarm of fighting sailor-men, and such strong stimulus was given to the marine industries of ship-building, rope-making, and the putting up of sea-stores, that only a few cities in Europe could compare in completeness of equipment with New York."

In 1850 the ship-builders of the U. S. cut loose from the trammels of precedence and brought out the clipper ships which, owing to their remarkable performances, soon influenced the naval architecture of foreign nations. One of this class, the Red Jacket, of New York, made the trip from Sandy Hook to Melbourne, 12,720 miles, in 69 days and 11 hours; another, the Sovereign of the Seas, of Boston, sailed 5,391 miles in 22 days. The Great Republic was the largest of this class of vessels; she was 325 feet long, 53 feet wide, and 37 feet deep, with a capacity of 4,000 tons. She had four masts, the main-yard being 120 feet long; a suit of her sails contained 15,653 sq. yards of canvas, or sufficient to cover about 3¼ acres of land. So fleet were these vessels that for long distances, especially where the trade-winds could be utilized, they were scarcely inferior to vessels propelled by steam, and so were enabled to carry a large amount of the world's trade long after steam-vessels were successfully introduced.

A great change took place in the art of ship-building when the steam-engine was applied to ships. "The old proportions and forms so well suited for the speed of sailing ships and the forces impressed upon them were ill adapted for propulsion by the paddle-wheel, and still more so for propulsion by the screw." The form now adopted for propulsion by the screw has been arrived at by successive steps, as experience and investigation have pointed the way.

The investigations with regard to the strength of materials, the forms of least resistance, and the character of the stresses and strains brought upon ships from the action of wind and waves have brought ship-building almost to an exact science.

Materials.—Vessels are built of wood, of iron, of steel, and of a combination of wood and iron or steel. The era of wooden vessels in the U. S. reached its perfection in the building of the war-vessel Trenton, which was wrecked at Samoa during the great storm of 1889. Great Britain early saw the advantages of constructing its vessels, both merchant and naval, of iron, and has led the way in the development of iron and steel construction.

From the difficulty of obtaining the necessary strength without excessive weight wooden ships have been confined to moderate dimensions. Their advantages are the ease with which they can be constructed and consequent low cost, and the fact that below the water they can be covered with copper, which by exfoliation clears the bottoms of barnacles and marine growths, thus enabling them to remain afloat a long time without docking. On the other hand, owing to the nature of the material of which they are constructed, frequent and extensive repairs are necessary.

The introduction of iron and steel as a material for ship-building made possible ships of almost any size, the only limit being the cost of production and maintenance, and the size of existing docks. The difficulties experienced are deterioration from the action of salt water upon the metal, and the fact that barnacles and marine growths seem to claim the bottoms of iron and steel vessels as their own peculiar field for operation, especially in tropical waters, thereby retarding the speed to a marked degree, and making necessary the frequent docking of vessels to clean and paint the bottoms. To obviate this trouble many medium-sized vessels are built of iron or steel throughout, except the outer skin and deck plank, which are of wood. The bottom planking, being of wood, is readily coppered, while the framework and topsides, being of metal, confine the repairs chiefly to the renewal of the planking. This style of construction is called "composite."

Ship-designing.—It is not proposed to enter into a discussion of the theoretical principles involved in the science of ship-design, but simply to state certain conditions that confront the naval architect in the preparation of a design for an ordinary seagoing merchant vessel, and to illustrate the principal steps in the preparation of the design. The naval architect must provide a hull with continuous fair lines, alike pleasing to the eye and giving economy in propulsion—that is, no abrupt forms should be found tending to create eddies and so increase the resistance in propelling the vessel through the water. The vessel must have a certain capacity for carrying cargo, accommodation for a specified number of passengers and crew, and power sufficient to drive her at a given speed, with due regard to the economical consumption of fuel used in generating the power. A sufficient amount of coal must be carried to allow the machinery to be driven at full power during the entire trip. Appliances must also be provided that will enable the vessel to be under control at any and all times. It is the function of the naval architect to combine these features so that the vessel may be easy in her movements at sea, float at a predetermined draught-line, possess under all circumstances the property of returning to an upright position when inclined by the action of wind and waves, and to provide a structure that in all conditions of service shall have ample strength to resist any stresses brought to bear upon it. To effect this the naval architect must possess a knowledge of complex physical laws and a well-trained judgment in applying reliable experimental data. The minimum cargo capacity, passenger accommodations, speed, and the maximum draught are readily determined from the requirements of the company for which the steamship is to be built. The first step is to assume by comparison a total displacement of vessel that will fulfill the given conditions. The factors upon which the exact displacement or weight of the vessel depends are the power necessary to attain the given speed, with the weight involved, the amount of fuel necessary, and the weight of the hull structure. The most reliable method of determining the indicated horse-power required is to construct curves of the powers and speeds, ascertained by trial, of vessels similar in form but of different displacements. Similar vessels are those having the same ratio of length to breadth and to draught and the same degree of fineness. Mr. Froude found by repeated experiments that the resistances of such vessels, at speeds proportional to the square roots of their displacements, vary as the displacements. The speeds and powers taken from the platted curves are then raised by Froude's law of comparisons to the assumed displacement and a new curve drawn through the points thus established. From this curve the power required for the given speed may be obtained and the weight of the machinery ascertained by direct calculation. The amount of coal necessary is also computed direct from the power, experience having shown that an average of 2½ lb. of coal per hour is required for each indicated horse-power of the machinery. By comparison with the known weight of the hull of a similar vessel the architect is enabled to establish a ratio of weight of hull to volume of displacement that will allow him to fix upon a close approximation to the weight of the completed hull. Having then the weights of hull, machinery, coal, cargo, passengers, outfit, etc., the total weight or displacement of the vessel must equal the sum of these weights, so that the architect can at once begin the plans showing the underwater form of the vessel and make the necessary computation of cost. The behavior of the vessel at sea and the line at which the vessel will float depend upon certain geometrical properties of the form of the vessel. A ship floating at rest displaces a volume of water which is in weight equal to the weight of the ship. The weight of the vessel may be supposed to be acting downward through a point which is the center of gravity of the entire ship, including cargo, machinery, coal, etc. There is an equal force derived from

the buoyancy of the water acting in an opposite direction through a point which is the center of gravity of the volume of displacement, called the center of buoyancy. When the vessel is at rest in an upright position the two points lie in the same vertical plane. The position of the center of buoyancy is calculated about two axes—one taken at the load-line and the other at the mid-length of the vessel. In order that the vessel may float at a given draught at the bow and stern, the center of gravity of the vessel in a fore-and-aft direction must lie in the same vertical line with the center of buoyancy of the immersed body. When these points are thus located the vessel is said to be in trim and proves the correctness of the designer's calculations, for in order to ascertain with accuracy the position of the center of gravity of the vessel the weight of each particle that goes to make up the entire vessel must not only be calculated, but also its moment about some point in the length taken as an axis. In a similar manner, the vertical center of gravity must be determined in order to ascertain its distance, called the metacentric height, below the metacenter of the vessel. The metacenter is a point above the vertical center of buoyancy at a distance equal to the moment of inertia of the load-water plane divided by the volume of water displaced. The metacentric height is a measure of the initial stability of the vessel, but not of the range of stability. (See HYDROSTATICS, *Stability of Floating Bodies.*) For good easy behavior the metacentric height should not exceed 3 feet, and for safety not be less than 18 inches, provided that the vessel has a reasonable amount of free-board or height out of water. There are many other calculations that can be made in regard to the stability of the vessel in various conditions of load or when some of the compartments are filled with water.

The plans necessary to give a clear idea of the design are given below, but these must be supplemented by detail plans of the principal parts of the vessel: 1. Plan of lines, or half-breadth and body plan. 2. Midship section. 3. Profile inboard. 4. Deck plans. 5. Cross-sections. 6. Sail plan.

The plan of lines shows the form of the vessel, and is in reality the "traces" of planes taken at right angles to each other throughout the ship. From these the shape of the vessel is laid down full size upon the mould-loft floor. The midship section is taken at the mid-length of the vessel and shows the character of the framing, the disposition and thickness of the plating of sides and bottom, decks, bulkheads, stringers, etc., in fact, all the parts upon which the strength of the vessel depends. If the vessel is not built according to the rules of one of the insurance companies, plans and calculations showing the strength of the structure must accompany the application, and this involves considerable mathematical investigation, for the ship must be taken as a girder, and the maximum stresses the material is subject to calculated for the top and bottom flanges of the girder. The inboard profile gives the location of the principal weights in a fore-and-aft direction, the spacing of the frames, the location of bulkheads, the distances between the decks, the position of cargo hatches, and the portions devoted to cargo, coal, passengers, crew, etc. The deck plans and cross-sections show the general arrangement of the deck framing and plating, and the arrangement of the cabins and passenger accommodations. The sail plan gives the general outside appearance of the vessel, with the amount of sail carried, the height of masts, etc. The many questions of handling cargo quickly and effectively, of steering-gear for controlling the vessel, providing sufficient sail-power to prevent the vessel falling off in the trough of the sea when the machinery is disabled, the working and stowing of lifeboats, give the designer occasion for the careful application of scientific and experimental data. The work involved in the preparation of the design for a war-vessel is of a much more complex nature. The features of speed, armament, protection, accommodation, and endurance are so thoroughly interwoven and depend so much one upon the other that the emphasizing of any one feature must be at the expense of some of the others. Thus the most thorough and scientific investigation must be made of the vessel in all its features to enable the maximum of efficiency to be attained in the ship as a whole.

Laying Down.—The form of the vessel or the lines having been determined in the draughting-room, the frames or ribs are next drawn full size upon the floor of a building known as the mould-loft, in order that moulds or scrive-boards may be made, to which each frame is shaped or bent. To facilitate the work in the loft, the ship is divided into two parts called the fore and after bodies, being divided by an imaginary line amidships, or a point near which the curvature of the lines is reversed. On the bodies are laid off the edges of the plating, the line of the stringers and keelsons, the undersides of the decks, the outline of the floors, etc. For the wooden vessels the moulds represent the shape and taper of the frame timbers. Pieces of timber are then selected and worked exactly to the moulds, their edges beveled to conform to the curvature of the vessel taken from the mould-loft floor, and the joints or butts carefully doweled together. For metal vessels the moulds are made to show the shape of the outer edge of the frame and the line of the floors; the object in thus moulding, shaping, and bending the frames is to have them their true shape, so that when put together they shall form the outlines of a vessel agreeing with the plan of the naval architect, and giving, when the planking or plating is fastened to them, the complete outline of the hull. While this part of the work is going on, the shipwrights are preparing the foundation and laying the keel-blocks upon which the vessel is to be built.

Ordering Material.—For convenience in ordering the material of an iron or steel vessel an exact model of it is made in wood on a scale $\frac{1}{24}$th or $\frac{1}{48}$th of full size; on this model are marked off the stations or the frames, the deck-lines, the edges of the plating and stringers, and the plates laid off in their proper lengths so as to have a proper shift of the butts or joints. The dimensions of the frames and plates are then measured from the model, and after verification as to width in the loft are sent to the mills. An allowance is made for machining the plates, or such of them as form the outer strakes, for the inner strakes are often placed on the ship without planing the edges, the ends only being machined in order to have close joints for calking metal to metal.

Keel-blocks.—As the entire weight of the vessel must come upon the keel-blocks, it is essential that they shall have a very firm foundation, such as piling or concrete; they generally slope lengthwise toward the water, and are placed about 4 feet apart from center to center. Each block is built up of several pieces of timber, the bottom pieces often of sufficient length to serve as a foundation upon which to build up the supports of the launching ways; the upper pieces are in some yards so put together as to permit of being removed from under the keel without splitting, while in others the removal of the blocks is effected by splitting out the cap pieces. The blocks are generally given an inclination to the foot of from five-eighths of an inch in heavy vessels to three-quarters of an inch in light ones, to facilitate launching.

Keel.—The first operation, be the ship of wood or metal, is to place the keel upon the blocks; if the vessel is of metal the keel may be constructed after one of several methods. The bar-keel consists of a plain bar in suitable lengths with scarfed butts, the plating of the garboard strakes being flanged or turned down against the bars, and riveted through and through. Another variety is the side bar-keel, which is built up of three parts, the middle piece extending above the keel proper to a depth equal at least to the floors, and the garboard strakes being riveted through in a manner similar to that employed with the ordinary bar-keel; this is one of the strongest of keels, and also one of the most costly. Another variety, and one that, in these days of cellular or double-bottom construction, finds general acceptance, is the flat keel; this consists merely of flat plates bent to shape. If the keel laid is a bar-keel of either type, the garboard strakes are at once put in place to afford a landing for the frames. The stem and stern post are set up, and, if the vessel is of wood, the deadwood and other pieces in the center line are bolted in place.

Stem and Stern Post.—The stem of a metal vessel is usually a simple forging rabbeted to receive the ends of the plating—that is, a recess is cut in it on each side so that the plates may end in it and form a fair and flush surface. The stern-post, if of a single-screw vessel, is quite an elaborate forging, although of late years castings of steel have been substituted for forgings with great success. The post is made up of two parts in one, first the post proper on which the plating ends, and through which the screw-shaft passes, forming incidentally a part of the stern bearing, and second the rudder-post or the support of the rudder; the two connected form a continuous frame about the propeller. In twin-screw vessels the stern frame is scarcely less elaborate, for provision is usually made for heeling thereon the shaft brackets or struts which support the screws. The frame must also receive the ends of the hull-plates and support the rudder.

Raising Frames.—In wooden ships the frames are raised upon, and securely fastened to the keel, and are set at right angles to the keel, except that at the ends they are placed normal to the outside planking. These end timbers are called "cants," and are adjusted at their heels to mortises made in the deadwood. In iron vessels of the plainer class the frames and floors are often riveted up entire upon the ground, and then raised to their place upon the keel or garboard plates, but first the frames and floors must be bent to shape, and this is done as follows: The frames are usually of shape iron rolled in one length, either of angle bar, angle bulb, channel, or Z bars. The long bars are placed in a furnace especially designed for this purpose, and heated until they can be readily bent to the shape of the mould, which has been marked off upon the bending slabs; the slabs are of cast iron, from 3 to 4 inches thick, perforated with square holes closely set, and arranged so as to form a smooth floor of sufficient size to accommodate the largest frames, and give room to the workmen. In the square holes iron stops are placed agreeing in contour with the shape of the mould; the bars after being heated are forced back against the stops and at the same time beveled to conform to the bevels taken from the mould-loft floor. After cooling, holes are punched for the rivets used in connecting the frames with the floors, skin-plating, beams, etc.

The upper ends of the frames are held by crosspieces of plank, called spalls. Each frame is adjusted so as to be exactly perpendicular to the keel, and is held in place at the top by strips of timber called rib-bands, which have been prepared from measurements taken from the loft, and the proper positions of the frames marked thereon. The rib-bands and frames are shored up to keep them in position until the inner strakes of plating are on.

Main Keelson.—The main keelson is then placed upon the floors directly over the keel; if of wood, it is fastened through floors and keel, but if of metal it is riveted to the floors, they in turn being riveted to the outside plating. This keelson serves to keep the floors from tripping and enters into the stress-resisting element of the vessel.

Double-bottom Framing.—A much better disposition of the material, on the same weight, is known as the cellular construction or double-bottom system; on this system are constructed nearly all of the large and magnificent vessels engaged in the transatlantic trade, and nearly all war-vessels. The frames in the double bottom, or the space between the inner and outer skins, are made up of short frames and bracket-plates somewhat like the lattice-work of bridge girders, between the keelsons or longitudinals, so that the erection of the longitudinal and transverse framing must be carried on together; outside of and above the double bottom the raising of the frames is substantially the same as described above.

Putting on Planking or Plating.—Before the planking is placed on the vessel the sheer lines at side and the normal lines or spilings of the bottoms are marked on the outside surface of the frames; the spilings are found by fastening a broad, flexible, and straight-edged batten to the frames in such a manner as to cross the midship frame at right angles; the batten itself will then assume a line at all points normal or square to the frames of the ship. These lines are laid off at intervals of from six to eight seams or widths of planking. The planks are worked either in parallel strakes or in combination of two strakes with the alternate edges straight. This is sometimes called the "anchor-stock method," the object being to have the narrowest portion of one strake always opposite the widest portion of the other. The butts of the plank are shifted so as to have at least three strakes between butts in the same frame space. The strakes next the keel, called the garboard strakes, and those at the heads of the frames are made thicker than the balance of the plank, in order to have the greater amount of material at the parts of the vessel where the greatest strains are experienced. Before the planks are placed in position the frames are often bound together inside and strapped diagonally by iron bands 2½ to 3 inches wide; thus the frames are bound longitudinally by the planking and ceiling and diagonally by the bands. In metal vessels the plates forming the outside skin are worked in lengths from 12 to 20 feet, and in widths varying from 24 to 60 inches. Templates are constructed from the loft, giving the exact size of the plates with the position of the rivet-holes marked thereon; the plates are then planed to the required sizes and the rivet-holes punched and countersunk, and are then ready to be put in place. The inside strakes are placed in position first and bolted up. Templates of the rivet-holes in the edges are taken off for the outer strakes in order that the holes in the inside and outside strakes may exactly coincide for riveting. The necessary holes for the stringers and keelsons are also punched at the same time. As the finished surface of the vessel beneath the water must be smooth and free from all protuberances, the rivets that pass through the plates are beaten down to a conical head to fit countersinks in the outer surfaces of the plate.

Deck Beams.—The beams not only serve to carry the deck and its load, but are also struts and ties which prevent in a certain measure the ship's sides from collapsing; it is very necessary therefore that they shall have good connection with the frame and the outer skin. In wooden vessels the beams are made in one length, if possible, but are sometimes built up, that is, composed of several pieces of timber securely scarfed and bolted together. The beams rest at their outer ends upon clamps, which are thick pieces of plank running fore and aft on the inner side of the frames, and are securely fastened by means of vertical knees to the framing and planking. They are also braced in a longitudinal direction by smaller knees placed horizontally. The whole structure—beams, knees, clamps, frames, and planking—is thoroughly bolted and doweled together.

In order to give the beams strength to resist deck loads, and at the same time throw the water to the sides, where the waterways are located, they are slightly arched; the arch is called spring or round.

The beams of metal vessels are usually formed of iron or steel rolled to shapes known as T or angle bulb. They vary in weight and in depth from 4 to 15 inches. The lengths are taken from the plans and ordered in one piece for each beam, with the proper round or spring. The beam so ordered is slightly longer than the distance from side to side of the ship, to allow for turning down the lower half at the ends to form knees through which they are fastened to the frames. The method of forming the knee is to split the beam for a slight distance at each end, midway of its depth, and turn down the lower half upon a former; a piece of metal is then welded in to connect the upper and lower parts. After the beams are in position the spalls can be removed from the frames, leaving the space between decks free for the workmen. In framing the decks the beams are arranged to allow of the boilers and machinery being lowered to their beds without disarrangement of the deck-plating; provision is also made for the cargo-hatches, mast-partners, and other openings.

Inner Skin or Ceiling.—In wooden vessels the ceiling and the thick strakes and keelsons form a complete lining to the vessel, worked on the inner side of the frames. In metal vessels the inner skin is more often called the inner bottom, and is worked only when the vessel is constructed on the cellular system. It is usually placed from 3 to 3½ feet from the outer skin, to allow ready access for thorough inspection, cleaning, and painting. It is worked on the upper side of the bracket frames very much in the same manner as the outside plating is put on. For structural purposes the inner bottom enters largely as a factor of strength. Many freight-vessels, oil-steamers, and colliers are provided with inner bottoms, the space between the inner and outer bottoms being used as tanks for water ballast.

Bulkheads.—At certain positions throughout the ship are located water-tight partitions or bulkheads; those in the middle portion of the vessel are necessarily determined by the arrangement of the boilers and machinery, but every effort is, or should be, made to allow at least any two of the compartments bounded by the bulkheads to be filled with water without endangering the stability of the vessel. The foremost bulkhead of all is called the collision bulkhead, and is located half the maximum breadth of the vessel from the bow. This bulkhead is especially stiffened and braced to withstand the pressure of the water against it in case of injury to the ship forward of it. In metal vessels bulkheads have two functions to perform: one to serve as a structural tie uniting the sides of the vessel, the other, by far the more important, to confine the inflow of water in case of damage to the compartment injured. The pressure per square inch due to a head of water of 25 feet is about 11 lb. Very efficient stiffening must be provided to enable the plating to withstand such pressure. The best method of construction is to have the plating worked horizontally, with heavy vertical stiffeners bracketed at the heads and heels. The stiffeners may be of rolled shapes or built up of plates and angles, as the depth and width of the bulkhead may

require. In addition to the vertical stiffening, horizontal webs are sometimes worked on the opposite side of the bulkhead, with their ends securely bracketed to the ship's side.

Decks.—The upper deck, to which is carried the full scantling of the vessel, plays a very important part in the structural strength. The arrangement of the material subject to longitudinal stress may be compared to a beam of which the upper deck is the top and the keel the bottom flange, the outside plating forming the web of the beam; therefore in vessels of large size this deck is plated completely over in order to secure for the top flange of the girder the proper sectional area. On the ends of the beams are worked stringers of heavier plating than the balance of the deck-plating, making good connection with the sheer strake by means of heavy angle bars; the space between the stringers is filled in with plating as required. In wooden vessels the strength at the deck is made up through the waterways, thick strakes, and clamps, which are strong pieces of timber or plank running longitudinally.

The remaining decks of an iron vessel are worked in a manner similar to the upper deck. Where the frames pierce the plating staple-angles are sometimes worked about the frames to make them water-tight. Deck beams should be supported by stanchions; so far as possible these should be in the midship line, but for convenience of staterooms and deck arrangements they are sometimes worked two to a beam, and placed beside the joiner-work bulkheads.

Fastenings.—The fastenings of a wooden vessel are composed of copper and iron bolts, iron spikes, and treenails of wood. The plank is fastened generally by spikes or treenails, except at the butts, which are bolted. For additional security the frames, outside and inside planking, are often fastened together by through-bolts, driven from the outside and riveted on washers against the inside of ceiling. The deck plank is usually fastened by spikes. The fastenings of a metal vessel consist almost entirely of rivets, which are hammered into place while hot.

Calking.—When the planking is fastened the seams or slight spaces between the edges of the plank are filled with oakum, and this is driven in with great care until it is as hard as the plank. To hold the oakum the planks are laid with a slight bevel outward, about $\frac{1}{16}$th of an inch for each inch of thickness of plank; otherwise the oakum would be easily forced through the seam. An improved method is to cut a recess in the edges of the plank about midway of the depth, so that the oakum will spread into the recess and render it impossible to be driven through. After the calking the seams are paid with hot pitch or marine glue. In metal vessels all water-tight work must be calked metal to metal, that is, a slight layer of metal must be driven over against the adjacent metal until the joint is absolutely tight. This work was formerly done entirely by hand; now a calking-tool operated by compressed air or electricity is used, the blows being given with great rapidity.

Launching.—The vessel has been built resting upon the keel-blocks and shores; while here the shafting and propellers have been put in place, the rudder hung, the bottom painted, and all work below the water-line on the outside surface finished. Now the vessel is to be transferred from the fixed keel-blocks to a movable platform which shall allow the vessel to move easily and without damage into the water. This is done by building on each side of the vessel, about one-fourth of the breadth of beam from the keel, a platform or foundation to which the weight of the vessel shall be transferred. In laying the keel-blocks the bottom pieces were made of sufficient length to allow of their forming the foundation for this platform. On these are built up the groundways, which are shored to prevent spreading and are capped with strong pieces of timber, $3\frac{1}{2}$ to 4 feet wide, with smooth upper surfaces; on these are laid the bilgeways, which are also large smooth pieces of timber, free to slide with the vessel; on the bilgeways are constructed the cradles, which are fitted to the ship's bottom; between the cradles and the bilgeways are fitted rows of long wedges of such thickness that when driven up the vessel will be lifted from the keel-blocks, and the weight brought to bear on the groundways. The upper surface of the groundways and the bottom surface of the bilgeways are coated with tallow, and the bilgeways secured to the groundways by pieces of plank at the bow so that they can not move until they are sawn asunder. Then the wedges are set up until the keel-blocks can be removed and all clear for launching; when all is clear, the planks at the bow are sawn off, and the vessel, resting only on the greased surfaces, begins slowly to slide down the inclined plane; she soon gains headway, and in a few seconds is in the water. After launching, the fitting of the joiner work and cabins, the putting together of the machinery, stepping and securing the masts and rigging of the ship, are proceeded with until the vessel is complete in all respects.

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Ship-canals: canals intended for the passage of ships proper; hence, therefore, canals to connect sea with sea, and thus by a short cut to obviate a long ocean navigation. Such canals are usually laid across an isthmus or peninsula. The Suez Canal is an apt instance; so also are the projected canals across the Central American isthmus and the isthmus of Florida. The CALEDONIAN CANAL (*q. v.*) of Scotland is an instance of a class of minor ship-canals. In another sense ship-canals are those proposed to connect routes of natural navigation (rivers or lakes), by allowing a passage of the vessels, whatever they may be, used in such navigation. To this class belong many of the works described in the cyclopædia under separate heads—e. g. the ILLINOIS AND MICHIGAN CANAL (*q. v.*); see also the article CANALS.

The importance of a navigable connection between the Atlantic and Pacific Oceans through the isthmus which connects North and South America calls for a condensed view of the chief plans proposed at different dates, and of the natural obstacles baffling them all up to the present. From the era of the Spanish conquest of America the search for the secret of the supposed natural strait was carried on along the whole coast-line of the two continents; and when this ceased, the possibility of the construction of an artificial route began to be discussed. Governments, companies, and individuals have devoted much time and money to the search for a practical route for a ship-canal. Tehuantepec, Honduras, Nicaragua, Chiriqui, the Isthmus of Panama (or Darien), and the Atrato river, have all figured in connection with this question, and a full statement of the various surveys and projects made prior to 1866 will be found in the report of the superintendent of the U. S. Naval Observatory (Admiral C. H. Davis), made in compliance with a resolution of the U. S. Senate (*Ex. Doc.* $62^{3}_{1}{}^{2}$). See also *Engineering* (London), in a series of articles entitled *The Nicaragua Canal* (Feb. 24, 1893, *et seq.*).

The results of the surveys since 1875 of the American isthmus for ship-canals and their substitute, the ship-railway, will be found under *Nicaragua Canal* and *Panama Canal*, below, and in the article SHIP-RAILWAYS. Since 1879 important results at both Nicaragua and Panama have proceeded from efforts to construct the canals. The remaining projects have ended either in surveys and estimates, or in lapsed concessions from the governments on whose territory the canals were to have been constructed.

Panama Canal.—Across the Isthmus of Panama occurs, next to Nicaragua, the greatest depression yet found on the isthmus, the summit-level of the railway being 287 feet above sea-level. The route from Porto Bello or Chagres to Old or New Panama has been the established line of communication since 1653, nearly coeval with the first settlement in America. A survey was made in 1843 by the French engineer, M. Garella (*ingénieur-en-chef des mines*), of which the report was printed in the *Journal of the Franklin Institute*, and in the French *Journal des Ponts et Chaussées* (1844). George M. Totten, chief engineer of the Panama Railroad, subsequently made an estimate for a canal with locks, to cost from $60,000,000 to $115,000,000, according to the summit-level adopted. The survey was renewed by the U. S. Government, by Commander E. P. Lull, U. S. navy, resulting in the location of a practicable line for an interoceanic ship-canal, 26 feet deep, from the Bay of Aspinwall on the Caribbean Sea to Panama on the Pacific.

In 1879 Count Ferdinand de Lesseps made an appeal to the several nations to send delegates to a proposed congress to meet in Paris, to decide upon the route and the plan for an interoceanic canal between the Atlantic and Pacific Oceans through the American isthmus. On May 15 of that year the congress met in Paris. Twenty-four countries were represented. Count de Lesseps was elected president. The congress decided that a canal with a constant level was desirable, and that this canal should be by way of Limon Bay to Panama.

Immediately after the adjournment of the congress the Universal Interoceanic Canal Company was organized under

the French law for building the canal under a concession previously granted to Lieut. Lucien N. B. Wyse by the Government of Colombia, and sold by him to Count de Lesseps.

The total length of the canal as projected is 46 miles; the heaviest cutting, that in the Culebra, is 330 feet. The route in general follows that of the Panama Railroad. The dimensions of the canal are as follows: The breadth at the bottom is 22 to 24 meters (72 to 78 feet); the breadth at the surface of the water, 28 to 50 meters (92 to 164 feet); depth, 8½ to 9 meters (28 to 29½ feet). The curves on the canal are to have a minimum radius of 2,000 meters (6,560 feet). The greatest obstacle to be overcome on the Atlantic side, both in construction, maintenance, and operation, is the Chagres river. It was the original intention to dam back this river and carry its floods to the sea by an artificial channel along the slopes of the mountains, but the great cost and doubtful practicability of the plan led to its abandonment.

The canal, if built according to the original design, would require a tide-lock at Panama, where the ordinary range of tides is 18 feet. During storm-tides the range is much greater. The materials in general to be excavated are, on the marshes and valley of the Chagres river, a very fine alluvium in which is but little mineral silt; elsewhere, solid rock, clay mixed with conglomerate, with tufa (or compressed volcanic ashes) in the Cerro Culebra. From Culebra to Panama the route is through pyroxenic rock, sandstone tufa, and conglomerate. The total amount of materials to be excavated in the canal proper, according to the originally steep sections, is 143,000,000 yards, and, with the lateral cuts for the Chagres river, not including those required for the Chagres dam at Gamboa, is 13,000,000 cubic yards, or a total of 156,000,000 cubic yards.

The original estimate made by the Panama Canal congress was 600,000,000 francs = $120,000,000. At the close of the year 1888 the amount expended, not all on the actual work, however, was 1,000,000,000 francs, equal to $200,000,000. It was necessary to raise much more money, as there was at that time not more than one-third of the whole work completed. It was found impracticable to raise this money except by a lottery loan, but this scheme failed, and work ceased on the isthmus in 1889. A commission sent out by the French Government reported that it would cost $342,000,000 to complete the canal. The canal was thrown into the hands of a receiver, M. Monchicourt being appointed by the Government as liquidator. In 1890 he estimated that it would require to complete the canal at sea level three milliards of francs, or about $600,000,000.

Nicaragua Canal.—The Nicaragua route follows the most deeply marked depression of the American isthmus, and has the natural advantage of the great lake of the same name as a canal-feeder. It would perhaps be more directly in the world's highway than the Panama route. A route for a ship-canal was in 1850 surveyed by Orville Childs, C. E., whose report will be found in the *Journal of the Franklin Institute*, June, 1870. A Government survey was also made by Commander Edward P. Lull, U. S. navy.

In 1879 a commission was appointed by President Grant for examining the reports of the various isthmian surveys. After an examination of all the routes they reported and estimated the cost of construction, including the harbor improvements, as at least $100,000,000. Other estimates were those of Maj. Walter McFarland, U. S. A., $140,000,000, and of A. G. Menocal, C. E., U. S. N., $40,910,839. A congressional committee which investigated the subject and the estimate of Mr. Menocal placed the total cost at $92,881,124.

Concessions have been given to various companies by the Nicaraguan Government. The first given to a U. S. company was that called "the Vanderbilt concession of 1849." This was abrogated in 1856 on account of the non-fulfillment by the company of the conditions of the concession, but in 1857, by another administration, the concession was renewed, to be abrogated only upon the decision of arbitrators who have as yet not been appointed. The concession of 1849 and the complications that existed, particularly on account of the claim by Great Britain to the territory at the northern terminus of the canal, led to a treaty (still in force) between the governments of the U. S. and Great Britain, called the Clayton-Bulwer Treaty of Apr. 19, 1850, which in Article I. states: "The governments of the U. S. and Great Britain hereby declare that neither the one nor the other will obtain or maintain for itself any exclusive control over the said canal." On Jan. 10, 1888, a bill was introduced in the U. S. Congress to incorporate the Maritime Canal Company of Nicaragua under a concession granted by that Government. This bill became a law on Feb. 20, 1889. In the meantime the Nicaragua Canal Construction Company was incorporated under the laws of the State of Colorado. This latter company contracted with the canal company to complete the surveys and construct the canal. In June, 1889, the preliminary work on the construction was begun. Before Oct., 1890, over $2,000,000 had been expended, as certified by the Nicaragua Government commissioners, the concession requiring this expenditure within three years after the inception of the work.

The route which was finally located and on which work has been begun is from Greytown, on the Atlantic, to Brito, on the Pacific, 169½ miles apart. In detail, the line of the canal extends from Greytown in a southeasterly direction 9¼ miles through the low grounds of the heavily wooded plains and swamps. The cross-section of the canal here is to be 120 feet wide at bottom, 288 feet at surface, and 28 feet deep. Lock No. 1 will have a lift of 31 feet; dimensions of lock, 650 feet by 80 feet. Lock No. 2, 1¼ miles from No. 1; lift, 30 feet. Lock No. 3, about 2 miles from No. 2; lift, 45 feet. About 3 miles from No. 3 is the "Eastern divide" cut, 2·9 miles long; summit depth of cut, 298 feet; average depth entire length of cut, 141 feet; material mostly rock; dimensions of the cut, 80 feet at bottom, 80 feet at surface, with ⅕ to 1 slopes above water; depth of water, 30 feet. The route from the divide cut is through the basin of the San Francisco river. It is a tributary of the San Juan and flows across the axis of the canal. It and all other openings are dammed up to make an impounded reservoir, or lake, extending from the divide cut 12½ miles to the main San Juan at Ochoa, where the river is to be dammed by an immense work of loose rock, to be hauled from the divide cut. This dam is to be 70 feet high, 1,900 feet long, and it will raise the water above it to a level of 106 feet above the sea, and this will raise the level of Lake Nicaragua from 105 feet, its present level, to 110 feet above the sea.

The San Carlos river now discharges into the San Juan above the dam site, and the lower reach of this river must be dammed also. From 6 to 8 miles of embankments are required, some of them 60 feet high, to impound and hold the waters.

Several waste weirs, or sluices, to relieve the basin of excessive flood waters, are provided for in the plans. These dams and embankments will make slack-water navigation from lock No. 3 to the lake.

Considerable dredging is required in the river channel, especially near the lake, for about 20 miles. It is then necessary to dredge 20 miles out into the lake, as the shore has a very flat slope. On the opposite side of the lake submarine rock dredging is required for 9 miles. The depth from shore to shore of the lake is to be 30 feet. From the Ochoa dam to the west shore of the lake the distance is 121·04 miles, the lake being 56½ miles wide. From the lake to the Pacific the distance is 17·04 miles.

There are three locks, Nos. 4, 5, and 6, located near each other. Their lifts are each 42½ feet, No. 6 having a variable lift on account of the fluctuations of the tides of the Pacific.

The harbor of Greytown before 1855 was a good and capacious port. Drifting sands have closed up its connection with the sea and only a shallow lagoon exists, with its entrance practically closed to navigation. The work of restoration has been attempted by building a jetty out from the shore about 1,000 feet and dredging a channel under its protection, which is about 12 feet in depth. The work thus far executed is some dredging on the axis of the canal by the great Panama dredges, which were purchased and taken to Nicaragua, and the construction of several miles of the ordinary railway, to be used as an auxiliary to the canal work; also some clearing in advance of the work and a telegraph line for some distance. At Brito, on the Pacific, is an open roadstead which must be inclosed by heavy stone dikes, or breakwaters. The cost of the entire work, estimated in May, 1889, by the commission of civil engineers employed for the purpose by the construction company, is $87,799,570. On account of financial difficulties the work was suspended in 1893. See SHIP-CANALS in the Appendix.

Florida Ship-canal.—The U. S. Congress has made a number of appropriations for surveys for a Florida ship-canal. Four routes have been surveyed under the direction of the Secretary of War; these surveys were made in 1824, 1855, 1856, and 1878–79. A survey was made by the city of Mobile in 1872, but with the exception of discussions on the subject nothing has been done for some time to pro-

mote the undertaking. For a full history and complete statement of facts see the *Florida, Atlantic, and Gulf Ship-canal Company*, published in New York (1881); also report of Gen. Quincy A. Gillmore, in the annual report of the chief of engineers U. S. army (1880).

Cape Cod Ship-canal.—To shorten the distance and avoid the dangers of navigating around Cape Cod a proposition for a ship-canal between Barnstable Bay on the north and Buzzard's Bay on the south has been brought forward. Probably the best route follows a natural depression between Sandwich on the north coast and Monument, at Buzzard's Bay, on the south, a distance of about 8 miles. At an earlier geological period this depression was a sea-channel separating Cape Cod from the mainland, and it is so low even now that within the nineteenth century the storm-tides have met each other.

Many examinations, surveys, and reports were made from 1776 to 1878, when Clemens Herschel, C. E., made an exhaustive report on the subject, and estimated the cost of a canal and jetties with a depth of 18 feet at mean low water, and a width of 111 feet, at $2,000,000 in cash.

Although the State Legislature has granted many charters to different companies, yet very little actual work has been done on the construction of the canal. There are (1895) several bills for charters before the present session of the Legislature.

Suez Canal.—According to Diodorus Siculus (B. C. 60) there was a canal from the Gulf of Pelusium (not far from the present terminus of the canal) to the Red Sea. It was begun by Necos, continued by Darius, and finished by Ptolemy II. The canal was said to be wide enough for two galleys to pass abreast.

For the modern canal nothing was done except to make careful surveys until 1849, when the project of a ship-canal was finally taken up, to be carried through by Count Ferdinand de Lesseps. After the route had been carefully surveyed and favorably reported on, the Viceroy of Egypt granted the first concession to M. de Lesseps in Nov., 1854. At Constantinople, where de Lesseps had an interview with the prime minister, the project was favorably received; but through the interest of the representative of Great Britain, Lord Stratford de Redcliffe, the sanction was not given. In order to place the subject prominently before commercial nations de Lesseps wrote to the principal foreign ministers, asking that they would name engineers of high rank, and would secure their uniting in a commission to examine the routes for a ship-canal. The commission met and appointed a sub-commission to prosecute the study of the proposed route on the ground, which they did, and presented to Said Pasha a preliminary report dated Alexandria, Jan. 2, 1856. The commission rejected the plan for an indirect canal from Alexandria as "inadmissible from a technical and an economical point of view," and reported in favor of a direct route, making an estimate of 200,000,000 francs as the cost of the work. A second concession was given on Jan. 15, 1856, the terms of which were designed to satisfy the opposition which had already begun in Great Britain, and to guarantee fair returns to the stockholders who might invest. The viceroy made an official declaration for himself and his successors, subject to the ratification of the sultan, that the canal and all its ports should be open at all times as a neutral highway to every merchant ship passing from one sea to another, without any exclusive distinction or preference to persons or nationalities. The statutes which were to govern the company fixed its capital stock at 200,000,000 francs.

The Egyptian Government engaged to furnish a contingent of the fellaheen, and the work was at once begun. The location of the northern terminus of the canal was changed from Pelusium to Port Said. The first work on the canal was at this terminus, and was begun on Aug. 25, 1859, by de Lesseps in the presence of about 150 persons. For a description and illustration of the artificial harbor at Port Said, see HARBORS.

From Port Said the distance across the isthmus in a direct line is about 70 miles. The length of the canal is 100 miles, of which over 60 per cent. is through shallow lakes. The material excavated was usually sand, but in places it was necessary to blast through strata, 2 or 3 feet in thickness, of solid rock. The total excavation was 80,000,000 cubic yards.

On account of the complications with Great Britain and its opposition to the construction of a canal, obstructions were placed in the way of the work from time to time which greatly delayed its completion and increased its cost. The most important result was the withdrawing of the fellaheen from the work by peremptory orders from the British Government to the viceroy. Although the work was delayed by this, it served to bring into use a much more extensive plant of machinery, specially constructed to perform work hitherto done by men. The appliances thus used were various and very efficient. With them the contractors excavated 50,000,000 cubic meters, with the assistance of less than 4,000 men and in the space of less than five years. The work was all performed in daylight.

The canal was formally opened by vessels from nearly all the maritime nations of Europe on Nov. 17, 1869. The canal at that time was in a very imperfect state, not being fully completed in width and depth, but the company has since finished the work and maintained the depth needed. The canal has a sufficient depth and width to permit the safe passage of ships drawing 25 feet of water. The following table shows the increase in the number of ships, tonnage, and receipts:

YEAR.	Number of vessels.	Net tonnage.	Receipts from tolls and passengers.
1870	486	435,911	* $869,152
1875	1,494	1,887,578	5,286,158
1880	2,026	3,057,421	7,501,627
1885	3,624	6,335,753	12,423,354
1890	3,389	6,890,094	12,882,502
1891	4,207	8,698,777	16,789,113
1892	3,559	.....	14,890,475
1893	3,341	7,710,000	14,133,722
1894	3,352	8,039,106	14,770,081

* Computed at 5 francs to the dollar.

In the concession it was laid down that the maximum charge was to be 10 francs per ton "of capacity." The business of the canal became so great that it was necessary to widen and deepen it. This work is now nearing completion. The new dimensions are 31·2 feet depth; bottom width, 108·2 feet; surface width, 420 feet; area of prism, 8,240 sq. feet. There are sidings—called *gures*—excavated for the passage of vessels at several points; the radius of the curves is 2,000 feet. The cost of the canal as originally completed was $95,000,000.

The Corinth Canal.—This canal extends from the Bay of Corinth to the Gulf of Athens. It was across this isthmus that the Athenians, 300 years before Christ, hauled their triremes, which are thought to have been of about 150 tons burden. The canal saves 185 miles (342 km.) from Adriatic ports and 95 miles (178 km.) from Mediterranean ports. The average tolls are 18 cents per ton and 20 cents per passenger. The length of the canal is 3·9 miles (6,290 meters), part of which is excavated in alluvial soil and part in calcareous and granitic soft rock. There is no lock or tunnel, it being a sea-level canal. There are generally quiet harbors at each end, but jetties have been constructed for further protection. The width of the canal is 22 meters (72 feet) at bottom, and 24·20 meters to 28 meters (79½ to 92 feet) at the low-water level. The depth of the canal below low-water level is 8 meters (26¼ feet). The heaviest cutting is about 79 meters (259 feet); the average cutting is 45 meters (147½ feet). The amount of material excavated was 11,500,000 cubic meters (14,453,400 cubic yards). The total cost was nearly $5,000,000. The work was begun in 1884, but suspended at various times by financial embarrassments. It was completed so as to permit its inauguration by the King of Greece on Aug. 6, 1893, but it was not opened to navigation until Nov. 9, 1893. Owing to the slips of the canal sides, developed in the original excavation, it was found necessary to construct retaining walls for rather more than half of its length. The total amount of masonry in these walls and used in protecting the slopes of the cuttings was 165,000 cubic meters (216,000 cubic yards).

Cronstadt and St. Petersburg Canal.—This is a work of great strategical and commercial importance to Russia. The plans were matured in 1874, and work was begun in 1877. The canal and sailing course in the Bay of Cronstadt are about 16 miles long together, the canal proper being 6 and the bay channel 10 miles, and extend from Cronstadt, on the Gulf of Finland, to St. Petersburg. The available depth prior to its construction was 9 feet in the river. The canal, opened in 1890, is navigable for vessels drawing 20½ feet; its greatest width is 350 feet and its least width 220 feet; the total cost was $9,000,000. For a descriptive and historical sketch, see London *Times*, Oct. 17, 1884.

The Brussels Canal in Belgium is (1895) approaching realization. This has been contemplated and urged for over 400 years. The distance by water from Brussels to Antwerp is about 32 miles, of which 17½ are on the Willebrach Canal, now 10½ feet deep, 4½ miles on the canalized river Rupel, and 8 miles on the Scheldt. Vessels of 300 to 400 tons can now sail to Brussels, but the narrowness of the canal and locks excludes larger vessels. It is intended to deepen the canal to 21½ feet. The cost is estimated at $5,000,000.

Manchester Ship-canal.—The city of Manchester, England, is situated on the Irwell, about 50 miles from the Liverpool bar. The canal avoids cost and delay in transshipment at Liverpool. In 1882 a plan was proposed by E. Leader Williams as engineer, and James Abernethy as consulting engineer. The terminus in the estuary of the Mersey was to be a point opposite Garston. The canal in the estuary was to consist of low training-walls. Several modifications were made in the route and plans of the canal during the various discussions that took place in Parliament. The final total estimate on the plan before that body in the spring of 1884 was £6,904,186 12*s.* 2*d.* The plan was opposed in Parliament by the Mersey docks and harbor board on the ground that it would reduce the depth on the Liverpool bar at the mouth of the estuary, and as this view was sustained by James B. Eads, the engineers of the ship-canal changed the route so as to reach the estuary at Eastham, about 6 miles from Liverpool, on the south bank of the estuary. The necessary parliamentary approval was then obtained.

The locks for admitting vessels at Eastham (three in number) are respectively 600 feet long by 80 feet wide, 350 feet long by 50 feet wide, and 150 feet long by 30 feet wide. The four other sets of locks between there and Manchester are of similar dimensions. The total length of the canal is 35½ miles. The total rise from the ordinary water-level of the canal at Eastham to the docks at Manchester is 60 ft. 6 in. Dividing this between the four sets of locks gives an average rise of about 15 ft. 1½ in. All the lock-gates are worked by hydraulic power. Sluices are provided on Stoney's patent. The railways and highways crossing the route of the canal have been raised by expensive constructions, so as to give a clear height of 75 feet for the vessels traversing the canal. An ordinary canal was carried across by a swinging aqueduct composed of a long iron caisson resting on a pivot pier.

The canal is excavated throughout its whole length to a minimum width of 120 feet at the bottom, and it averages 172 feet wide at water-level. The upper portion, from Barton to Manchester, is 170 feet wide at the bottom and 230 feet at water-level. At the various locks the canal is widened considerably, and vessels can be turned there if necessary. The width adopted permits large steamers to pass each other at any part of the canal. The minimum depth of the canal is 26 feet. The sills for all the locks are placed 28 feet below water-level to allow future deepening of the canal by dredging. Extensive docks have been constructed at Manchester, and at Warrington there is one of 23 acres. The time required for navigating the whole length of the canal is from five to eight hours.

The masonry, both brick and stone, used in the locks, basins, piers, and retaining walls is of the best quality, both in materials and workmanship. The total amount in cubic yards of brickwork is 175,000, and 220,000 cubic yards of masonry. The lower portion of the dock and lock walls is made of concrete, the culverts being lined with masonry of brickwork. At the water-level granite or limestone fender courses, slightly projecting from the face of the wall, are inserted to protect the concrete facing. The deepest cutting is near Runcorn, where, for a short distance, it is 60 feet. The cutting with the largest prism is at Latchford, where, for a distance of 1½ miles, the depth averages 55 feet. The slopes of the excavations varied with the nature of the soil from 1 to 1 to 2 to 1. In the lock excavations the sides are nearly vertical. The total amount of excavation in the canal and docks was about 46,000,000 cubic yards. 10,000,000 cubic yards of which was in sandstone rock. All this waste material from the canal was used in filling up the bends of the river Mersey which are cut off by the canal, and in raising the low lands so as to make them available for shipping, building, and other purposes. The canal was opened for operation throughout on Jan. 1, 1894. The total cost was about $77,000,000. The excess over the estimated cost ($46,000,000) was largely due to extraordinary cost of right of way. The engineer of the work was Sir E. Leader Williams.

The Baltic and North Sea Canal (now known as the *Kaiser Wilhelm Canal*), between the Baltic Sea and the North Sea, in Germany, opened June 20, 1895, was constructed mainly for military and naval purposes, although largely used for general mercantile traffic. The work was begun June 6, 1887. The canal is 61·31 miles long, the terminal in the Baltic Sea being at Holtenau, at the harbor of Kiel. The route lies mostly through marshes, shallow lakes, and the valleys of two small rivers, the summit of the watershed being about 79 feet above sea-level. The normal water-level is that of the Baltic Sea, but there are protective locks at each end. The canal has a depth of 29·52 feet below mean water. The width at bottom is 72 ft. 2 in. and the minimum width on the surface is 190 ft. 3 in. Six passing-places of ample length and width are provided. The total amount of earth removed was about 107,000,000 cubic yards, and the total cost of the canal was about $39,000,000. E. L. Corthell.

Ship-fever: See Typhus Fever.

Shipley, Orby: clergyman and author; b. at Southampton, England, July 1, 1832; educated at Cambridge; was for twenty-three years a clergyman of the Church of England; was received into the Roman Catholic Church Oct. 26, 1878; edited many ascetic and devotional works; translated from Catholic authorities three volumes of religious poetry (*Lyra Eucharistica*, *Messianica*, and *Mystica*) and a number of volumes of essays by different authors (*The Church and the World*, *Tracts for the Day*, *Ecclesiastical Reform*, *Studies in Modern Problems*, *Carmina Mariana*).

Shipman, Nathaniel: See the Appendix.

Ship-money: a tax formerly laid in England on the cities, ports, towns, and boroughs of the kingdom in order to provide and furnish ships for a navy. It was first imposed about 1007 to resist the invasion of the Danes. Ship-money was among the wrongs complained of in England in 1641, and was one of the causes which led to the death of Charles I. on Jan. 30, 1649. He was very much in need of money, and Parliament, which alone could vote him a subsidy, he would not convoke, or perhaps he dared not. He then undertook to levy a tax on his own authority, the so-called ship-money. Such a tax had been levied previously without any special vote of Parliament, but only in the sea-towns and coast-districts, and only in time of war; it was simply another form of the old duty resting on this part of the country of furnishing ships for the navy. In 1636 the king arbitrarily extended this tax to the inland counties and to times of peace. John Hampden (*q. v.*) was taxed twenty shillings, but refused to pay, and asked for a decision by the courts. The courts decided against Hampden, holding that the ship-money was not a tax, but in 1640 and 1641 the Long Parliament declared this exaction illegal, and the bill stating this principle received the assent of the king in Aug., 1641.

Shipp, Albert Micajah: educator; b. in Stokes co., N. C., Jan. 15, 1819; graduated at the University of North Carolina 1840; became a Methodist preacher 1841, president of Greensboro Female College 1848, Professor of History and English Literature in the University of North Carolina 1849, president of Wofford College, South Carolina, 1859, and Professor of Exegetical Theology in Vanderbilt University, Nashville, Tenn., 1875. He was author of *History of Methodism in South Carolina* (1887). D. June 27, 1887.

Shippard, Sir Sydney G. A.: See the Appendix.

Shippen, Edward, LL. D.: jurist; b. in Philadelphia, Pa., Feb. 16, 1729; studied law in Philadelphia and at the Temple, London, where he was admitted a barrister 1750; became prothonotary of the Supreme Court of Pennsylvania and judge of admiralty 1753; held various judicial positions, and was chief justice of Pennsylvania 1799–1806. D. in Philadelphia, Apr. 16, 1806.—His daughter Margaret was second wife of Benedict Arnold. F. S. A.

Shippensburg: borough (laid out by Edward Shippen in 1734, incorporated in 1819); Cumberland co., Pa.; on the national pike road, and the Cumberland Valley, the Phila. and Read., and the W. Md. railways; 11½ miles N. N. E. of Chambersburg, 41 miles W. of Harrisburg (for location, see map of Pennsylvania, ref. 6–F). It is in an agricultural region; has large deposits of iron ore in its vicinity; and contains water-works, gas and electric-light plants, macadamized streets, paved sidewalks, the Cumberland Valley State Normal School, a national bank with capital of $75,000, 2 weekly newspapers, and manufactories of clothing, furniture, hosiery, engines, flour, carriages, and fly-nets. Shippensburg was the seat of the first courts of the county,

the headquarters of Gen. Braddock's army, and the site of several colonial forts built to protect the settlers from Indians. Pop. (1880) 2,213; (1890) 2,188; (1900) 3,228.

JOHN C. WAGNER, EDITOR OF "NEWS."

Shippigan': post-village in Gloucester co., New Brunswick; on the Gulf of St. Lawrence, near the northeast angle of the province: 254 miles N. of St. John (see map of Quebec, etc., ref. 3–I). It has a magnificent harbor, which serves as a port of refuge, and important herring, cod, and mackerel fisheries. It occupies an important point in the scheme to shorten the transatlantic passage. It is the proposed terminus of the Continental Railway, and from this port ferry-steamers are to cross to St. George's Bay, Newfoundland. Just beyond Shippigan is the wide flat island of Miscon, said to be the best district for plover in the Dominion. Pop. 2,500, nearly all French-Canadians. M. W. H.

Shipping-articles: See SEAMAN.

Shipping, Law of: the body of rules governing the ownership and employment of vessels, as well as the relations and conduct of persons engaged in their navigation. It is a branch of MERCANTILE LAW (*q. v.*).

What is a Ship?—The term has a very broad signification in this branch of the law, unless narrowed by a statute. Whether a particular water-craft is subject to the rules of shipping depends not on its size, form, capacity, or means of propulsion, but upon the use for which it was designed and to which it is put. Hence a floating elevator, a steam-dredge, and a floating bath-house have been treated as ships, because intended and employed for navigation and transportation. A bath-house built on several boats, with a view to its transportation whenever and wherever desired, is to be deemed the permanent cargo of the boats. *Public Bath No. 13*, 61 *Federal Reporter*, 692.

Ownership of Vessels.—This may be acquired by capture (see *The General Usages of War* under INTERNATIONAL LAW), by operation of law, as in the case of the bankruptcy or the death of the former owner, or by contract between the former and the present owners. A contract to purchase a vessel from a ship-builder and to pay the price in installments as the work progresses does not pass the title to the purchaser until the vessel is in a deliverable state and the purchaser is notified thereof, unless the parties stipulate that it shall pass sooner. Such has been the rule always in the U. S. (*Clarkson* vs. *Stevens*, 106 U. S. 505), and was finally established in Great Britain by the House of Lords in *Seath* vs. *Moore*, 11 Appeal Cases 350 (A. D. 1886).

The present sale of a chattel passes title to the purchaser at common law, although the contract is oral, and the chattel is not delivered nor the price paid, except in cases within the statute of frauds. (See FRAUDS, STATUTE OF.) This rule is believed to apply to ships in the U. S. British courts, however, declare that "a ship is not like an ordinary chattel; it does not pass by delivering, nor does the possession of it prove the title to it," and that as well by the law merchant as by the Merchant Shipping Act (17 and 18 Vict., c. 104, §§ 55–65) a bill of sale is necessary to the transfer of title from the seller to the purchaser of a ship.

Because of the costliness of ships and of the risks and repairs incident to them, it has been customary from an early period for several persons to unite in their ownership. Generally the title of such persons is that of part-owners and not of partners—a form of title much older than that of partnership (see PART-OWNERSHIP), although by agreement they may constitute themselves partners. If part-owners of a vessel can not agree as to its employment, English mercantile law permits the majority in value to "employ it upon any probable design," upon their giving a stipulation to the dissenting owners, in a sum equal to the shares of the latter, either to restore the ship or to pay the value of such shares. Such dissenting owners then bear no part of the expense and reap none of the profits of the adventure. This rule is based on the idea that ships "are built to plow the sea, and not to lie by the walls"—that their employment is a matter of public concern. If the part-owners are equally divided, the court will decide between them. In the U. S. it has gone to the extent of ending such conflicts by forcing a sale of the vessel, but in Great Britain it never exercised such power until authorized by statute. (24 Vict. c. 10, § 8).

Liability of Owners.—English maritime law determined the liability of ship-owners for the conduct of persons in charge of the vessel on their behalf by the common-law rules of agency. (See AGENT.) In case of loss occasioned by their agents, their responsibility was coextensive with the loss. Such was not the rule of the general maritime law of Europe. By that rule innocent owners were chargeable for the acts of the master and crew to the extent of their interest in the ship only, and if the ship was lost their liability was at an end. The reason given by Grotius for this rule is that men would be deterred from owning and operating ships if they were subject to the fear of an indefinite liability for the acts of the master. This fear induced Parliament to limit the liability of ship-owners (see preamble to 7 Geo. II., c. 15), although British legislation has not adopted fully the doctrine which prevails on the Continent; it leaves innocent owners responsible, in many cases, to the value of ship and freight immediately before the injury, although the ship be destroyed or injured by the same act, or afterward on the same voyage. (See 17 and 18 Vict., c. 104, § 503, and 25 and 26 Vict., c. 63. §§ 54–56.) The U. S. Government has abolished the English rule which it inherited, and has adopted the continental rule, graduating the liability by the value of the ship after the injury as she comes back into port, and the freight actually earned; and enables the owners to avoid all responsibility for acts done without their privity or knowledge, by giving up the ship and freight, if still in existence, in whatever condition the ship may be; and without such surrender subjects them only to a responsibility equivalent to the value of the ship and freight as rescued from the disaster. U. S. Rev. Statutes, §§ 4282, 4283; *The Scotland*, 105 U. S. 24.

Master's Duties and Powers.—The master is responsible for the proper navigation of the ship, and is entitled to the obedience of all the officers and crew. He is bound to exercise due care and skill in keeping the vessel in a seaworthy condition, and in properly guarding all interests committed to him by the owners of the ship or of the cargo. Accordingly, he has authority to make contracts relative to the usual employment of the ship and to its repairs and necessaries. He may even sell it when the prosecution of the voyage becomes impossible and immediate necessity to sell exists. His power to pledge the ship and crew is described in the articles on BOTTOMRY and RESPONDENTIA (*qq. v.*). When the vessel is in her home port, or subject to the supervision of the SHIP'S HUSBAND (*q. v.*), the master's implied authority is greatly limited.

Nationality and Registration.—The registration of British ships begins with the Navigation Act of 1660 (12 Car. II., c. 18, § 10), whose professed object was "the increase of shipping and encouragement of the navigation of this nation, wherein, under the good providence and protection of God, the wealth, safety, and strength of this kingdom is so much concerned"; but whose real objects, according to Blackstone, were dealing a blow to the sugar islands and "clipping the wings of those our opulent and enterprising neighbors." (1 *Commentaries* 418.) Under this act ships might be registered as a rule by English owners, whether built in England or elsewhere; but a statute of the next year required them to be of English building. (13 and 14 Car. II., c. 11, § 6.) This remained the policy of Great Britain until 1850. The subject is now governed by 17 and 18 Vict., c. 104, which provides that any ship may be registered which is owned by natural-born subjects, or by persons legally naturalized or denizated, or by corporations established under the laws of, and having the principal place of business within, the British dominions. Unless registered, a ship is not to be recognized as a British ship, so as to be entitled to any of the advantages or to the protection enjoyed by such a ship, or to use the national flag or to assume the national character.

The registry laws of the U. S. are based upon an early act of Congress (ch. i. of 1792) which copied very closely the English statute then in force. (26 Geo. III., c. 60.) Only vessels built within the U. S. and belonging wholly to citizens thereof, and vessels which may be captured in war by citizens of the U. S. and lawfully condemned as prize, or which may be adjudged to be forfeited for a breach of the laws of the U. S., being wholly owned by citizens, or vessels wrecked in the U. S. and purchased and repaired by a citizen, in case the repairs cost three-fourths of the value of the vessel when repaired, can be registered (U. S. Rev. Stat., §§ 4132 and 4136), with the exception of a limited class provided for by ch. 63 of the laws of 1892 and other special statutes. The place of registration is the vessel's home port. In order to register a vessel, the owner must take and subscribe the oath required by statute, must give a bond that the certificate of registry shall be used solely for this vessel, must produce a certificate of construction from the carpen-

ter who built it, and must have it surveyed. If the ship or any interest therein is sold, or if it is altered in form or burden, a new registry is required. If the vessel is not to be engaged in foreign commerce, but in the coasting trade or in fishing, instead of being registered it must be enrolled, if of 20 tons and upward, or if of less than 20 tons it must be licensed. (U. S. Rev. Stat., §§ 4311–4390.) Under this legislation U. S. ships have a virtual monopoly of the coasting trade.

Inspection of Steam-vessels.—The owners of registered or enrolled steam-vessels navigating the public waters of the U. S. are required to have them inspected from time to time, and to obtain a certificate that they are suitable for the service in which they are employed. U. S. Rev. Stat., §§ 4399–4462.

Many of the rules relating to this branch of the law are set forth in other articles and need not be repeated here. See Admiralty, Average, Bill of Lading, Carriers, Common; Charter-party, Demurrage, Freight, Jettison, Lien (*Maritime Liens*); Marine Insurance, Pilot, Road, Law of the; Salvage, Seamen, and Stoppage in Transitu.

The literature on this subject is very extensive. Among the most important treatises are Abbott, *Law of Merchant Ships*; Dixon, *Law of Shipping*; Maude and Pollock, *Law of Merchant Shipping*; Parsons, *Law of Shipping*; Reeves, *History of the Law of Shipping and Navigation*; Wynkoop, *Vessels and Voyages*.

Francis M. Burdick.

Shipping-master: See Seaman.

Ship-railways: railways for the transportation of ships overland between separated bodies of navigable water. The connection between the water and land-transportation is effected by lowering the ends of the railway-tracks into the water to such a depth that the ship floats on and off a carriage or cradle. This is done by means of hydraulic lifting-docks, inclined planes, or any of the other methods in common use for raising ships out of the water for repairs.

Method of Operating a Ship-railway.—The cradle, having on its deck a line of supports along the center to receive and sustain the keel, with other supports for the bilges arranged on each side, is lowered on the rails into the water. The vessel is then brought into position and the cradle is raised to a bearing along the keel, and the bilge-supports are adjusted to place, after which the cradle and vessel are lifted out of the water to the level of the tracks on shore. The motive power is then applied, and the ship is taken across the railway line to the other harbor and lowered into the water by the means employed in raising it.

Early Methods of Overland Transportation.—Transportation by means of portage is the most ancient form of artificial navigation. The first ship-road recorded is one that was used through centuries, the Diolcus of Corinth, which existed at the time of Aristophanes, 400 B. C., and which is said to have been in operation 300 years. It connected Schænus to Port Lechæum, and its remains can still be seen there. It is thus described in the *Lexicon* of Cornelius Schrevelius: "A track on the Corinthian isthmus where ships were hauled out of the Ionian into the Ægean Sea." The ships carried are said to have been about 150 feet long and 18 feet wide, with a draught of 8½ feet. It is very probable that before the Diolcus was built the practice of transporting ships overland was long in use, for the ability to handle such ships as those mentioned must have had a long and slow development, with the limited knowledge and power at the service of the engineers of those days. It is said that this method of ship transport was employed by the Greek admiral Nicetas Ooryfas in the year 831 to attack the Arabian corsairs who were then devastating the coasts of the Peloponnesus.

In 1438 the Venetians transported under the direction of Nicolo Sorbolo, a civil engineer of Venice, a fleet of thirty-three vessels overland from the river Adige to Lake Garda, a distance of 90 miles, the motive power on the plains being oxen and on the mountains windlasses worked by men. The largest ships of the fleet averaged 148 feet in length, 40 feet beam, with a displacement of 300 tons, and were armed with the ponderous stone-throwing artillery of the period, and laden with large stores of cross-bows, arrows, lances, and all the usual munitions of war in vogue.

The object of the expedition was to relieve the city of Brescia, at the time besieged by the Milanese. This was accomplished in a measure, but the Milanese captured and burned the fleet. Early in the spring of 1440 a larger and more powerful fleet was in like manner transported to Lake Garda, and accomplished the relief of Brescia. Thirteen years later, at the siege of Constantinople in 1453, the mouth of the Golden Horn being closed to their ships by heavy chains, the Turks moved a large fleet from the Bosphorus into the Golden Horn behind the chains in a single night, over rudely constructed timberways 5 miles long, thereby almost doubling the length of line which the besieged had to defend, and largely contributing to the city's fall and the consequent end of the Greek empire. In 1718 Swedenborg conveyed a shallop, two galleys, and four large boats 5 leagues over mountains and valleys from Stromstad, Sweden.

Application of Railways to Navigation.—The first application of railways to navigation occurred in providing substitutes for locks on canals and in one notable instance for the canal itself. The Bude Canal in Cornwall, England, between Bude and Launceston, has been in use since 1826. At Hobbacote Downs the canal-boats, which are furnished with small iron wheels, ascend to the uplands by an inclined plane 900 feet long provided with two lines of rails terminating at each end in the canals. There are seven of these inclined planes on the Bude Canal.

The Morris and Essex Canal in New Jersey is operated with inclined planes connecting different levels.

Before the Pennsylvania Railroad was built a portage railway 30 miles long was in operation across the Alleghanies between Johnstown and Hollidaysburg, upon which canal-boats were carried in sections from one canal to another.

In 1860 Sir James Brunlees and E. C. Webb proposed to the Emperor Napoleon III. a ship-railway across the Isthmus of Suez in lieu of the ship-canal. Marshal Vaillant, Minister of War, referred the matter to M. de Lesseps, who rejected the idea. It was proposed to make the railway level throughout, have ten rails in its track, and to use there for the first time the hydraulic lift invented by Edwin Clark, and since so successful at the Victoria Docks and elsewhere. The speed was to be 20 miles per hour; that on the ship-canal, for steam-vessels, is 5 miles per hour, a difference in favor of the ship-railway which, as soon as its practicability is demonstrated elsewhere by everyday use, may cause it to supersede its one-time successful rival. Messrs. Brunlees and Webb also in 1872 prepared plans for a ship-railway which the republic of Honduras proposed to build across its territory from Puerto Caballos to the Bay of Fonseca. It was to carry vessels of 1,200 tons, and doubtless would have been successful had the republic found the money to carry out the work. Another plan of great interest for a ship-railway was that of Sir John Fowler for passing the cataracts of the Nile.

The Chignecto Railway.—In 1875 H. G. C. Ketchum, C. E., of Fredericton, New Brunswick, proposed a ship-railway as a substitute for the Baie Verte Canal across the Isthmus of Chignecto, to connect the navigation of the Gulf of St. Lawrence and that of the Bay of Fundy. From the report in 1783 of Col. Robert Morse, chief of the Royal Engineers, recommending the construction of the Baie Verte Canal as an important necessity of commerce, the question of where and how it should be built was never allowed to drop. In 1822 the first actual survey for a canal was made by the government of New Brunswick, and from that time until Mr. Ketchum's survey in 1881 of the ship-railway line there was no possible canal route that had not been gone over and reported on, so great was the interest of Government and individuals in the question. The ability and perseverance of Mr. Ketchum, and the superiority of a ship-railway for the purpose intended, finally carried the day. The proposal to form a company to build a ship-railway was accepted by the Dominion Government, and an annual subsidy of $170,602 was granted for twenty years. The company was not to call on the Government for any portion of the subsidy except what might be necessary to make up the net earnings of 7 per cent. on the authorized capital of $5,500,000, and it agreed to pay over to the Government half of the surplus profit beyond the 7 per cent. until the whole of the subsidy which might have been paid to the company should be repaid.

In 1888, under Sir John Fowler, Sir Benjamin Baker, and H. G. C. Ketchum as engineers, the construction of the Chignecto ship-railway was begun. It is 17 miles long, and on a straight line from end to end, running through a country moderately rolling, with only one watercourse to cross, and generally favorable to the rectilinear location and $\frac{2}{10}$ per cent. maximum grade adopted.

Fig. 1 shows a vessel as it will look on the lifting-dock

ready for transportation. The vessel, resting on blocks along its keel and bilges, is supported on platform-cars 38 feet wide, carried on 240 wheels, arranged in four lines to run on two tracks of standard gauge, 18 feet apart between

Fig. 1.

centers. The gridiron on which the ship and cradle move up and down in the lifting-dock is like the deck of a bridge with floor-beams arranged in pairs, slightly separated to admit the hydraulic presses between them, and are connected in the usual way by track-stringers under the rails. The hydraulic presses are 25 inches in diameter and twenty in number, and are designed to lift a vessel carrying 1,000 tons of cargo, together with the cradle and gridiron, a total weight in all of 2,500 tons. They are placed 21 feet apart longitudinally and 64 feet transversely, and have a maximum stroke of 40 feet. The cross-heads on the inner cylinders or rams are attached to the floor-beams with eye-bars.

When a vessel is to be lifted the gridiron, with a cradle on its tracks, is lowered, and the vessel is hauled into position with hydraulic capstans. Water is then forced into the presses until the keel-blocks are brought to a bearing; next the bilge-blocks are drawn into place and the pumps are again started, raising the gridiron in less than ten minutes to a position where its tracks are slightly above those of the railway. A connected system of heavy iron chocks, supported by the masonry, is then moved under the ends of the girders by hydraulic power, the gridiron is lowered to a bearing on them, and its tracks are connected with those of the railway. Two locomotives will haul the ship across the isthmus in less than two hours, and the lifting-dock at the other end by a reverse operation quickly replaces it in the water.

The track is composed of rails weighing 110 lb. per yard, laid on very heavy ties, some of which extend under all four rails. It is stone-ballasted, on the most solid cuttings and embankments, and is characterized by smoothness and rigidity.

A novel feature is the way in which the difficulties arising from the immense tides of the Bay of Fundy are overcome. A basin 500 feet long and 300 feet wide is constructed at the south end. The entrance-gates and sea-walls are of heavy masonry, the top being at the common level of the top of the lifting-dock and railway. The top of the gate proper is 17 feet lower, or 13 feet below high water spring tide, and retains a minimum depth of 32 feet in the basin. The lifting-dock at the inner end of the basin is 270 feet long. Vessels will be able to enter or leave during the high stages of the tide, while the excellent anchorage off shore, and the large storage capacity of the basin, insure a continuity of traffic uninterrupted by the fluctuations of the bay. This pioneer ship-railway is (1895) more than three-fourths finished. Awaiting the completion of this great work are many others that are projected, and whose construction will doubtless quickly follow.

The Hurontario Railway.—This is to connect Georgian Bay with Lake Ontario at Toronto. It is to be 66 miles long, probably in one straight line; the maximum grades going south (the direction of heaviest traffic), 8 feet per mile; going north, 22 feet per mile; its track will consist of six rails, and the estimated cost is $15,500,000. The available water-power along its line is over 100,000 horse-power, from which electricity for doing all the work of operating the railway will be generated. The saving in distance over the route around by way of Detroit is about 300 miles, while the country through which it is to run favors facility and permanence of construction.

Columbia River Railway.—A boat-railway along the Dalles of the Columbia river, U. S., between Three Mile Rapids and Celila, is under way, Congress in Aug., 1894, having appropriated $100,000 for the preliminary work. The novel feature of this work is the proposed use of one-degree curves on the railway. The track would be similar to the Chignecto ship-railway, and the general features are also alike with some variation in details to suit the flat-boat traffic for which it is designed.

The Tehuantepec Railway.—This was first proposed by Capt. James B. Eads in 1879, and with characteristic energy, in a few years, in the face of almost universal opposition, he pushed through all the stages of preliminary surveys, detailed plans, congressional inquiries, procurement of concessions from Mexico, and some actual construction at a cost of more than half a million dollars. A table of the distances the railway would save is unnecessary, for it is plain that lengths and breadths of continents are involved. With the opening of the Suez canal, one of the two great barriers to interoceanic navigation was removed. The completion of the Tehuantepec ship-railway would remove the other.

Tehuantepec was selected as the proper location because of its greater proximity to the U. S., its superior advantages

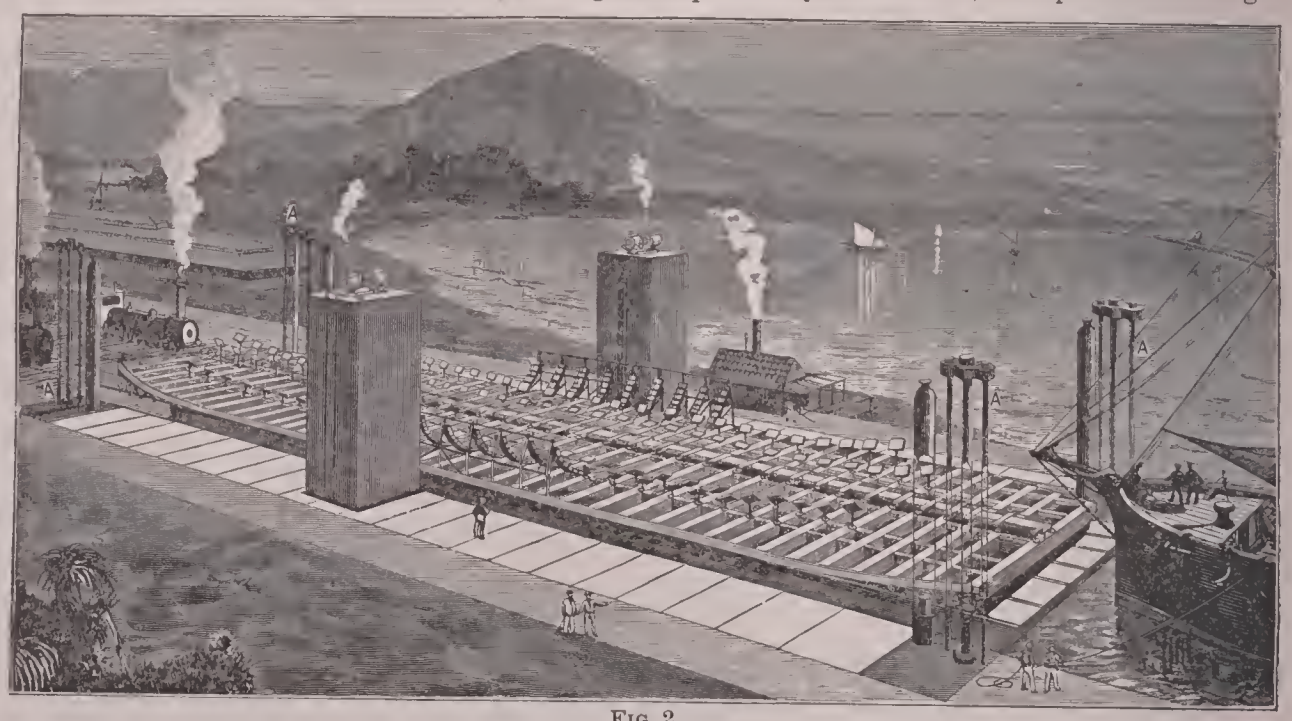


Fig. 2.

in distance and time to the main lines of commerce, its more healthful climate, the easy grades that are practicable

for the railway, and the excellence of the harbors (when improved) on each side. The summit between the two oceans is 736 feet above low tide; the heaviest grade on the line is $52\frac{8}{10}$ feet per mile, between the summit and the Pacific plains; on the remainder of the railway the grades where they occur are from 20 to 40 feet per mile. The total weight of ships carried will not exceed 7,000 tons; there will be six rails of very large section, laid in the most substantial manner, forming the railway, which is to be 134 miles long; all of which, with the lifting-docks, harbors, machinery, stations, shops, and all equipments, will cost less than $50,000,000.

Fig. 2 shows the proposed lifting-dock and cradle ready to receive a vessel as soon as submerged. The lifting-dock is to be a steel pontoon 450 feet in length, 75 feet in breadth, and 15 feet in depth. The pontoon is sunk very quickly by admitting water through sluice-gates in its sides, and can be raised again by powerful pumps in about fifteen minutes. The cradle is to be fitted with hydraulic appliances to properly distribute the weight of the vessel over the keel and bilge supports.

It is quite plain that a loaded ship's cradle presents exceptional difficulties as regards curves on the ship-railway.

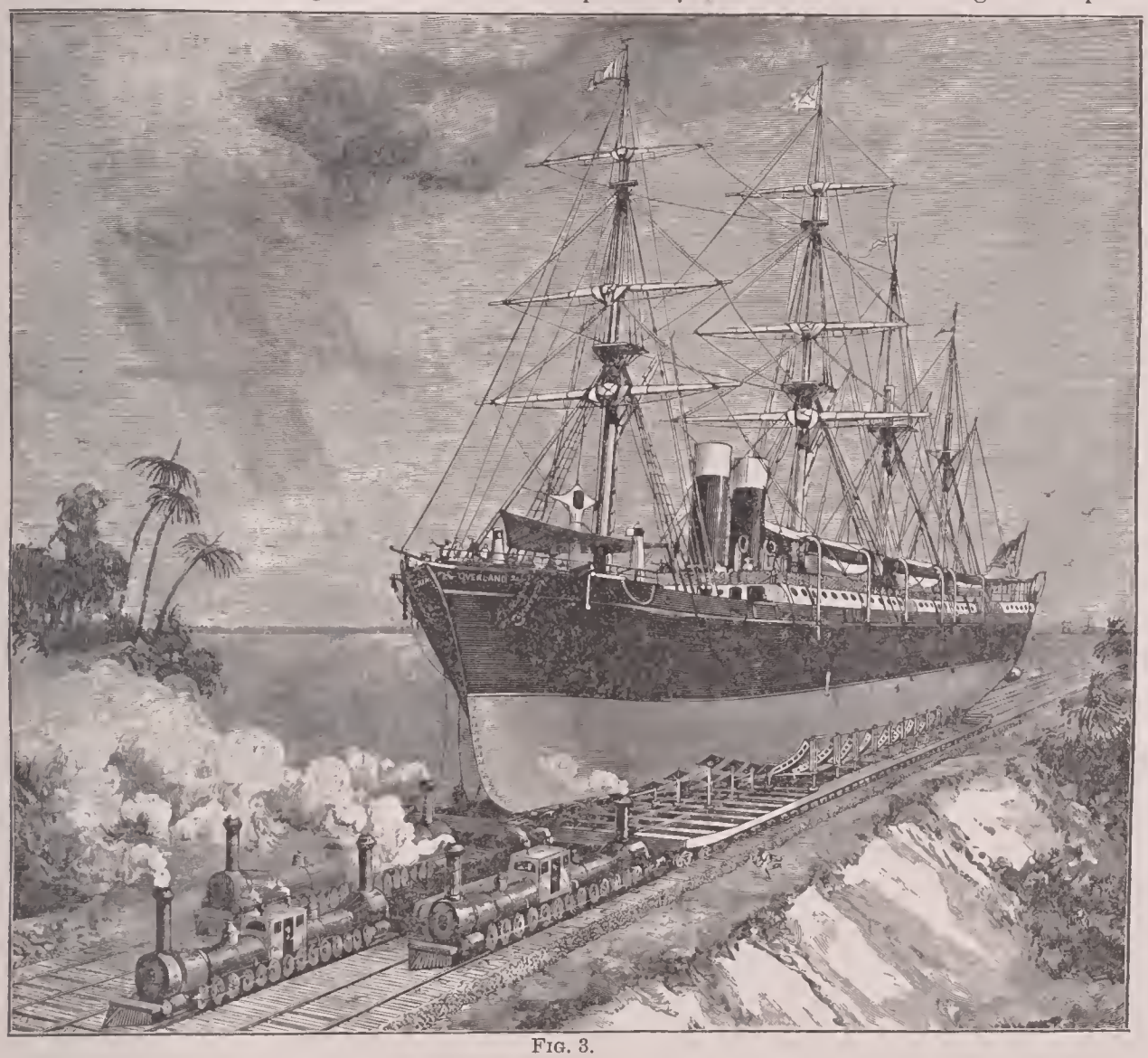


FIG. 3.

This difficulty is met at Tehuantepec by locating the railway on practically straight lines (no curves of less than 15 miles radius being permitted) connected with each other by turn-tables at their intersections.

Fig. 3 shows a steamer crossing the isthmus and hauled by the special locomotives designed for that purpose. As the electrical transmission of power is being rapidly developed into practical form, it is not unlikely that electrical motors on the axles of the cradle may be substituted for locomotives. The speed on the railway will be about 10 miles an hour, and the time elapsing between the taking of the vessel from one ocean and placing it in the other will not exceed eighteen hours.

E. L. CORTHELL.

Ship's Husband: the person to whom the owners of a ship delegate "the management of their common concern." Early treatises on the law of shipping show that the ancient practice was to confer this office on a part-owner, but at present a stranger is frequently employed in this capacity. If a part-owner holds the position he is known generally as managing owner. (See U. S. Rev. Stat., § 4145; 39 and 40 Vict., c. 80, § 36.) The ship's husband sees to the outfit for the voyage; procures provisions and sea-stores; provides proper master and seamen; looks after her legal registration and documents, as well as her due clearance from the custom-house; engages and settles for freight, adjusts averages, salvage, etc., enters into charter-parties, and keeps true and proper accounts of all contracts, payments, and receipts in the course of his employment. The master is sometimes called the ship's husband, but all that is meant in such cases is that when the ship is beyond the jurisdiction of owners and of husband, the master possesses many of the latter's powers. As the ship's husband is the agent of the owners in their capacity of joint adventurers in her employment, and not in their capacity of part-owners of the vessel, the scope of his authority is limited accordingly. He can do what is necessary to enable the ship to prosecute her voyage and earn freight, but he has no implied authority to bind the owners by a contract for altering the size of the ship, or for her insurance. Mercantile usage, however, seems to be extending the scope of this peculiar agent's authority. See Maclachlan's *Law of Merchant Shipping*, pp. 186–192 (ed. 1892); Abbott's *Law of Shipping*, pp. 99–111 (ed. 1892). He is paid by commissions generally, and is not entitled to additional compensation for any of the duties incident to his position. If he makes a secret profit out of his agency, it belongs to his principal. *Williamson* vs. *Hine* (1891), 1 Chancery Division 390.

F. M. BURDICK.

Ship's Magnetism: the disturbing effect produced on a compass by the magnetism of the iron in a ship. For the general principles of which ship's magnetism is a special case see the articles MAGNETISM, MAGNETISM OF IRON, and MAGNETISM, TERRESTRIAL.

So long as ships were chiefly built of wood it sufficed to avoid the use of iron about the compass within a radius of a few yards, and, in case metal had to be employed, to substitute copper. With the increased use of iron in the shape of beams, girders, posts, stanchions, guns, large anchors, engines, funnels, wire rigging, and its special use in ships of war, and when the ship itself could be regarded as a large magnet under the earth's inductive force, the subject of the deviation of the compass assumed a vast practical and theoretical importance.

The disturbance of the compass is principally due to subpermanent magnetism of the ship's iron, and is always produced by the transient induced magnetism of masses of soft iron. In wood-built ships there is little permanent magnetism, the generally small observed deviation being due to temporarily induced magnetism. In iron-built ships the generally large deviation is dependent on permanent magnetism, and remains indicative of the direction in which the ship was built, its magnetism, as a whole, having then become fixed by the process of hammering and riveting.

The inductive effect of the earth's magnetism is greatest in the line of the magnetic dip. By means of a small com-

pass C. A. Schott was enabled to trace out with chalk on the iron gun-turret (sides 11 inches thick) of an ironclad vessel its magnetic equator, and found its plane inclined to the horizon at an angle of nearly 90° dip; after revolving the turret 180°, the line of no polarity again was traced out, when the plane, passing through the intermediate horizontal position, gradually approached its former place after a lapse of about twelve hours; it probably takes weeks before the fixed position is reached, depending on the action of the iron. Inside such turrets the magnetic intensity is very much weakened, but 12 per cent. was found to be left in the above case. The reader is referred to Sir George B. Airy's *Treatise on Magnetism* (London, 1870) and to the *Admiralty's Manual for the Deviations of the Compass*, by Capt. F. J. Evans, R. N., and Archibald Smith (London). This manual is the standard work on the subject of the deviation of the compass.

The earth's magnetic force has been represented by three component forces, to the ship's head, to the starboard side, and to the keel respectively; similarly, the components of the combined total magnetic force of earth and ship are in these directions: their respective differences or components of disturbance can be expressed by linear equations possessing each a constant and three coefficients, which are to be determined by experiment for each ship and position of compass, and must be numerically worked out by application of the method of least squares.

The general character of the deviation in wood-built sailing ships, with compass as usual on the quarter-deck and over the middle fore-and-aft line of the ship, is found as follows: No deviation when heading (magnetically) N. or S.; greatest deviation when heading (magnetically) E. or W.; deviation easterly when head in eastern semicircle, and westerly when head in western semicircle. In steam-vessels, with the compass aft, these directions of no and maximum deviation will often be found displaced by several degrees, yet preserving their general symmetrical character. In the southern (magnetic) hemisphere the deviations are reversed, though for steam-vessels they may be only partially changed. In iron-built ships an individual character has to be recognized. The points of no deviation are shifted from the N. and S. points, and lie nearly in the direction (by compass) of the ship's head and keel while building; they may not be opposite to each other, nor be removed exactly at right angles from the point of maximum deviation. In general, the deviation is easterly when the part of the ship which was S. in building is E. of the compass; westerly when W. The deviation described above is technically known as the semicircular deviation, and may be expressed by $B \sin \zeta' + C \cos \zeta'$. In the general deviation formula $\delta = A + B \sin \zeta' + C \cos \zeta' + D \sin 2\zeta' + E \cos 2\zeta'$, the angle ζ being the azimuth or the compass-bearing of the ship's head reckoned from the disturbed magnetic meridian positive to the eastward; it is a constant, generally small, + if easterly deviation is in excess. $+ B$ is approximately the deviation at E., and $+ C$ at N.; in the last terms of the harmonic function involving $2\zeta'$, and which are technically known as the quadrantal deviation, $+ D$ is the mean deviation approximately at N. E. and S. W.: the coefficient E is generally small or zero; the deviation δ is reckoned + when the N. end of the needle is drawn to the E.; and the above empirical expression applies, provided the deviation on any course does not much exceed 20°, or about two points, in which latter case the formula becomes more complicated. The correct magnetic course will be $\zeta = \zeta' + \delta$. The semicircular deviation rarely exceeds 10° in wood-built vessels, but in iron-built ones may reach double and treble this amount. The quadrantal deviation seldom exceeds 1° or 2° in wood-built ships, but in iron-built ones may reach three or four times this amount. The semicircular deviation is principally due to the effect of permanent or sub-permanent magnetism. The quadrantal deviation, which undergoes no change with a change in the ship's place, is mainly due to the effect of induced magnetism.

The heeling error in wood-built ships is not appreciable, but in iron-built ones it may be serious; generally, the error vanishes with the ship's head at or near E. or W., and attains a maximum value with headings at or near N. or S. The sign of the error changes with a change from the northern (magnetic) to the southern hemisphere. In the northern (magnetic) hemisphere, with the compass above the upper deck, the majority of iron ships have the N. end of their compass-needle drawn to windward, and in the southern hemisphere to the leeward. The heeling error is due to the joint disturbing effect of the vertical components of permanent and of induced magnetism.

The values of the coefficients A, B, C, D, E, are found directly from observations, the deviation of the compass being observed with the ship heading in a number of equidistant points around the horizon, usually either 32, 16, or 8. If the deviation is observed on four cardinal compass-points, D remains indeterminate; if on four quadrantal compass-points, E remains indeterminate. These observations are made by swinging the ship (or allowing it to swing by the tide), and noting for the several headings the bearing of a distant object, or by reciprocal bearings if the locality be confined, or when at sea by azimuths of the sun, the local time and latitude being known. The deviations being determined for a number of points, they may be plotted on what is known as Napier's diagram, and graphically interpolated by drawing a curve with a free hand through the several fixed positions. The deviations for any compass course will then become known. They may also be tabulated. If we deduce numerically the coefficients A, B, C, D, E, we can compute directly the values of δ for plotting or tabulation. In either case we know the correct magnetic course corresponding to the disturbed or compass course, as well as the reverse of the compass course belonging to any correct magnetic course.

It has been remarked that inside iron turrets the magnetic intensity is greatly diminished; the same is the case with nearly all iron ships, the directive force of the needle being diminished. The relative horizontal force is found by means of the number of oscillations in a given time of a small needle, and the proportion of the disturbed to the undisturbed horizontal force, usually called λ, is determined from oscillations in four equidistant azimuths. It is usually less than 1, and is closely connected with the coefficient D, as may be surmised from the fact that λ is due to the effect of the horizontal induction of soft iron. D and λ are nearly constant. A knowledge of the value of λ is of importance; by its assistance the values of B and C may be found without swinging the ship from observations of δ and λ on one course; similarly, observing on two courses, we may determine B, C, D and λ. The value of λ is further needed in the computation of the heeling error, which is expressed—$\left(D + \frac{\mu}{\lambda} - 1\right) \tan \theta \,.\, i \,.\, \cos \zeta'$ for a heel of the vessel of $+ i$ degrees to the starboard. Here μ is the ratio of the disturbed vertical force at the compass to the earth's vertical force; it is found by means of oscillations of the dipping-needle in the plane of the magnetic prime vertical; μ changes with a change in the geographical position; θ is the magnetic dip. It is therefore not actually necessary to heel the ship in order to determine the heeling deviation. It should be added to the general deviation table.

The mechanical correction of the deviation of the compass is properly resorted to in case no suitable position for the standard compass can be found where the deviations are comparatively small; in ships built head S. (northern hemisphere), and intended for navigation in northern magnetic dips, the compass should be placed as far forward as practicable. It may also be elevated 3 or 4 yards above deck. The semicircular deviation may be corrected mechanically, either by means of two magnets or by one magnet; the quadrantal deviation may be corrected by a mass of soft iron placed near the level of the compass; the same may be effected by the mutual action of two compasses placed side by side; the heeling deviation may be corrected by the application of a vertical magnet. In mechanically corrected compasses there is always some danger that, with change of geographical position, loss of magnetism of magnets, and change in the sub-permanent magnetism of the hull, deviation may reappear, though the disturbing force may have been completely neutralized in one place and at one time. It is therefore never to be trusted, and, as a rule, deviation tables should be formed whether mechanical corrections have been applied or not.

An excellent collection of important memoirs, entitled *A Series of Papers from the Transactions of Foreign Societies by Poisson, G. B. Airy, A. Smith, F. J. Evans, W. W. Rundell*, with other papers and documents, has been published by the British Admiralty. Revised by Frank H. Bigelow.

Ship's Papers: See the Appendix.

Ships of War: vessels built and armed for offensive or defensive purposes. Modern war-ships include the fol-

lowing types: armored vessels for the line of battle and for coast service, armored cruisers, rams, protected cruisers, unarmored cruisers and auxiliaries, gun-vessels, gunboats, torpedo-vessels, torpedo-catchers, torpedo-boats, and various vessels for harbor service. It is the endeavor to give in this article a brief historical sketch of modern naval construction in Great Britain, France, and the U. S., which, until the later activity of the Italian authorities, have alone originated types of war-vessels; this to be followed by descriptions of the more important typical war-ships of the various classes, which may serve to render more intelligible the tabular statement of the ironclad navies of the world.

Incentives to the Application of Armor.—Since about the middle of the nineteenth century a revolution has been brought about in naval construction, and new systems have been adopted through the influence of the following agents: (1) The application of steam, strictly the screw-propeller; (2) shell-firing and the increased power of artillery; (3) the use of armor; (4) the submarine torpedo. Up to the time that the advantages of the screw were established to the satisfaction of admiralty boards, steam-vessels were regarded valuable merely as auxiliaries, owing to the vulnerability of paddles and machinery, the limited scope of the battery, the enormous coal-consumption of their engines, and the difficulty in making paddle-wheel steamers good sailing vessels. The U. S. steamer Princeton (1842–43) was the first screw war-steamer. She was designed by Ericsson, and her construction and success were mainly due to the efforts of Capt. Robert F. Stockton, U. S. navy. Great naval powers are reluctant to begin changes that involve costly reconstruction; this, with the conservatism regarding any new system, was the reason of the otherwise inconceivable reluctance of the British to take up the project of a screw-navy. When the French built the line-of-battle screw-ship Napoleon (1850), the British took alarm and began reconstruction with vigor; and the renovation of their navy by the application of the screw was well advanced in 1859, when the French launched the ironclad wooden frigate La Gloire. Then began the decline of unarmored battle-ships.

The principal incentive to the application of armor was the destruction anticipated from shell-fire. It was not until 1854 that naval batteries consisted entirely of shell-guns, the magazines being filled with loaded shells entirely fused. Admiral Dahlgren carried the application of this missile to great perfection in the U. S. frigates of 1854. The Merrimac, one of these, visited Europe in 1856, startling naval administrations by the enormous shell-power of her battery. The swift destruction of the Turkish fleet at Sinope by the shells of the Russian ships during the war in the Crimea (1853) had much to do with hurrying forward the application of armor; the destruction of the Congress and the Cumberland during the civil war in the U. S., and the Monitor and the Merrimac engagement, gave it fresh stimulus.

Early Forms of Armored Ships.—The first definite proposal for building an ironclad was made in 1841 by Robert L. Stevens, of Hoboken, N. J.; armor, it is stated, was suggested by his father, John Stevens, in 1812. An act approved Apr. 12, 1842, authorized the Secretary of the Navy to enter into a contract with Stevens for the construction of a "war-steamer for harbor defense, shot and shell proof, to be built principally of iron." The contract was made Feb. 10, 1843, and altered Nov. 14, 1844, increasing the dimensions so as to make them as follows: Length, 415 feet; beam, 48 feet; depth, 33 ft. 6 in.; protection, 6¾ inches of iron; horse-power intended, 8,624. Work was begun in 1854; and when the vessel was about half completed, the Government refused further appropriations.

It was the initiative taken by the Emperor Napoleon III. which brought about a complete revolution in modern naval construction of war, as the first ironclads used in battle were the French batteries Dévastation, Lave, and Tonnante, begun for service in the Crimea in Sept., 1854, two months after the keel of the Stevens battery was laid at Hoboken. They were all of the same dimensions—namely: Length, 171 ft. 9 in.; beam, 43 ft. 1 in.; draught, 8 ft. 8 in.; hulls, of wood; armor, 4·33 inches thick; armament, 16 guns of French "50," corresponding to 68-pounder, carried 2 ft. 11 in. above water-line. They were about 1,600 tons displacement, with speed about 4 knots an hour. They formed part of the fleet, carrying 1,500 guns, which destroyed Fort Kinburn, an inferior barbette work. The ironclads engaged at about 1,000 yards, at which range they were proof against 32-pound shot with 10-pound charges. The British adopted the design and built five, but they were never in action.

In view of these successful results, the French determined to build ships which should combine with their protective armor satisfactory seagoing qualities, and in Mar., 1858, the first ironclad frigate, La Gloire, was begun at Toulon. The construction of two other wooden armored frigates—the Invincible and the Normandie, of the same type as the Gloire—and the Couronne, an iron vessel, was ordered. The latter ship differed from the others not only in the materials employed, but in the strength of the deck, which afforded protection against the projectiles then in use. The Couronne was especially constructed with a view of establishing comparison between wooden vessels and those of iron. The four frigates were completely armored above the water-line with 5-inch plates resting on a 26-inch wood backing. The armament consisted of thirty-six 5-ton guns mounted on a single battery, extending the whole length of the ship, 6 ft. 3 in. above the water-line.

Great Britain at last decided to follow in building armored ships. The Warrior was ordered in June, 1859, a few months before the completion of the Gloire. The Warrior and her counterpart, the Black Prince, were one-half greater displacement than the Gloire, and 132 feet greater length; they were built entirely of iron and armored with 4½-inch iron plates over a length of 218 feet out of a total length of 380 feet. Their speed was 14 knots, compared with 12·8 for the Gloire. The wise choice of the material of construction leaves them serviceable vessels to-day, while the French ships were some years since stricken from the list. The Defense and the Resistance, of 6,150 tons displacement, with similar disposition of armor, were begun at the same time. In 1861, following upon the four ships just mentioned, Great Britain undertook the construction of not less than eleven ironclads, representing four different types—the Achilles, 9,820 tons displacement, armored along the whole length with 4½-inch plates, then the Minotaur, the Northumberland, and the Agincourt, of 10,700 tons displacement, similar to the Achilles, except that the armor was 5½ inches thick amidships, tapering to 3 inches at the extremities. The vessels of the fourth type, the Hector and the Valiant, have proved more serviceable than the others, being smaller, more manageable, and much more economical; they were armored throughout the whole length with 4½-inch plates, the protection being only above the water-line at the bow and stern. The Magenta and the Solferino, laid down two years after the Gloire, formed part of the first group of French ironclads. The second group consisted of ten vessels of the Provence or Flandre class. The displacement was slightly augmented, but the protection was increased to 6 inches of armor.

Up to 1855 the vessels built for the U. S. navy were the best possible specimens of their class; among the early steamers, the Powhatan and the Susquehanna, at the time they were launched, in 1850, were the most efficient naval vessels afloat. The screw frigates, built in 1855, were regarded all the world over as the model men-of-war of the period. Of these, the largest was the Niagara. The other five—the Roanoke, the Colorado, the Merrimac, the Minnesota, and the Wabash—were vessels of about 5,000 tons, and carried a powerful battery of shell-guns. The twelve screw-vessels were of two classes, built in 1858, the first, of about 3,000 tons, including the corvettes Lancaster, Hartford, Richmond, Brooklyn, and Pensacola; the second class, small sloops. These were all admirable vessels, but they were no advance upon the type of the Wabash class. At the beginning of the civil war, of the ninety ships on the naval register fifty were sailing vessels, and only twenty-four of the forty others were serviceable steamers. The construction of iron or armored vessels had not been begun, and sail-power had been only partly replaced by steam-power. At the outbreak of the war a special naval board was appointed to determine upon types of ironclads to be built for immediate service. The three ships ordered on the recommendation of the board were the broadside vessels Galena and New Ironsides, and the Monitor. The first vessel was armored with bars, of 2½ inches total thickness, put on in a very complicated manner, which proved so deficient that the vessel failed in the first test under fire, in the James river, in an action from which the Monitor came out unharmed. The New Ironsides was a casemated ironclad wooden frigate with unarmored ends, except that the water-line belt was complete all around. Her armor consisted of 4½-inch solid plates backed by 21 inches of oak, the whole inclined throughout the casemate at an angle of 30° from the vertical. Her battery consisted of fourteen 11-inch

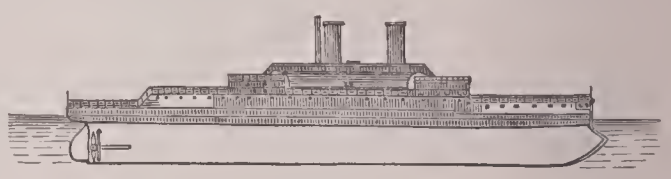
smooth-bores and two 8-inch Parrott rifles. Though her speed was only about 6 knots at the best, this vessel performed most valuable and effective service throughout the war, both before fortifications and on the blockade. In a period of about six months she was struck some 193 times, but never forced to go into a home port or to depend upon outside assistance for repairs. The MONITOR (*q. v.*) was built of iron under the superintendence of, and from an original design by, Ericsson. The opportune appearance of the Monitor in Hampton Roads in Mar., 1862, and her successful combat with the Merrimac, gave a fictitious value to this vessel as an example of naval architecture. Nevertheless, these vessels performed invaluable services and furnished the type of modern coast-service ironclads and a system of armament which has been followed in the most powerful ironclads of recent construction. At the termination of the war it was determined to build four seagoing double-turreted monitors without overhanging armor-shelf at either the end or the sides. These were the Miantonomoh, the Monadnock, the Terror, and the Amphitrite. Their hulls were of wood, and were armored with laminated plates an inch thick, with a total thickness of 6 inches at the sides and 12 inches on the turrets. The Miantonomoh made a voyage to England, where she attracted much attention, and was no doubt the progenitor of the Devastation; the Monadnock was sent around Cape Horn to San Francisco. In 1874 these vessels were broken up and rebuilt into the double-turreted monitors of the same names.

Improvements in the Construction of Ironclads.—During the period of the civil war in the U. S. construction of ironclads proceeded rapidly in Europe, but until a later period it was more influenced by the developments in artillery than by the results of the war. The introduction, in 1864, of the 7¾ and 15½ ton guns into the French armaments made the Flandre class ineffective before they were completed. In 1865 the Océan was begun, and later the Marengo, the Suffren, and the Friedland, after the same type, only the latter being completely of iron. They were protected at the water-line by 8-inch armor. The armament consisted of four 23-ton guns mounted in a central battery protected by 6½-inch armor, and four 15½-ton guns in barbette turrets at each of the four corners, projecting beyond the sides of the ship, and armored with 6½-inch plates. The Friedland differs from the other ships in having only two barbettes, each armed with a 23-ton gun. In 1868–69 a fourth group of ships was begun, the Richelieu, the Colbert, and the Trident, plated with 9-inch armor and very similar to the preceding group, the excess of 1,200 tons displacement being devoted mainly to armor and armament. The hulls of these ships were constructed of wood, except the extremities forward and abaft of the central battery, which were of iron. Such was the construction of the French ironclad navy up to the time of the Franco-German war.

E. J. Reed, appointed in 1862 to the office of chief constructor of the British navy, undertook the building of the Bellerophon, in which the cellular system of construction was first fully introduced, realizing a considerable saving in weight with great increase in the strength of the structure, and obtaining a system of water-tight subdivision which is the only protection against rams and torpedoes. Designs for the best mode of defense combined with the most powerful means of attack sprang up with the rivalry between guns and armor. For masted ships Capt. Coles advocated the turret system and Mr. Reed the broadside system, each striving to give the utmost protection armor could afford to the battery and other vital parts, while enabling the largest guns to be worked safely under these defenses. The broadside system armored the battery and the water-line, while the sides and the upper portions of the ships remained much as in the older frigates. The turret aimed at lower sides, as offering less target to the enemy, while affording an all-round protected fire. In 1862 the Enterprise, the Favorite, and the Research were adapted to Mr. Reed's principle—the belt and the battery—upon which, also, with the addition of indented ports at the corners of the battery, to give wider range of fire, were built the Pallas, the Penelope, the Bellerophon, and the Hercules. In the Sultan an upper-deck battery with four guns was added. On the Sultan pattern the Audacious and several other vessels were built. As the guns increased in size the batteries decreased and the guns became fewer, but the belt remained.

The Monarch, ordered in 1865, was designed as a seagoing rigged turret-ship having 7-inch armor, a free-board of 14 feet, and an armament of four 25-ton guns in two turrets plated with 8-inch and 10-inch armor. Then came the Captain, a ship designed by Capt. Coles and Messrs. Laird in rivalry of the Monarch. She was intended to combine a low free-board with the qualities of a seagoing frigate, and the result of her first cruise seemed to indicate the value of the combination; but an investigation of the calamity of her capsizing in the Bay of Biscay, on the night of Sept. 6, 1870, with 500 men, only eighteen of whom were saved, showed that, in comparison with the other qualities, the small stability due to lack of free-board was a fatal error in her design. This disaster led to more complete and exact investigations of the stability of ships than had ever before been customary. A seagoing mastless turret-ship, or improved and enlarged monitor, was then devised, and three such ships were built—the Devastation, the Thunderer, and the Fury.

The Devastation is a mastless, twin-screw, sea-going turret-ship, 285 feet long, 62 ft. 3 in. beam; mean draught, 26 ft. 8 in.; displacement, 9,300 tons. Her sides, which rise 4 ft. 6 in. above the water-line right aft, are protected along the whole length by armor 12 inches thick; right forward this belt drops to 6 inches above the water-line, and is covered by an armored deck, 3 inches thick, arranged so as to give great support to the bow in ramming. Armor of the same thickness covers the deck aft. On the middle of the upper deck there is a raised breastwork about 150 feet in length, protected by 10-inch and 12-inch armor, covered by a deck 2 inches thick and 11 feet above the water, forming a glacis for two turrets, each containing a pair of 35-ton guns, protected by armor 12 and 14 inches



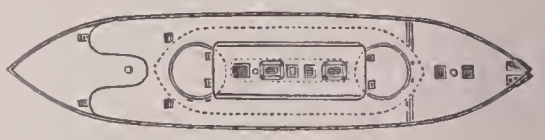


FIG. 1.—Devastation.

thick. All the necessary hatches, openings, smoke-pipes, etc., are led up by iron trunks to a light flying-deck which extends between the two turrets, slightly overlapping each. The sides of the vessel above the armor-belt are continued, forming an unarmored superstructure extending 9 ft. 3 in. above the water-line forward, and to the height of the breastwork throughout its length and slightly abaft it, the open deck aft having 4½ feet free-board. The trial at load-draught showed a speed of 13·84 knots, the engines developing 6,650 indicated horse-power. She carries 1,350 tons of coal, which enables her to steam 4,700 knots at 10 knots an hour.

In 1894 the Devastation was refitted throughout, supplied with new machinery and armament, and extensive internal rearrangement. The tables at the end of this article give the present outfit.

In the construction of the third ship, the Dreadnought—first named Fury—a new design was followed, making the breastwork of the same width as the ship itself—in other words, raising the armored side of the ship to a level with the upper deck of the breastwork. The Dreadnought was 35 feet longer and of over 1,500 tons greater displacement than the Devastation, and the armored belt was carried for the whole length of the ship at the same height above the water-line, increased to 14 inches thickness amidships. In 1885 this vessel, whose design was then sixteen years old, was commissioned as the flagship of the British Channel squadron.

In 1872–73 the Italian first-class battle-ships Duilio and Dandolo were begun. They were the first vessels of the central-citadel type with revolving turrets *en échelon*. For their general design the naval authorities accepted the view of the British committee on designs, trusting for both buoyancy and stability to their unarmored raft. The principal dimensions are as follows: Length between perpendiculars, 340 ft. 11 in.; beam, 64 ft. 9 in.; mean draught, 26 ft. 7 in.; displacement at deep load-line, 11,200 tons.

There is a central citadel or compartment, 107 feet in length and 58 feet in breadth, which descends to 5 ft. 11 in. below the water-line, protecting the machinery and boilers, the magazines and shell-room, and a portion of the

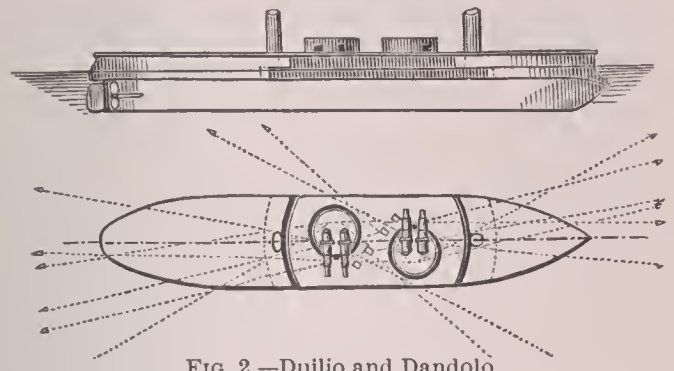


Fig. 2.—Duilio and Dandolo.

machinery for working the turrets and guns. Forward and aft of this citadel, the decks, which are 4 ft. 9 in. under water, are defended by horizontal armor. Over this citadel is built a second central armored compartment, inclosing the bases of the turrets and the remaining portion of the mechanism employed in loading and working the guns. Lastly, above this second compartment rise the two turrets, placed at diagonally opposite corners of the citadel, the effect of which arrangement is to render possible the discharge of three guns simultaneously in a direction parallel with the keel. Each turret is armed with two 100-ton Armstrong muzzle-loading guns. The armor of the central portion of the vessel is 21·67 inches thick, and that of the turrets is 17·72 inches. The decks are protected by horizontal armor of steel and iron, the latter being under the former. The Duilio has twin screws, driven by a pair of Penn's trunk-engines. On the trial, in 1880, with all weights on board, at a mean draught of 26 ft. 9 in., the vessel showed on the measured mile, with 7,710 indicated horse-power, a speed of 15 knots per hour.

The Inflexible.—Upon the construction of these ships Mr. Barnaby, director of naval construction in Great Britain, brought forward the design of the Inflexible, of similar type, until 1886 the largest vessel in the British navy. The Inflexible, begun in 1874 and launched in 1876, is a

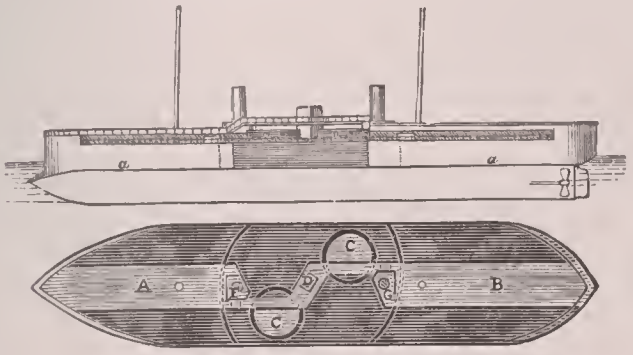


Fig. 3.—Inflexible.

twin-screw double-turret ship with a central armored citadel. Her length is 320 feet, and she has the extraordinary breadth of 75 feet. The displacement at the mean load-draught of 25 ft. 3 in. is 11,880 tons. The general design is similar to that of the Duilio. The protected portion of the ship is confined to the citadel or battery, within whose walls are inclosed the engines and the boilers, the turrets, the hydraulic loading-gear, the magazines, and, in fact, all the vital parts of the vessel. It measures 110 feet in length, 75 feet in breadth, and is armored to the depth of 6 ft. 5 in. below the water-line and 9 ft. 7 in. above it. The sides of the citadel consist of two thicknesses of 12-inch armor, each backed by iron girders and teak backing. Inside of this are two thicknesses of skin-plating, to which the horizontal girders are secured, the whole of the armor-backing and plating being supported by and bolted to transverse frames 2 feet apart, composed of plates and angle-irons. It will thus be seen that the total thickness of armor at the water-line is not less than 24 inches. The armor-belt, however, is not of uniform strength throughout, but varies in accordance with the importance of the protection required and the exposure to attack. Consequently, while the armor at the water-level is 24 inches, in two thicknesses of 12 inches each, above the water-line it is 20 inches, in two thicknesses of 12 inches and 8 inches, and below the water-line it is reduced to 16 inches, in two thicknesses of 12 inches and 4 inches. Outside the citadel a 3-inch armor-deck, 6 ft. 6 in. below the water-line at the sides, extends to the extremities of the vessel, depressed at the fore end to meet the spur of the ram. Over this shot-proof deck, at a level a little above the water-line, comes the middle deck; and the entire space between the two decks is divided into compartments arranged partly to carry coal and partly stores packed in water-tight tanks, forming further subdivisions of the space. At the sides of the ship the compartments, about 4 feet wide, are filled with cork, inside which, again, are compartments, 2 feet wide, filled with layers of canvas and oakum. The cork and canvas compartments are carried above the main deck, 4 feet and 2 feet respectively, and 30 feet forward of the citadel and 37 feet aft of it. Thus if a shot hit the unarmored ends of the vessel at right angles to the water-line, it would travel through, first, 4 feet of cork, then 2 feet of canvas and oakum, then such coal and stores as were uneonsumed, and would finally pass through oakum and cork to the sea on the opposite side from which it entered. The cork is, of course, intended as a life-belt to the ship, to give her additional buoyancy and stability when the unprotected ends are riddled and filled with water. The turrets are set *en échelon*, or diagonally in opposite corners of the citadel, so that all the guns can be fired together, either forward or aft, without either turret obstructing the fire of the other. They are protected by armor-plates 16 inches thiek. The internal diameter of the turrets is 28 feet; in each are two 80-ton muzzle-loading rifled guns mounted on Armstrong's hydraulic system. The guns themselves are 26 ft. 9 in. in length; the bore is 24 feet long and 16 inches in diameter. The weight of each projectile is 1,700 lb., and the powder-charge weighs 450 lb. The guns are loaded by depressing the muzzles bencath the level of the armor-deck covering the citadel, where a hydraulic hoist lifts the charge to the muzzle, whence it is put home by a hydraulic rammer. The Inflexible is propelled by twin screws—an arrangement adopted in all ironclads and most recent unarmored vessels. Each screw is driven by an independent three-cylinder inverted compound engine. On trial, when in commission and complete in every respeet, the engines developed an indicated power of 8,010, giving a speed of 13·81 knots per hour. The ship carries 1,200 tons of coal, enabling her to steam 4,900 knots at 10 knots per hour. Two years after the construction of this vessel was begun, Mr. Reed stated in Parliament and in the public prints that his investigations showed that in action the cork and stores might be shot away and the unprotected ends riddled and waterlogged, and that in sueh an event, though the citadel were still intact, the ship would capsize. The reply was that the supposed case was too remote a possibility to be considered, and that without any unprotected ends the ship would still float, and under the most unfavorable circumstances would have a margin of stability. A technical committee, appointed to investigate the matter, after most elaborate calculations of great value to naval architecture, completely sustained the views of the admiralty.

The Italia and the Lepanto.—In these great vessels of the Italian navy, launched in 1880 and 1883, of 15,900 tons displacement, side-armor is not used as a means of preserving stability when the ship is pierced at the water-line. Their buoyancy is preserved in such an emergency by the cellular subdivisions of the space just above an arched armored deck extending the whole length of the ship beneath the water-line. Armor is used only at the openings to the engine and boiler rooms, and to protect the heavy guns mounted *en barbette* and the communications leading to them from the magazines. The Lepanto was tried at sea in 1888 at a displacement of 14,800 tons, and made a maximum speed of 18·38 knots over a course of 80 miles, with the engines developing 16,150 I. H.-P. The trial is notable from the facts that the power and speed surpassed those of any ironclad afloat, and also because a large number of locomotive-boilers were used with complete success in connection with boilers of the usual type.

In 1883–84 Italy began the construction of the Andrea Doria, Ruggiero di Lauria, and the Francesco Morosini, first-class battle-ships of some 11,000 tons displacement; these ships were completed in 1892, and are similar in design to the Duilio. They were followed in 1885–86 by the Re Umberto and Sicilia, sister ships, similar to the Lepanto, and the Sardegna, a still more formidable ship of the same class, was begun in 1887.

The "Admiral Class" of British Vessels.—Following the Inflexible, the British built the Ajax and the Agamemnon, reduced copies of the first vessel, and then the Colossus and the Edinburgh of the same type, with 18 inches side-armor and armed with 43-ton breech-loading guns. A great gain was made in the speed of the latter two vessels over their predecessors, partly by a better form and partly by improved propelling machinery, by which much greater power has been obtained from the same weight of material. The "Admiral" class, of which the Collingwood was the first, begun in 1880, followed by the Rodney, the Howe, the Anson, the Camperdown, and the Benbow, in 1883–84, while following the same system of construction, have their battery mounted *en barbette*. This modifies the distribution of the armor by dispensing with the upper part of the citadel—necessary with turrets to protect their training, loading-gear, etc.—and allows the maximum thickness of the armor to be concentrated on the water-line where required to protect the machinery and the boilers. A part of the weight thus saved, and that due to the less weight of barbettes over turrets, is devoted to ordnance; for the Howe, the Camperdown, and the Anson carry four 66-ton guns each, the Rodney four 68-ton guns, and the Benbow has two 111-ton guns. In addition to the heavy guns they all carry six 6-inch guns in a machine-gun proof battery on the upper deck, between the barbettes.

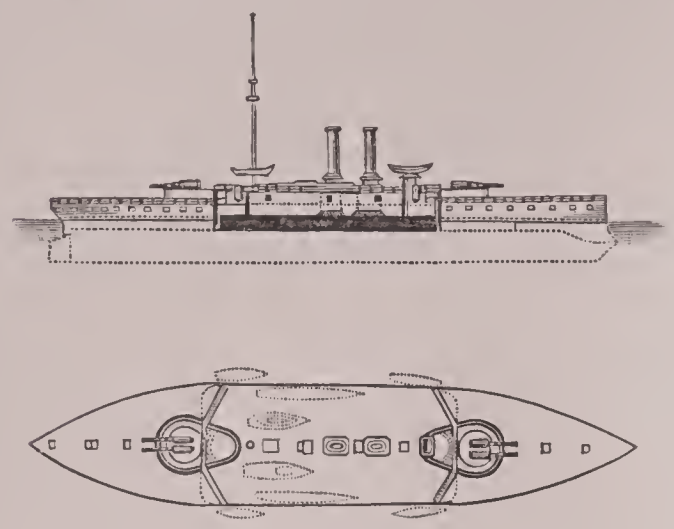


FIG. 4.—Collingwood.

British Turreted Ships.—The steady progress of France and Italy in the building of armored vessels of the first class had in 1884–85 aroused the attention of the British to the probability that if their rate of construction were to continue the French fleet would soon be superior to theirs, and eminent authorities contended that upon certain methods of comparison the French fleet was then the more powerful. The relative merits of the central-citadel type of British battle-ship and the completely armor-belted battle-ships of the type of the Amiral Duperré received careful attention, and though most serious allegations were made by Sir E. J. Reed, popularly considered an authority, against the safety of the citadel-ships when their ends were riddled by shot, the balance of favor seems to remain with the British type. As the result of this discussion Great Britain laid down in 1885 two turreted battle-ships, the Victoria (afterward sunk by collision with the Camperdown) and Sans Pareil, of 10,470 tons displacement each, the armament consisting of two 110-ton 16¼-inch guns in a single turret forward, protected by 18-inch compound armor, and twelve 6-inch guns in broadside on the upper deck, protected by a 3-inch steel side and steel traverses. The citadel is 170 feet long and the armor 18 inches thick at the sides. Also were then begun the Nile and Trafalgar, two double-turreted battle-ships of type similar to the Inflexible, of 11,940 tons displacement. Their armor-belt is of unusual length and 20 inches thick. The two turrets, each mounting two 66-ton guns, are situated, like the Dreadnought's, on the middle line, but, unlike this ship, the Nile and Trafalgar have a broadside battery of eight 5-inch guns between the turrets. These vessels attained on trial in 1890 a speed of 17 knots.

These vessels were regarded when designed as the maximum displacement and power to be hereafter required, and indeed it was predicted by some authorities who favored the building of protected cruisers that these vessels might be the last ironclad battleships. They were hardly launched when the British authorities formulated in 1889 the most extensive programme ever adopted by them. Under the title of the Navy Defense Act $105,000.000 was appropriated for building and completing by Apr., 1894, 70 vessels to carry 566 guns, having an aggregate of 336,000 tons displacement and of 594.000 horse-power. These vessels comprise 10 armored battle-ships, 8 of the first and 2 of the second class; 40 protected cruisers, 9 of the first and 31 of the second class; and 18 torpedo-vessels. The distinguishing features of the programme were the rapidity with which the vessels were to be built, the great increase of engine-power and speed, and the increase in size and power of the armored vessels. Nine out of ten of these are barbette-vessels, in contrast to the recent turret-ships, and are of greater free-board and superior sea-keeping qualities to the earlier vessels. The Royal Sovereign, the first of these battle-ships, was completed in Apr., 1892. The rapidity of construction surpasses all previous records in the building of great war-ships, as the Royal Sovereign was laid down in Sept., 1889. This vessel is the largest battle-ship hitherto constructed for the British navy, and has six counterparts, named the Renown, Repulse, Ramillies, Resolution, Revenge, and Royal Oak. The eighth vessel of this class is a turret-ship, the Hood. The armament of the Royal Sovereign comprises four 13½-inch 67-ton guns, mounted in barbette in pairs, and firing a projectile weighing 1,250 lb. with a powder-charge of 630 lb.; ten 6-inch 100-pounder quick-firing guns, double-banked, the four on the main deck being mounted in casemates protected by 6-inch armor, while the six on the upper deck are mounted in sponsons; sixteen 6-pounder and twelve 3-pounder quick-firers, 8 small machine-guns, and two 9-pounder field-guns. The auxiliary armament is distributed all over the ship and extends from bow to stern. The ship is also fitted with seven torpedo-tubes, of which two are submerged. The following table gives the principal dimensions of the Royal Sovereign and her predecessor in design, the Trafalgar, and includes the results of actual trials for speed and power as obtained in smooth-water trials:

DIMENSIONS, ETC.	Royal Sovereign.	Trafalgar.
Length	380 ft.	345 ft.
Breadth	75 ft.	73 ft.
Draught, mean	27 ft. 6 in.	27 ft. 6 in.
Displacement, tons	14,150	12,500
Free-board { forward	19 ft. 6 in.	11 ft. 3 in.
Free-board { aft	18 ft.	11 ft. 3 in.
I. H.-P. { natural draught	9,700	8,440
I. H.-P. { forced draught	13,300	12,900
Speed { natural, knots	16·77	16·22
Speed { forced, knots	18·0	17·28
Coal carried at the designed load-draught, tons	900	900
Coal endurance at 10 knots	5,000	5,000
Total weight of armament, tons	1,410	1,035
Weight of auxiliary armament, tons	500	135
Height of heavy guns above water-line	23 ft.	15 ft.
Length of belt	250 ft.	230 ft.
Greatest thickness { side armor	18 in.	20 in.
Greatest thickness { protective deck	3 in.	3 in.
Total weight of armor and backing, including protective deck, tons	4,550	4,400

Growth of the French Navy.—The modern navy of France dates from the close of the Franco-German war, when a programme was elaborated, according to which the armored fleet was to consist of 16 first-class ironclads, 12 second class, and 20 coast-service vessels of two classes. It was then definitely decided to use only iron or steel in future construction, a conclusion which was arrived at very tardily considering the progress upon the opposite side of the Channel.

The Redoutable, 8,800 tons, the first vessel built in accordance with the new programme, was begun in 1872 upon designs of M. de Bussy, and was then classed as a first-class ironclad. The Dévastation and Foudroyant (since named Courbet), ships of nearly 10,000 tons displacement, were begun in 1876 upon the same general plans as the Redoutable, masted, high free-board, central battery.

The Amiral Duperré, begun in 1876, has proved the type upon which the later French ships have been designed without substantial variation, excepting only that the later vessels have been fitted with military masts instead of the full ship-rig of spars and sails. The designers, believing that mastless low free-board turret-ships would not make good seagoing battle-ships, and in order to reduce the armored area and increase its thickness, discarded the central battery of the preceding first rates, which was also no longer suitable to the heavy guns required, and mounted on the Amiral Duperré four 13½-inch 48-ton guns, each in an armored bar-

British Battle-ship Royal Sovereign.

THE UNITED STATES BATTLE-SHIP "OREGON.

bette on the upper deck, 27½ feet above the water. There are fourteen 5½-inch guns in an unprotected gun deck-battery. The armor consists of a complete water-line belt 8 feet deep and 21·6 inches maximum thickness. The bar-

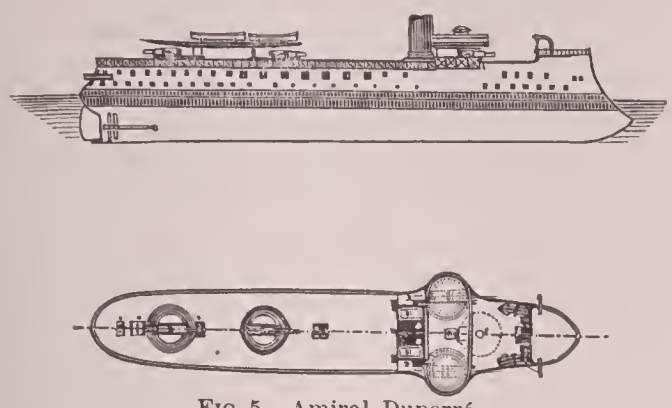


Fig. 5.—Amiral Duperré.

bettes have 15½-inch armor-plates and armored ammunition-tubes leading to the armor-deck, 2¼ inches thick at the level of the top of the belt. The Amiral Duperré has in a marked degree the distinguishing peculiarity of all the French vessels, a great "tumble home" or decrease in breadth from the water-line up. This serves the double purpose of decreasing the weight of upper works and giving better command to the battery. The Formidable and Amiral Baudin, sister ships, begun in 1878 and 1879 respectively, were practically upon the same design as the Amiral Duperré, the modifications consisting in mounting three 15-inch 75-ton guns in barbettes on the middle line of the upper deck and having two military masts, and consequently no sail-power. These two vessels were ten years in building, and were completed and successfully tried in 1889, the Formidable making under forced draught a speed of 16·2 knots with 9,700 I. H.-P. In 1880 four first-class battle-ships of 10,500 tons, from the same design by M. Huin, the Marceau, Hoche, Neptune, and Magenta, were begun. Each was to carry four 13½-inch guns in barbettes placed one forward and one aft on the middle line and one on each side in sponsons, obtaining a fore-and-aft fire. Subsequent changes were made by which the Hoche carries the forward and after guns in turrets with a comparatively low free-board at the extremities, similar to the British sixteen 5½-inch, as in the earlier designs, the armor being confined to the complete water-line belt and the barbettes.

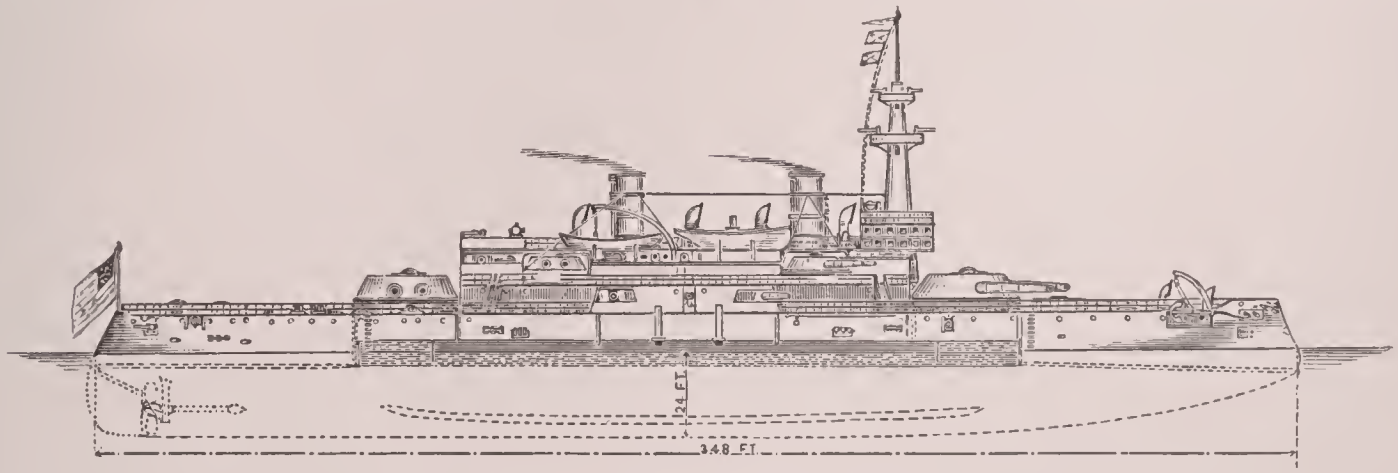
After these vessels some years elapsed before new designs for first-class battle-ships for the French navy were decided upon, and of these the Brennus, begun in 1889, was the first to show the marked influence of the great development during that time of quick-firing guns and high-explosive shells. The Brennus is nearly 11,000 tons displacement. The armor consists of a complete water-line belt 15¾ inches thick, covered by an armor-deck of 4 inches of steel. Above this the side is protected by a belt of thin armor, 4¾ inches thickness, 5 feet in height forward and 4 feet aft. Two 13½-inch guns are mounted in a pear-shaped turret forward with 17¾-inch armor, and one in a similar turret aft, each protected by 15¾-inch armor. The secondary armament consists of ten 4½-inch quick-firing guns, six mounted in a central fort of 4-inch armor which rises from the armor-belt to the upper deck, and four mounted in independent revolving turrets of 4-inch armor located upon the top of the central fort. The speed is 17½ knots.

In 1891 the Jauréguiberry, Carnot, and Charles Martel, of 12,000 tons displacement, were begun. The heavy guns are mounted in turrets, one 12-inch gun forward and one aft, and one 10¾-inch gun on each side in turrets at a lower level. On the central superstructure above all these turrets are eight 5½-inch guns, mounted in turrets of 4-inch armor, those of the Jauréguiberry in pairs and the others singly. The armor-belt at the water-line is 18 inches thick amidships and 11 inches at the ends, surmounted by an armor-deck 2¾ inches thick, and a cofferdam extending around the whole side, covered with 4-inch armor.

It will be seen that in these later ships the barbette has been abandoned for the turret, individual protected stations are provided for the smaller guns, and the side in the vicinity of the water-line is protected for the whole length by thin armor and minute water-tight subdivision.

The Masséna and a sister-ship of very similar design to the preceding vessels were begun in 1892. These are to have triple screws and a speed of 18 knots.

Of armored vessels for coast-defense of more modern type than the Tonnerre class the French have four ships from the same design, the Indomptable, Terrible, Caiman, and Requin, begun in 1877 and completed in 1886–87. Four ships of about the same class were begun in 1891, namely,



U. S. COAST-LINE BATTLE SHIP, MASSACHUSETTS.

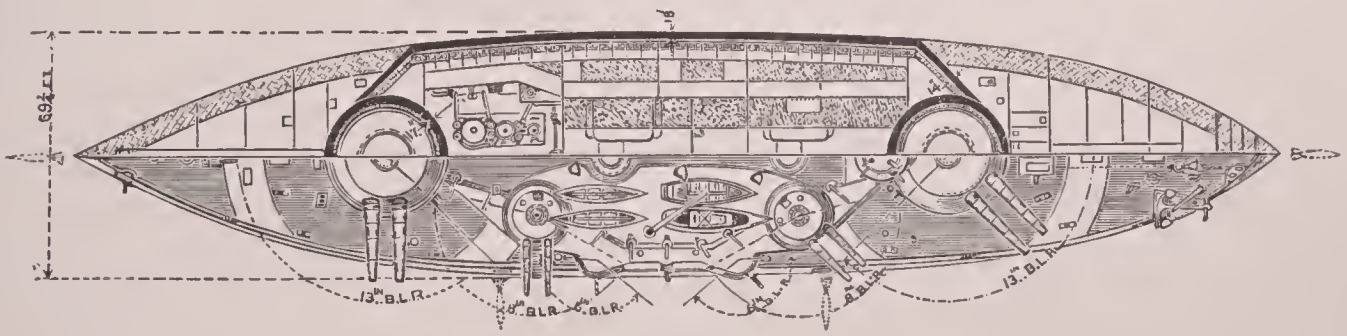


Fig. 6.

Admiral class. This, with the great height of the central superstructure carrying the boats, gives the vessel the appearance of a floating castle. The Hoche and Marceau were completed in 1891 and the remaining two in 1892. These vessels retain the unprotected gun deck-battery of small guns, the Tréhouart, Bouvines, Valmy, and Jemmapes. The first two of these vessels will be seagoing second-class ironclads.

First-class Battle-ships of the U. S. Navy.—These are represented by the Massachusetts, Oregon, and Indiana, begun in 1891 and designated for coast-line defense. The prin-

cipal dimensions are: Length, 348 feet; beam, 69¼ feet; mean draught, 24 feet; free-board, 11½ feet; displacement, 10,300 tons. There is a belt of 18-inch armor extending over slightly more than half the length, rising 3 feet above the water-line, and extending 4½ feet below it. The under-water protective decks at the ends of the belt are 3 inches thick, and the armor-deck over the belt 2¾ inches thick. Above the 18-inch belt and for the same length the side is covered with 5-inch armor to the upper deck.

The armament consists of four 13-inch guns mounted, two in a turret, one forward on the central line of the ship and one aft, each turret protected by 17-inch armor. At a higher level than these turrets are four others of 8½-inch armor, each containing two 8-inch guns. The battery is thus so arranged that four 8-inch guns fire straight ahead and four right astern, in addition to the 13-inch guns. There are also four 6-inch guns protected by 5-inch armor, two on each broadside on the main deck at the same level as the 13-inch guns. There are twenty-eight rapid-firing and machine guns and six torpedo-tubes. The battery of these vessels far exceeds that of any vessel in the world of their size, and equals that of any ship. The engines are of 9,000 I. H.-P., and a maximum speed of 16¼ knots is expected, with a sustained sea-speed of 15 knots. The normal coal-supply is 1,400 tons, and the bunker capacity 1,800 tons.

The seagoing battle-ship Iowa was authorized in 1892 and begun in 1893. This vessel will exceed her predecessors in size by about 1,000 tons and in speed by a knot, but will be of about the same general design, although greatly improved by considerable increase of free-board forward and better security against interference of the lines of fire of the guns of the battery.

In 1895 Congress authorized two additional battle-ships and six composite gunboats of 1,000 tons displacement.

The Texas and Maine, begun in 1889, should be, according to the latest classification adopted in the British navy, rated as third-class battle-ships. The Maine has been officially called an armored cruiser in the U. S.

CRUISERS.

There no longer exists in the classification of war-vessels a definite size or class which may actually be distinguished as armored or unarmored, as was the case so recently as 1880. Then began the extensive introduction of armored decks in all classes of cruisers, and since then the rapid improvement in rapid-firing and machine guns, and also the improvement in machinery with greater possibilities of speed, have tended to a rapid increase in the size of cruisers, and an increased amount of armored protection by the use of thin armor-plating on the sides in addition to protective decks, armored protection for individual guns, and coffer-dams of water-excluding material. The use of sails in the larger cruisers has practically disappeared, and the greater dependence upon fuel has also tended to increase the size of these ships in order to increase the supply of coal carried, and thus increase the endurance at sea under steam.

The following tabulated particulars relate to eight of the most important cruisers in the world:

water amidships; it is 6 inches thick on the slopes, 3 inches at the flats, reduced to 2½ inches at the ends of the vessel. In addition to this there is a belt of 5-inch armor in wake of the machinery spaces between the protective and main decks. Behind this belt is a cofferdam or cellular space 3 ft. 6 in. deep, extending all around the ship, filled with cellulose, a very light and water-excluding material. The armament consists of six 8-inch guns, two mounted in a barbette forward plated with 10-inch armor, two similarly mounted aft, and one on each broadside amidships on the spar-deck. Twelve 4-inch rapid-firing guns are mounted in sponsons of 4-inch armor on the main deck, and eight 6-pounder guns in 2-inch armored sponsons on the same deck. The 8-inch guns are 25 feet and the 4-inch guns 16½ feet above the designed load-line. There are six torpedo-tubes for ejecting Whitehead torpedoes above the water-line, one forward and one aft and two on each broadside. There are twin-screws, and each screw has two sets of three cylinder triple-expansion engines, making four sets of engines, each in a separate water-tight compartment. It is estimated that the vessel can maintain at sea a speed of 18·5 knots.

The first-class cruiser Brooklyn, authorized in 1892 and begun in 1893, is similar in design to the New York, but of greater size and armament.

The Columbia was built for the express purpose of preying upon commerce, and when begun in 1890 it was stated by the Secretary of the Navy that "no merchant vessel that she meets, armored or unarmored, can escape from her." She and her sister ship, the Minneapolis, are of 7,375 tons displacement, 412 feet long, 58 ft. 2½ in. beam, and 22 ft. 6½ in. draught. The Columbia is expected to maintain at sea a speed of 21 knots an hour. There are three screw propellers, one placed amidships as in ordinary single-screw ships, and one on each side, slightly forward of the middle screw. Each screw has a separate triple-expansion engine in an independent water-tight compartment. All the motive machinery and boilers are below the armored deck, which is 4 ft. 6 in. below the water-line at the sides and 1 foot above amidships; the slopes are 4 inches thick, and the flat 2½ inches. There is a cellular structure 5 feet wide extending the whole length of the ship at the outer edge of the protective deck. The coal carried at the designed draught is 750 tons, and the total capacity of the bunkers is 2,000 tons. The battery of this vessel is a light one, being only intended to cope with small cruisers and armed merchantmen; it consists of two 40-caliber 6-inch guns mounted in the open on the spar deck forward, one 8-inch gun aft, eight 4-inch rapid-firing guns in 4-inch steel sponsons on the main deck, and eighteen machine-guns of various sizes.

Growth of the U. S. Navy.—The navy of the U. S. began modern construction in 1883 by the building of the cruisers Chicago, Boston, and Atlanta, and the dispatch-boat Dolphin. During the period of the building and completion of these ships it became necessary also to establish in the U. S. the manufacture of the class of steel of which such vessels were built, and the construction of modern ordnance and ammunition. At this time twenty-five years had elapsed since the construction of powerful modern iron-

DIMENSIONS, ETC.	United States.			Spain, Infanta Maria Teresa.	Russia, Rurik.	Great Britain.		
	New York.	Brooklyn.	Minneapolis.			Edgar.	Blenheim.	Powerful.
Length	380 ft. 6½ in.	400 ft. 6 in.	412 ft.	340 ft.	396 ft. 6 in.	360 ft.	375 ft.	500 ft.
Breadth	64 ft. 10 in.	64 ft. 8¼ in.	58 ft. 2½ in.	65 ft. 2 in.	67 ft.	60 ft.	65 ft.	71 ft.
Draught	23 ft. 3½ in.	24 ft.	22 ft. 6½ in.	21 ft. 6 in.	26 ft.	23 ft. 9 in.	25 ft. 9 in.	27 ft.
Displacement	8,200 tons.	9,271 tons.	7,375 tons.	6,890 tons.	10,923 tons.	7,390 tons.	9,100 tons.	14,200 tons.
Coal capacity, maximum	1,290 tons.	1,753 tons.	1,670 tons.	1,100 tons.	2,000 tons.	850 tons.	1,500 tons.	3,000 tons.
Armor, thickness of belt	4 in.	3 in.	.....	12 in.	10 in.	.....	.....	.....
Armor, thickness of battery	5½ to 10 in.	5½ to 8 in.	.....	10 in.	.....	2 in.	.....	.....
Armor, thickness of deck	6 to 3 in.	6 to 3 in.	4 to 2½ in.	3 to 2 in.	2½ in.	5 in.	6 to 3 in.	6 in.
I. H.-P.	17,401	16,000	20,493.	13,722	13,250	12,550	21,411	25,000
Speed	21 knots.	20 knots.	23·073 knots.	20·24 knots.	18·5 knots.	20·97 knots.	21·6 knots.	22 knots.
Armament	six 8-in.	eight 8-in.	one 8-in.	two 11-in.	four 8-in.	two 10·6-in.	two 10·6-in.	two 9·2-in.
	twelve 4-in.	twelve 5-in.	two 6-in.	ten 5·5-in.	sixteen 6-in.	ten 6-in.	ten 6-in.	twelve 6-in.
	eight 6-pdrs.	12 6-pdrs.	eight 4-in.	two 2·75-in.	six 4·7-in.	twelve 6-pdrs.	16 3-pdrs.	28 R.-F.
	four 1-pdrs.	four 1-pdrs.	12 6-pdrs.	sixteen R.-F.	18 R.-F.	five 3-pdrs.	.....	.....
	2 Gatling.	4 Gatling.	4 1-pdrs. 4 Gatl'g.	.....	.....	.....	.....	.....
Cost, totals	.....	.....	.....	$3,000,000	$3,400,000	$2,000,000	$2,125,000	$3,500,000

*This table consists of actual trial data, excepting the Rurik and Powerful, given as designed.

Cruisers of the U. S. Navy.—The armored cruiser New York, begun in 1890 and completed in 1893, is of the same type as the Blake and Blenheim of the British navy, but slightly inferior in size and battery-power. She has an armored protective deck the whole length of the ship, extending 4 ft. 9 in. below the water at the side to a foot above the

clads was begun abroad, and during the greater part of that period, since the close of the civil war, none of the new types of war-vessels had been built in the U. S., and the republic was absolutely without rank as a naval power. In effective force the navy was in 1886 rated as nineteenth among the nations. Thus the U. S. followed Japan, Turkey,

Greece, Brazil, Chili, and Portugal. In 1895, counting as effective the vessels built and building, the U. S. takes rank as a naval power, fifth among the nations, in the following order: Great Britain, France, Russia, Italy, U. S. This classification is probably an unduly favorable comparison which does not actually represent the rank for active service, on account of the large proportion of vessels uncompleted.

Propelling Machinery of War-ships.—The gradual increase in the working-pressure of steam with the single engine, the consequent introduction of the compound engine, which has come into universal use since 1870—lately developed into the triple-expansion engine—and the continual rise in the steam-pressure since, have produced two very important effects: (1) A reduction in the expenditure of coal, making longer voyages possible, or increasing the endurance under steam and decreasing the necessity of sail-power, which is destructive to speed and hampers and obstructs the battery; (2) a reduction in the weight and space occupied by the machinery, both of which are most important elements in the efficiency of a man-of-war. The type of engine most in use at present for ironclads is the three-cylinder vertical inverted-cylinder engine, and the triple-expansion principle is almost universal. The piston speeds employed vary from 600 to 900 feet per minute, and are continually increasing with improvement in materials for machinery and the increased use of steel; the faster the engines run the smaller and lighter the parts. The Scotch type of boiler is generally employed, carrying 100 to 180 lb. per square inch of steam-pressure and burning 16 to 20 lb. of soft coal per square foot of grate per hour with natural draught. Such engines usually develop on trial from 8 to 10 indicated horse-power per square foot of grate surface of the boilers, and the usual weight of the latest types of machinery, engines, and boilers, including water, is from 350 to 380 lb. per indicated horse-power under natural draught. The French have adopted in several new vessels a type of multitubular boiler which effects a great reduction in weight of boilers and contained water. This type of boiler meets with increasing favor, and is being fitted in the latest and most powerful cruisers building.

The use of forced draught, by making the boiler compartments air-tight and forcing large volumes of air into them, has recently been revived, and is now an element in the design of all modern war-vessels, enabling them, by a largely increased consumption of fuel, to develop about from 30 to 50 per cent. more than the ordinary maximum power of the machinery for a few hours in cases of emergency when the greatest available speed is required. This method of forcing the fires was used so long ago as 1850 in U. S. river-vessels, but was first used by the French in war-vessels. It was the subject of considerable experiment in the British navy in 1883, on the Conqueror, the Satellite, and other vessels, in which the indicated horse-power per square foot of grate was increased from 8 or 10, under natural draught, to 16 with an air-pressure in the fire-rooms equivalent to a column of 1½ inches of water. These experiments have led to the introduction of the system in all new war-vessels, but, owing to the rapid deterioration of boilers subject to great forcing, its use has been carefully restricted.

In unarmored vessels horizontal engines are used only where necessary to get the machinery below the water-line and beneath the protective deck. Short-stroke vertical inverted engines are more generally employed on account of their greater simplicity and endurance, and because of their less weight and bulk for corresponding power. War-ships of over 1,500 tons displacement are now almost invariably provided with twin-screws and have two complete sets of propelling machinery, in separate, water-tight compartments, by which arrangement the danger of total disablement is reduced to a minimum. Twin-screws offer the additional advantage that they admit of adequate protection to the rudder and the stearing-gear, which is impossible in an unarmored single-screw ship and difficult to accomplish in an armored vessel. They also furnish a valuable auxiliary steering-power, and are equally efficient as propellers in comparison with the single screw. The system of trials of steamships initiated in the U. S. by Chief Engineer B. F. Isherwood, U. S. navy, but never developed, although for years in vogue in Europe, has done much toward economy in the expenditure of the power of marine engines and the determination of the power necessary for certain speeds of ships. In 1874 the system of obtaining the resistance of ships by towing models, established by William Froude in Great Britain, was confirmed by towing a full-sized ship, the Greyhound, and is now regarded as a means of immense advantage in design of ships. It forms the complement of the progressive speed-trials of the ship over a measured distance in smooth water, at which all data can be obtained under uniform conditions, and in a systematic manner.

Materials of Construction.—Since 1875 rapid progress has been made in the use of mild steel or ingot iron. This metal is chiefly produced by the open-hearth process, cast into large ingots, and then rolled into plates or shapes. It has not the distinctive property of tempering peculiar to steel, and contains from ·12 to ·20 of 1 per cent. of carbon. It is very ductile and malleable, and can be produced in large quantities of uniform quality; it has 25 to 30 per cent. greater tenacity than the best iron ship-plates, and is only 2 to 2¼ per cent. heavier for equal volumes. The cruisers begun in 1883 for the U. S. navy were the first in the U. S. built throughout of mild steel. The elaborate tests made by the Government have shown an average ultimate tensile strength of about 63,000 lb. per square inch, and an elongation under tension of 25¾ per cent. in a length of 8 inches. The use of this material, while adding considerably to the strength of a vessel, from its great ductility and uniform strength in all directions, enables a reduction in the weight of the structure of from 10 to 14 per cent. over that of iron. This fact led to its use even when the steel cost much more than iron. The cost of manufacture is so much less that it has practically replaced iron as a structural material.

The remarkable developments in ocean steamships and in ironclad and unarmored war-ships could never have been attained if wood had continued to be the material of construction. In wooden ships the limits of size and of proportion were practically fixed by the capabilities of the material of which they were built, but in iron ships the designer is left free to adopt such dimensions as will conduce to efficiency, safety, and economy. The greater strength of iron and steel, and increasing skill in the fashioning and disposition of the material in the structure of vessels have led to a continuous increase in the size of ships, which, combined with the corresponding decrease in the proportion of weight of hull to weight carried or to the load-displacement, has largely increased the efficiencies of ships—that is, it has increased their speed, both from absolute size and greater available weight for machinery, and their war-power by increased proportion of weight of armor and batteries. The decreased weight of hull, with, also, a gain in structural strength, has had equally remarkable effects in small as in large vessels, for through no other means could a torpedo-boat 63 feet long, weighing but 12·5 tons, capable of a speed of 18 knots an hour, stand the strains of the machinery and be sufficiently strong to be lifted from the water to rest on crutches on board an ironclad.

ARMORED VESSELS.*

* In this table names of ships building or being rebuilt in 1898 are named in Italics; b. p. = between perpendiculars; B.-L., breech-loading; R.-F., rapid-fire; S.-B., smooth-bore; M.-L., muzzle-loading; *, length on water-line; †, with forced draught; ‡, estimated.

Argentine Republic.

NAME.	Date of launch.	Length b. p.	Beam.	Mean draught.	Displacement.	Indicated horse-power.	Speed.	Armor.	Armament.
Turret-ship.		Ft. in.	Ft. in.	Ft. in.	Tons.		Knots.	Inches.	Guns.
Almirante Brown	1880	240 0	50 0	20 0	4,200	4,500	13·7	9 5	Eight 8-in., six 40-pdrs.
Monitors.									
El Plata	1875	180 0	43 0	10 6	1,535	750	9·5	6 4⅜	Two 9-in., two light.
Los Andes	1874	180 0	43 0	10 6	1,535	750	9·5	6 4⅜	Two 9-in., two light.
Libertad	1890	230 0	43 0	13 0	2,389	3,000	13–14	8 6	Two 9·2-in. B.-L., four 4·7-in. R.-F.
Independencia	1891	230 0	43 0	13 0	2,389	3,000	13–14	8 6	Four 3-pdrs. R.-F., four 1-pdrs. R.-F.

Austria-Hungary.

NAME.	Date of launch.	Length b. p.	Beam.	Mean draught.	Displacement.	Indicated horse-power.	Speed.	Armor.		Armament.
Barbette Ships.		Ft. in.	Ft. in.	Ft. in.	Tons.		Knots.	Inches.		Guns.
Erzherzog Rudolph	1887	295 0	62 4	25 3	6,870	7,500	16·0	12	11	Three 12-in., six 4·7-in.
Erzherzogin Stefanie	1887	278 10	55 9	21 6	5,060	8,300	17·0	9	8	Two 12-in., six 6-in.
Coast-defense Ships.										
Monarch	1895	305 0	55 9	21 0	5,500	8,500	17·25	11	0	Four 9·4-in., six 6-in.
Wien	1895	305 0	55 9	21 0	5,500	8,500	17·25	11	0	Four 9·4-in., six 6-in.
Budapest	1896	305 0	55 9	21 0	5,500	8,500	17·25	11	0	Four 9·4-in., six 6-in.
Erzherzog Albrecht	1872	285 2	56 3	22 0	5,940	3,600	13·0	9	7	Eight 9·6 in., 11 R.-F.
Central-battery ships.										
Custoza	1872	302 3	58 0	24 6	7,060	4,440	14·0	9	7	Eight 9·4-in., 6 R.-F.
Don Juan de Austria	1875	240 3	50 0	20 0	3,550	2,700	13·0	8	6	Eight 8·4-in., 6 R.-F.
Kaiser	1871	254 0	58 3	24 3	5,810	3,200	13·0	6	5½	Ten 9-in., 6 R.-F.
Kaiser Max	1875	240 3	50 0	20 0	3,566	2,700	13·0	8	6	Eight 8·4-in., 6 R.-F.
Prinz Eugen	1877	240 3	50 0	20 0	3,566	2,700	13·0	8	6	Eight 8·4-in., 6 R.-F.
Tegethoff	1878	286 11	71 1	24 10	7,390	8,950	15·5	14	14	Six 9·6-in., 5 6-in., 13 R.-F.
Armored Cruiser.										
Kaiserin Maria Teresa	1893	351 0	52 6	20 0	5,270	10,000	19·1	3	0	Two 9·6 in., six 6-in., 11 R.-F.
Monitors.										
Leitha	1871	166 0	27 6	3 7	310	320	8·0	2½	0	Two 6-in.
Maros	1871	166 0	27 6	3 7	310	320	8·0	2½	0	Two 6-in.
Körös	1892	177 0	26 9	....	448	1,250	10·0	.....		Two 4·7-in., 2 R.-F.
Szamos	1892	177 0	26 9	....	448	1,250	10·0	.....		Two 4·7-in., 2 R.-F.

Brazil.

Turret.										
Lima Barros	1866	180 0	36 0	13 6	1,350	2,100	12·0	4⅛	3	Four 7-in.
Bahia	1866	178 0	35 0	8 3½	1,000	640	10·5	4⅛	2⅞	Two 70-pdrs.
Riachuelo	1883	305 0	52 0	19 6	5,700	†7,300	16·7	7	10	Four 9·2-in. B.-L.
24 de Maio	1885	280 0	52 0	18 0	4,950	†6,201	‡15·8	.....		Four 9-in. B.-L., four 5¼-in. B.-L.
Central Battery.										
Mariz-e-Barros	1866	198 10	31 0	9 6	1,444	600	9·0	4⅛	2⅞	Four 7-in.
Brazil	1864	179 8	35 0	12 0	1,518	975	11·3	4⅛	2⅞	Four 7-in., four 68-pdrs.
Sete de Setembro	1874	219 0	46 6	11 6	2,145	2,000	12·0	3⅞	0	Four 9-in.
Monitors.										
Alagoas	1864	120 0	28 0	9 0	340	75	7·5	4⅛	2	One 70-pdr.
Rio Grande	1864	120 0	28 0	9 0	340	75	7·5	4⅛	2	One 70-pdr.
Piauhy	1864	120 0	28 0	9 0	340	75	7·5	4⅛	2	One 7-in.
Maranhao	....	.....	....	....	....	..	....	.....		
Pernambuco	....	.....	....	....	....	..	....	.....		

Chili.

Almirante Cochrane	1874	204 0	46 0	19 2	3,560	3,000	13·0	9	4½	Five 8-in. B.-L.
Huascar	1864	196 0	35 6	15 6	1,130	1,200	11·0	4½	2½	Two 8-in., four 20-pdrs.
Capitan Prat	1890	328 0	60 8	21 10	6,900	12,000	18·3	11·8	4	Four 9·5-in., eight 4¼-in., 20 R.-F.

China.

Ting Yuen	1881	308 5	59 0	20 0	7,430	6,300	15·38	14	8	Four 12-in., two 5$\frac{8}{10}$-in.
Chen Yuen	1881	308 5	60 0	19 8	7,500	6,200	14·50	14	8	Four 12-in., two 5$\frac{8}{10}$-in.
Tien Sing	1875	105 0	20 4	7 0	200	340	10·00	3	1	One 6$\frac{7}{10}$-in.
Ping Yuen	1890	200 0	40 0	16 0	2,850	2,400	10·5	8	2	One 10-in., two 6-in., eight light.
King Yuen	1887	270 0	40 0	16 0	2,850	3,600	16·5	8	2	Two 8·2-in., two 6-in., eight light.

NOTE.—In the war with Japan (1894–95) the Ting Yuen and King Yuen were sunk, and the Chen Yuen and Ping Yuen were captured.

Denmark.

Helgoland	1878	257 0	59 2	18 8	5,347	3,838	13·3	12¼	6	One 12-in., four 10$\frac{3}{16}$-in., five 4$\frac{11}{16}$-in.
Odin	1872	236 10	48 5	14 1	3,083	2,260	12·4	8	4½	Four 10-in., six light.
Lindormen	1868	216 3	39 4	14 1	2,044	1,560	12·2	5½	3	Two 9-in., two light.
Gorm	1870	231 8	39 0	14 5	2,304	1,670	12·3	7	4⅝	Two 10-in., two light.
Rolf Krake	1863	184 10	38 1	10 3	1,344	750	7·8	4⅝	2	Two 8-in., two light.
Esbern Snare	1862	150 0	26 0	10 1	527	500	11·0	2	2	Three 5½-in.
Absalon	1862	150 0	26 0	10 1	527	500	11·0	2	2	Three 5½-in.
Iver Hvitfeldt	1886	242 0	49 6	18 0	3,260	5,100	15·6	12	8	Two 10$\frac{3}{16}$-in. Krupp, four 5-in. Krupp.
Tordenskjold	1880	221 6	43 3	15 6	2,400	2,600	14·0	8	0	One 52-in. Krupp, four 5 in.
Skjold	....	226 3	38 0	13 5	2,150	2,260	13·0	9	8	One 9·6-in., three 5-in., 4 R.-F.

France.

PREMIER RANG.										
Cuirassés.										
Dévastation	1879	311 7	69 8	24 1	9,639	8,320	15·17	16½	8$\frac{7}{10}$	Four 13½-in., four 10⅝-in., six 5½-in.
Courbet	1882	311 7	69 8	24 1	9,639	8,100	15·4	16½	8$\frac{7}{10}$	Four 13½-in., four 10⅝-in., six 5½-in.
Amiral Duperré	1879	319 10	66 11	26 9	11,100	8,000	14·2	21$\frac{6}{10}$	10	Four 13½-in., fourteen 5½-in.
Caiman	1883	*278 2	59 0	23 7	7,239	6,000	14·5	20¾	15½	Two 16½-in., four 4-in.
Indomptable	1883	*279 9	59 0	23 7	7,239	6,000	14·5	20¾	14½	Two 16½-in., four 4-in.
Tonnerre	1875	*241 6	57 9	21 0	5,580	4,166	14·0	14½	9¾	Two 10⅝-in., four 4½-in.
Fulminant	1877	*248 0	57 8	21 0	5,584	3,550	13·22	14½	9¾	Two 10⅝-in., four 4-in.
Furieux	1883	*246 0	58 4	21 4	5,695	3,420	14·0	19⅝	12⅝	Two 13½-in.
Redoutable	1876	312 0	64 6	23 10	8,800	6,071	14·66	15⅝	10½	Eight 10⅝-in., six 5½-in.
Trident	1876	314 1	57 10	26 10	8,814	4,882	14·17	8⅝	6$\frac{8}{10}$	Eight 10⅝-in., two 9½-in., six 5½-in.
Friedland	1873	*317 0	58 0	27 6	8,916	4,428	13·3	9	8½	Eight 10⅝-in., eight 5½-in.
Colbert	1875	*317 9	57 10	26 7	8,617	4,654	14·47	8⅝	7$\frac{1}{10}$	Eight 10⅝-in., two 9½-in., six 5½-in.
Marengo	1869	*282 10	57 2	26 3	7,187	3,673	13·5	7⅝	7$\frac{1}{12}$	Four 10⅝-in., four 9½-in., seven 5½-in.
Océan	1868	*282 10	57 7	27 8	7,334	3,781	13·7	7⅝	7$\frac{1}{12}$	Four 10⅝, four 9½-in., two 5½-in., one 4½-in.
Suffren	1870	*282 10	57 2	27 2	7,604	4,181	14·3	7⅝	7$\frac{1}{12}$	Four 10⅝, four 9½-in., six 5½-in., one 4½-in.
Richelieu	1873	*322 7	57 10	26 5	8,790	4,006	13·11	8⅝	7$\frac{2}{10}$	Six 10⅝, five 9½-in., seven 5½-in., one 4½-in.
Formidable	1885	321 5	69 0	25 9	11,441	9,700	16·2	21½	0	Three 17-in., twelve 5½-in.
Terrible	1881	271 7	59 0	23 7	7,184	6,230	11·7	20¾	14¼	Two 16½-in., four 4-in.
Requin	1885	*279 9	59 0	23 7	7,184	6,000	15·0	20¾	17	Two 16½-in., four 4-in.
Amiral Baudin	1883	321 5	69 0	25 9	11,441	8,320	15·0	21⅝	13¾	Three 16½-in., twelve 5½-in.
Hoche	1886	330 0	65 6	26 3	10,581	11,000	16·5	17¾	13¾	Two 13½-in., two 10⅝-in., sixteen 5½-in.
Magenta	1890	330 0	65 6	26 3	10,581	12,000	16·5	17¾	13¾	Two 13½-in., two 10⅝-in., sixteen 5½-in.
Marceau	1887	330 0	65 6	26 3	10,581	11,017	16·4	17¾	13¾	Two 13½-in., two 10⅝-in., sixteen 5½-in.
Neptune	1887	330 0	65 6	26 3	10,581	11,000	16·0	17¾	13¾	Two 13½-in., two 10⅝-in., sixteen 5½-in.
Brennus	1891	*344 6	65 0	27 10	10,800	13,000	17·5	17¾	15¾	Four 13½-in., eight 9½-in., eight 5½-in.

France (continued).

NAME.	Date of launch.	Length b. p.	Extreme breadth.	Mean draught.	Displacement.	Indicated horse-power.	Speed.	Armor.	Armament.
PREMIER RANG.									
Cuirassés.		Ft. in.	Ft. in.	Ft. in.	Tons.		Knots.	Inches.	Guns.
Carnot	1894	393 7	77 1	26 0	11,900	12,400	18·0	18 3	Two 12, two 10¾-in., eight 5·5-in., 20 R.-F.
Jauréguiberry	1893	356 0	72 8	27 9	11,818	13,275	17·0	18 11	Two 12, two 10¾-in., eight 5·5-in., 24 R.-F.
Charles Martel	1893	393 7	71 1	26 3	11,900	12,000	18·0	18 3	Two 12, two 10¾-in., eight 5·5-in., 20 R.-F.
Jemmapes	1892	383 9	57 5	22 0	6,590	7,500	16·5	18 17	Two 13·5-in., four 4-in., eight light.
Tréhouart	1893	383 9	57 5	22 0	6,590	7,500	16·5	18 17	Two 13·5-in., four 4-in., eight light.
Valmy	1892	383 9	57 5	22 0	6,590	7,500	17·0	18 17	Two 13·5-in., four 4-in., eight light.
Bouvet	1896	382 3	70 3	27 7	12,200	13,000	17·5	15¾ 8	Two 11·8-in., two 10·8-in., eight 5·5-in., eight 4-in., 32 R.-F.
Charlemagne	1895	385 0	66 7	25 10	11,232	14,000	18·0	15¾ 3	Four 11·8-in., ten 5·5-in., six 4-in., 36 R.-F.
Henri IV	....	385 5	66 7	25 10	11,260	14,000	18·0	15¾ 3	Four 11·8-in., ten 5·5-in., six 4-in., 36 R.-F.
Masséna	1895	368 6	66 6	26 3	11,900	12,600	17·5	17¾ 9¾	Two 11·8-in., two 10·8-in., eight 5·5-in., eight 4-in., 30 R.-F.
Pothuau	1895	370 6	50 2	21 4	5,320	10,000	20·0	7 2	Two 7·6-in., ten 5·5-in., 24 R.-F.
Saint Louis	1896	385 5	66 7	25 10	11,260	14,000	18·0	15¾ 3	Four 11·8-in., ten 5·5-in., six 4-in., 36 R.-F.
SECONDE RANG.									
Tempête	1876	241 6	57 9	16 9	4,523	2,745	12·8	13 9⅝	Two 10⅝-in.
Vengeur	1878	241 6	57 9	16 9	4,523	2,319	10·83	13 9½	Two 13½-in.
Tonnant	1880	241 6	57 9	16 9	4,523	2,728	12·8	17¾ 13½	Two 13½-in.
La Galissonnière	1872	* 255 10	49 2	21 6	4,487	2,670	13·08	5½ 4¾	Six 9½-in., six 3⅝-in.
Triomphante	1877	* 258 2	48 9	20 9	4,127	2,400	12·89	5½ 4¾	Six 9½-in., one 7½-in., six 5½-in., one 4¾-in.
Victorieuse	1875	* 258 2	48 9	20 9	4,504	2,214	12·75	5½ 4¾	Six 9½-in., one 7½-in., six 5½-in.
Bayard	1880	* 265 9	57 2	23 3	5,881	4,556	14·53	9½ 6½	Four 9½-in., two 7½-in., six 5½-in.
Duguesclin	1883	* 265 8	57 2	23 3	5,869	4,100	14·0	11 7¹¹⁄₁₂	Four 9½-in., one 7½-in., six 5½-in., one 4¾-in.
Turenne	1879	* 265 9	57 2	23 3	5,881	3,955	14·14	9½ 6½	Four 9½-in., two 7½-in., four 5½-in.
Vauban	1882	* 265 8	57 2	23 3	5,869	4,100	14·0	11 7⅝	Four 9½-in., one 7½-in., six 5½-in., one 4¾-in.
Achéron	1885								
Cocyte	1887								
Phlégéton	1890	* 181 0	40 4	11 0	1,639	1,700	13·0	9½ 0	One 10¾-in., two 4-in.
Styx	1890								
Fusée	1884								
Grenade	1885								
Mitraille	1886	* 165 0	35 7	10 4	1,045	1,500	13·2	9½ 0	One 9½-in.
Flamme	1885								
Dupuy de Lôme	1890	374 0	52 0	23 3	6,297	14,000	20·0	4 0	Two 7·5-in., six 6·3-in., two light.
Bouvines	1892	283 9	57 5	22 0	6,590	7,600	17·0	18 17	Two 13·5-in., four 4-in.
Bruix	1894	348 0	46 0	19 2	4,745	8,300	19·0	3½ 0	Two 7·5-in., six 5·6-in.
Chanzy	1894	348 0	46 0	19 2	4,745	8,300	19·0	3½ 0	Two 7·5-in., six 5·6-in.
Charner	1893	348 0	46 0	19 2	4,745	8,300	19·0	3½ 0	Two 7·5-in., six 5·6-in.
Latouche Tréville	1892	348 0	46 0	19 2	4,745	8,300	19·0	3½ 0	Two 7·5-in., six 5·6-in.
Garde-côtes cuirassés.									
Bélier	1870	196 10	53 0	17 9	3,390	1,921	12·25	8⅝ 8⅝	Two 9½-in.
Boule-dogue	1872	196 10	53 0	19 1	3,510	1,827	12·25	8⅝ 8⅝	Two 9½-in.

Germany.

Frigates.									
Kaiser	1874	280 0	62 2	25 1	7,696	8,000	14·5	10+1½ 5+1½	Eight 10½-in., one 8¼-in.
Deutschland	1874	280 0	62 2	25 1	7,696	8,000	14·5	10+1½ 5+1½	Eight 10½-in., one 8¼-in.
König Wilhelm	1868	345 4	60 0	25 6	9,757	8,000	19·0	9½ 6½	Eighteen 9½-in., four 8¼-in.
Friedrich der Grosse	1874	307 5	53 6	23 9	6,770	5,400	14·0	10½ 5⅞	Four 10½-in., two 6 7/10-in.
Oldenburg	1884	249 0	59 0	19 6	5,200	3,900	13·5	12⅔ 0	Nine 9½-in., five 6-in.
Corvettes.									
Sachsen	1877	298 6	60 0	19 8	7,400	5,600	14·0	17¼ 15½	One 11¾-in. B.-L., four 10½-in. B.-L.
Bayern	1878	298 6	60 0	19 8	7,400	5,600	14·0	17¼ 15½	One 11¾-in. B.-L., four 10½-in. B.-L.
Würtemberg	1878	298 6	60 0	19 8	7,400	5,600	14·0	17¼ 15½	One 11¾-in. B.-L., four 10½-in. B.-L.
Baden	1880	298 6	60 0	19 8	7,400	5,600	14·0	17¼ 15½	One 11¾-in. B.-L., four 10½-in. B.-L.
Gun-vessels.									
Wespe	1876	143 0	35 6	10 3	1,109	700	9·0	8 4	One 12-in.
Viper	1876	143 0	35 6	10 3	1,109	700	9·0	8 4	One 12-in.
Biene	1876	143 0	35 6	10 3	1,109	700	9·0	8 4	One 12-in.
Skorpion	1877	143 0	35 6	10 3	1,109	700	9·0	8 4	One 12-in.
Mücke	1877	143 0	35 6	10 3	1,109	700	9·0	8 4	One 12-in.
Basilisk	1878	143 0	35 6	10 3	1,109	700	9·0	8 4	One 12-in.
Camæleon	1878	143 0	35 6	10 3	1,109	700	9·0	8 4	One 12-in.
Crocodil	1879	143 0	35 6	10 3	1,109	700	9·0	8 4	One 12-in.
Salamander	1880	143 0	35 6	10 3	1,109	700	9·0	8 4	One 12-in.
Natter	1880	143 0	35 6	10 3	1,109	700	9·0	8 4	One 12-in.
Hummel	1881	143 0	35 6	10 3	1,109	700	9·0	8 4	One 12-in.
Coast Defense.									
Siegfried	1889								
Beowulf	1890								
Frithjof	1891								
Hagen	1893	240 0	49 3	17 9	3,500	4,800	15·0	9½ 8	Three 9·4-in., six light.
Heimdal	1892								
Hildebrand	1892								
Battle-ships.									
Kurfürst Friedrich Wilhelm	1891								
Woerth	1892	354 4	64 0	24 7	9,842	8,000	16·0	16 12	Six 11·2-in., sixteen 3·5-in.
Weissemburg	1891								
Brandenburg	1891								

Great Britain.

FIRST CLASS.									
Turret-ships.									
Inflexible	1876	320 0	75 0	25 3	11,880	8,010	13·81	16 24	Four 16-in., eight 4-in., 6 R.-F.
Dreadnought	1875	320 0	63 10	26 6	10,820	8,210	14·0	11 14	Four 12½-in., 18 R.-F.
Devastation	1871	285 0	62 3	27 6	9,330	7,214	14·5	10 14	Four 10-in. B.-L., two 7-pdrs., 14 R.-F.
Thunderer	1872	285 0	62 3	26 8	9,330	6,270	13·4	10 14	Four 10-in., 14 R.-F.
Colossus	1882	325 0	68 0	26 3	9,420	7,488	14·2	14 18	Four 12-in. B.-L., five 6-in., 14 R.-F.
Edinburgh	1882	325 0	68 0	26 3	9,420	6,000	14·2	14 18	Four 12-in. B.-L., five 6-in., 14 R.-F.
Nile	1888	345 0	73 0	27 6	11,940	12,000	16·7	20 14	Four 13·5-in., six 4·7-in., seventeen light.
Trafalgar	1887	345 0	73 0	27 6	11,940	12,000	16·7	20 14	Four 13·5-in., six 4·7-in., seventeen light.
Sans Pareil	1887	340 0	70 0	27 3	10,470	14,500	17·2	18 16	Two 17-in., one 10-in., twelve 6-in., twenty-one light.
Hood	1891	380 0	75 0	27 6	14,150	13,000	17·5	18 17	Four 13·5-in., ten 6-in., eighteen light.

Great Britain (continued).

NAME.	Date of launch.	Length b. p.	Extreme breadth.	Mean draught.	Displacement.	Indicated horse-power.	Speed.	Armor.	Armament.
FIRST CLASS. *Barbette Ships.*		Ft. in.	Ft. in.	Ft. in.	Tons.		Knots.	Inches.	Guns.
Collingwood	1882	325 0	68 0	26 10	9,500	9,570	16·5	10 18	Four 12-in. B.-L., six 6-in., 23 R.-F.
Rodney	1884	325 0	68 0	26 9	9,600	11,100	16·75	10 18	Four 13·5-in. B.-L., six 6-in., 14 R.-F.
Howe	1885	325 0	68 0	27 3	10,300	11,500	16·8	10 18	Four 13·5-in. B.-L., six 6-in., 18 R.-F.
Camperdown	1885	330 0	68 6	27 3	10,000	†12,000	16·9	12 18	Four 13·5-in. B.-L., six 6-in., 22 R.-F.
Benbow	1885	330 0	68 6	27 3	10,600	11,500	16·7	12 18	Two 17-in. B.-L., ten 6-in., 18 R.-F.
Anson	1886	330 0	68 6	27 3	10,600	11,500	16·9	12 18	Four 13·5-in. B.-L., six 6-in., 22 R.-F.
Barfleur	1892	360 0	70 0	25 6	10,500	13,000	18·0	12 9	Four 10-in., ten 4·7-in., seventeen light.
Centurion	1892	360 0	70 0	25 6	10,500	13,000	18·5	12 9	Four 10-in., ten 4·7-in., seventeen light.
Royal Sovereign	1891	380 0	75 0	27 6	14,150	13,000	18·0	18 17	Four 13·5-in., ten 6-in., 28 light R.-F.
Royal Oak	1892	380 0	75 0	27 6	14,150	13,000	18 0	18 17	Four 13·5-in., ten 6-in., 28 light R.-F.
Revenge	1892	380 0	75 0	27 6	14,150	13,000	17·5	18 17	Four 13·5-in., ten 6-in., 28 light R.-F.
Resolution	1892	380 0	75 0	27 6	14,150	13,000	17·9	18 17	Four 13·5-in., ten 6-in., 28 light R.-F.
Repulse	1892	380 0	75 0	27 6	14,150	13,000	17·5	18 17	Four 13·5-in., ten 6-in., 28 light R.-F.
Ramillies	1892	380 0	75 0	27 6	14,150	13,000	17·5	18 17	Four 13·5-in., ten 6-in., 28 light R.-F.
Empress of India	1891	380 0	75 0	27 6	14,150	13,000	18·0	18 17	Four 13·5-in., ten 6-in., 28 light R.-F.
Magnificent	1895	390 0	75 0	27 6	14,900	12,000	‡17·5	14 6	Four 12-in., twelve 6-in., 28 R.-F.
Majestic	1894	390 0	75 0	27 6	14,900	12,000	‡17·5	14 6	Four 12-in., twelve 6-in., 28 R.-F.
Renown	1895	380 0	72 0	26 9	12,350	12,000	‡18·0	14 6	Four 10-in., ten 6-in., 20 R.-F.
Prince George	1895	390 0	75 0	27 6	14,900	12,000	‡17·5	14 6	Four 12-in., twelve 6-in., 28 R.-F.
Victorious	1895	390 0	75 0	27 6	14,900	12,000	‡17·5	14 6	Four 12-in., twelve 6-in., 28 R.-F.
Hannibal	1896	390 0	75 0	27 6	14,900	12,000	‡17·5	14 6	Four 12-in., twelve 6-in., 28 R.-F.
Cæsar	1896	390 0	75 0	27 6	14,900	12,000	‡17·5	14 6	Four 12-in., twelve 6-in., 28 R.-F.
Mars	1896	390 0	75 0	27 6	14,900	12,000	‡17·5	14 6	Four 12-in., twelve 6-in., 28 R.-F.
Jupiter	1895	390 0	75 0	27 6	14,900	12,000	‡17·5	14 6	Four 12-in., twelve 6-in., 28 R.-F.
Illustrious	1896	390 0	75 0	27 6	14,900	12,000	‡17·5	14 6	Four 12-in., twelve 6-in., 28 R.-F.
SECOND CLASS. *Turret-ships.*									
Agamemnon	1879	280 0	66 0	24 0	8,660	4,500	12·1	14 18	Four 12½-in., two 6-in., 14 R.-F.
Ajax	1880	280 0	66 0	24 0	8,660	6,000	12·1	14 18	Four 12½-in., two 6-in., 14 R.-F.
Conqueror	1881	270 0	58 0	24 0	6,200	6,000	15·3	8½ 12	Two 12-in. B.-L., four 6-in., 6 R.-F.
Hero	1885	270 0	58 0	24 0	6,200	6,000	15·2	8½ 12	Two 12-in. B.-L., four 6-in., 10 R.-F.
Rupert	1872	250 0	53 0	22 9⅓	5,440	6,000	14·0	9 14	Two 9·2-in. B.-L., two 6-in., 10 R.-F.
Hotspur	1870	235 0	50 0	21 10	4,010	2,500	11·2	8 11	Two 12-in. M.-L., two 6-in., 4 R.-F.
Glatton	1871	245 0	54 0	19 5	4,910	2,000	11·0	10 14	Two 12-in. M.-L., 3 R.-F.
Orion	1880	245 0	52 0	21 4	4,870	2,600	11·9	12 5	Four 12-in. M.-L., six R.-F. 6-pdrs.
Belleisle	1878	245 0	52 0	21 0	4,870	2,600	11·9	12 5	Four 12-in. M.-L., six 6-pdrs. R.-F.
THIRD CLASS. *Armored Cruisers.*									
Superb	1875	332 3	59 0	26 5	9,170	8,500	15·0	7 12	Sixteen 10-in. M.-L., six 4-in., 16 R.-F.
Neptune (turret)	1874	300 0	63 0	25 5	9,310	6,000	13·4	9 12	Four 12½-in. M.-L., two 9-in., 8 R.-F.
Monarch "	1867	330 0	57 6	26 7	8,320	8,000	14·5	6 10	Four 12-in. M.-L., 2 9-in., 1 7-in., 10 R.-F.
Hercules	1868	325 0	59 0½	26 6	8,680	8,500	14·7	6 9	Eight 10-in. M.-L., 2 9-in., 4 7-in., 21 R.-F.
Sultan	1868	325 0	59 0½	26 8½	9,210	8,000	14·0	6 9	Eight 9·2-in. B.-L., 4 8-in., 7 4-in., 21 R.-F.
Alexandra	1873	325 0	63 8	26 3	9,490	7,000	14·3	6 12	Ten 10-in., 2 11-in. M.-L., 6 4-in., 10 R.-F.
Téméraire	1876	285 0	62 0	27 1	8,540	6,500	13·8	8 11	Four 11-in. M.-L., four 10-in. M.-L., six 4-in., 14 R.-F.
Nelson	1876	280 0	60 0	24 0	7,630	5,500	13·6	6 9	Four 10-in. M.-L., eight 9-in. M.-L., 24 R.-F.
Northampton	1876	280 0	60 0	24 0	7,630	4,500	12·6	6 9	Four 10-in. M.-L., eight 9-in. M.-L., 14 R.-F.
Shannon	1875	260 0	54 0	22 3	5,390	2,500	12·35	6 9	Two 10-in. M.-L., seven 9-in. M.-L.
Bellerophon	1865	300 0	56 1	24 8½	7,550	4,000	12·4	6 0	Ten 9-in. M.-L., 5 7-in. M.-L., 6 4-in., 4 R.-F.
Penelope	1867	260 0	50 0	16 8½	4,470	2,700	11·0	15 6	Eight 8-in. M.-L., three 40-pdrs.
Impérieuse (barb.)	1883	315 0	62 0	27 4	8,400	10,000	16·7	18 10	Four 9·2-in. B.-L., six 6-in., 13 R.-F.
Warspite "	1884	315 0	62 0	27 4	8,400	10,000	16·7	18 10	Four 9·2-in. B.-L., six 6-in., 13 R.-F.
Orlando "	1886	300 0	56 0	22 6	5,600	8,500	18·1	10 0	Two 9·2-in. (18-ton) B.-L., ten 6-in. B.-L., 9 R.-F.
Undaunted "	1886	300 0	56 0	22 6	5,600	8,500	18·1	10 0	
Australia "	1886	300 0	56 0	22 6	5,600	8,500	18·1	10 0	
Narcissus "	1886	300 0	56 0	22 6	5,600	8,500	18·1	10 0	
Galatea "	1887	300 0	56 0	22 6	5,600	8,500	18·1	10 0	
Immortalité "	1888	300 0	56 0	22 6	5,600	8,500	18·1	10 0	
Aurora "	1886	300 0	56 0	21 0	5,600	8,500	18·1	10 0	
Audacious	1869	280 0	54 0	22 3½	6,010	3,310	11·6	6 8	Ten 9-in. M.-L., eight 4-in. M.-L., 10 R.-F.
Invincible	1869	280 0	54 0	22 3	6,010	3,500	12·5	6 8	Ten 9-in. M.-L., 4 64-pdrs., 4 4-in., 4 R.-F.
Iron Duke	1870	260 0	54 0	21 9	6,010	3,500	12·4	6 8	Ten 9-in. M.-L., four 64-pdrs., 8 R.-F.
Swiftsure	1871	280 0	55 0	25 3	6,910	3,500	12·6	6 8	Ten 9-in. M.-L., eight 4-in. M.-L., 8 R.-F.
Triumph	1870	280 0	55 0	25 7½	6,640	3,500	12·6	6 8	Ten 9-in. M.-L., eight 4-in. M.-L., 16 R.-F.
FOURTH CLASS. *Turret-ships.*									
Cyclops	1871	225 0	45 0	16 4	3,480	1,200	9·9	6 10	Four 10-in. M.-L., four 6-in., 6 R.-F.
Gorgon	1871	225 0	45 0	16 4	3,480	1,200	9·9	6 10	Four 10-in. M.-L., 4 R.-F.
Hecate	1871	225 0	45 0	16 4	3,480	1,200	9·9	6 10	Four 10-in. M.-L., 4 R.-F.
Hydra	1871	225 0	45 0	16 4	3,480	1,200	9·9	6 10	Four 10-in. M.-L., 4 R.-F.
Prince Albert	1864	240 0	48 1	19 6	3,880	1,300	9·7	sides 4½ / turrets 10	Four 9-in. M.-L.
Scorpion	1863	224 6	42 4½	16 2	2,750	1,450	10·51	4½ 0	Four 9-in. M.-L.
Wivern	1863	224 6	42 4½	15 9	2,750	1,000	8·5	4½ 0	Four 9-in. M.-L.
FIFTH CLASS. *Rigged Ships.*									
Warrior	1860	380 2	58 4	26 7	9,210	4,000	12·7	4½ 0	Four 8-in. M.-L., twenty-eight 7-in. M.-L.
Black Prince	1861	380 2	58 4	26 9	9,210	4,000	12·7	4½ 0	Four 8-in., twenty-four 7-in. M.-L.
Achilles	1868	380 0	58 3½	27 3	9,820	4,000	12·7	4½ 0	Fourteen 9-in. M.-L., two 7-in. M.-L.
Minotaur	1863	400 0	59 4¾	26 9	10,690	4,000	12·0	5½ 3	Seventeen 9-in. M.-L., 12 R.-F.
Agincourt	1865	400 0	59 5	27 6	10,690	4,000	12·0	5½ 3	Seventeen 9-in. M.-L.
Northumberland	1866	400 4	59 5	27 3½	10,780	4,000	12·0	5½ 3	Six 9-in. M.-L., 18 8-in., 2 6-in. B.-L.

NOTE.—Many of the older British vessels have been refitted with new machinery, and others are rated at actual present performance, therefore not identical with the original design or trial performance given in the text for historical review.

Greece.

Basileus Georgios	1867	200 0	33 0	15 6	1,774	2,400	12·8	7 6⅜	Two 9-in.
Olga	1869	249 0	59 0	22 6	2,060	1,950	10·0	$5\frac{8}{10}$ 5	Four $6\frac{7}{10}$-in., two $5\frac{7}{10}$-in., two $4\frac{7}{10}$-in.
Hydra	1889	320 0	51 10	18 0	4,885	6,700	17·0	12 4½	Three 10·6-in., five 6-in.
Spetsia	1889	320 0	51 10	18 0	4,885	6,930	17·5	12 4½	Three 10·6-in., five 6-in.
Psara	1890	320 0	51 10	18 0	4,885	6,900	17·0	12 4½	Three 10·6-in., five 6-in.

French Battle-ship Hoche.

Argentine Cruiser Nueve de Julio (3,575 tons; 22 knots).

United States Monitor Amphitrite.

Italy.

NAME.	Date of launch.	Length b. p.	Beam.	Mean draught.	Displacement.	Indicated horse-power.	Speed.	Armor.	Armament.
FIRST CLASS.									
Battle-ships.		Ft. in.	Ft. in.	Ft. in.	Tons.		Knots.	Inches.	Guns.
Italia	1880	400 6	74 0	31 2	15,900	16,000	18·0	19 0	Four 17-in., twelve 6-in.
Lepanto	1883	400 6	74 0	31 2	15,900	15,840	18·4	19 0	Four 17-in., twelve 6-in.
Duilio	1876	340 11	64 9	26 7	11,200	7,710	15·4	$21\frac{67}{100}$ $17\frac{72}{100}$	Four $17\frac{7}{10}$-in., four $4\frac{7}{10}$-in.
Dandolo	1878	340 11	64 9	26 7	11,200	7,900	15·4	$21\frac{67}{100}$ $17\frac{72}{100}$	Four $17\frac{7}{10}$-in., four $4\frac{7}{10}$-in.
Ruggiero di Lauria	1884	328 2	65 4	27 2	11,000	10,600	17·0	$17\frac{5}{8}$ 0	Four 17-in., twelve 6-in.
Francesco Morosini	1885	328 2	65 4	27 2	11,000	10,000	16·0	$17\frac{5}{8}$ 0	Four 17-in., twelve 6-in.
Andrea Doria	1885	328 2	65 4	27 2	10,045	10,500	16·1	$17\frac{5}{8}$ 0	Four 17-in., twelve 6-in.
Ré Umberto	1888	400 0	76 9	28 6	13,251	19,500	18·2	19 0	Four 13·5 in., eight 6-in., sixteen $4\frac{7}{4}$-in.
Sicilia	1891	400 0	76 9	28 6	13,251	20,000	18·0	19 0	Four 13·5-in., eight 6-in., sixteen $4\frac{7}{4}$-in.
Sardegna	1890	411 0	76 9	28 6	13,940	23,000	19·0	14·2 barb. 4 inside	Four 13·5-in., eight 6-in., sixteen $4\frac{7}{4}$-in.
Ammiraglio di St. Bon.	1897	344 6	68 10	24 9	9,800	13,500	18·0	$9\frac{7}{4}$ 4	Four 10-in., eight 6-in., 8 4·7-in., 16 R.-F.
Emanuele Filiberto	1897	344 6	68 10	24 9	9,800	13,500	18·0	$9\frac{7}{4}$ 4	Four 10-in., eight 6-in., 8 4·7-in., 16 R.-F.
SECOND CLASS.									
Palestro	1871	261 7	57 8	26 3	6,419	3.496	12·9	$8\frac{5}{5}$ 6	One 11-in., six 10-in.
Principe Amadeo	1872	261 6	57 4	24 8	5,854	3,413	12·4	$8\frac{5}{5}$ 6	One 11-in., six 10-in.
Roma	1865	261 3	57 5	24 4	5,814	3,000	13·0	$4\frac{7}{4}$ 4	Eleven 10-in.
THIRD CLASS.									
Affondatore	1865	293 8	40 4	21 6	4,376	3,240	13·0	5 3	Two 10-in., eight light.
Castelfidardo	1863	249 4	47 11	20 9	4,224	2,115	12·0	$4\frac{3}{10}$ 3	Two 9-in., nine 8-in., eight light.
Ancona	1864	249 4	47 11	20 9	4,224	2,471	13·0	$4\frac{3}{10}$ 3	Two 9-in., nine 8-in., seven light.
Maria Pia	1863	247 6	50 0	20 9	4,268	2,924	11·5	$4\frac{7}{10}$ 3	Two 9-in., nine 8-in.
San Martino	1863	247 6	50 0	20 9	4,268	2,620	11·5	$4\frac{7}{10}$ 3	Two 9-in., nine 8-in.
Armored Cruisers.									
Carlo Alberto	1896	325 0	59 0	23 7	6,500	13,000	....	.....	
Giuseppe Garibaldi	1897	325 0	59 0	23 7	6,500	13,000	18·0	.....	Two 10-in., ten 6-in., six 5-in., 20 R.-F.
Nino Bixio	....	.....	....	....	6,500	14,000	....	.....	
Varese	1897	325 0	59 0	23 7	6,500	13,000	18·0	.....	Two 10-in., ten 6-in., six 5-in., 20 R.-F.
Vettor Pisani	1895	325 0	59 0	23 7	6,500	13,000	18·0	.....	Two 10-in., ten 6-in., six 5-in., 20 R.-F.

Japan.

Fusō	1877	218 8	47 6	18 0	3,718	3,500	14·0	9 8	Four $9\frac{4}{10}$-in., two $6\frac{1}{2}$-in.
Ko-ngo	1877	229 6	40 7	17 6	2,200	2,500	14·0	$4\frac{1}{2}$ 0	Six $5\frac{1}{2}$-in., three $6\frac{11}{16}$-in.
Hi-yei	1877	229 6	40 7	17 6	2,200	2,500	14·0	$4\frac{1}{2}$ 0	Six $5\frac{1}{2}$-in., three $6\frac{11}{16}$-in.
Rio-Jo	1864	210 6	38 7	17 4	1,459	975	10·0	4 0	Two $6\frac{7}{10}$-in., six $5\frac{1}{2}$-in.
Armored Cruisers.									
Chiyoda	1890	308 0	42 6	14 0	2,450	5,600	19·0	$4\frac{5}{5}$ 0	Ten 4·7-in. R.-F., fourteen light.
Hashidate	1891	295 0	50 10	21 2	4,300	5,400	17·5	12-in. barb.	One 12·6-in., eleven $4\frac{7}{4}$-in., eleven light.
Itsukushima	1889	295 0	50 6	21 2	4,300	5,400	17·5	12-in. barb.	One 12·6-in., eleven $4\frac{7}{4}$-in., eleven light.
Matsushima	1890	295 0	50 6	21 2	4,300	5,400	17·5	12-in. barb.	One 12·6-in., eleven $4\frac{7}{4}$-in., eleven light.

For Chen Yuen and Ping Yuen, see under China.

Netherlands.

SECOND CLASS.									
Reinier Claesen	1891	229 7	44 3	14 5	2,490	2,400	16·5	11 4	One 8·2-in., one 6·7-in., five light.
Koningen Wilhelmina	1892	328 0	49 3	19 8	4,600	5,900	17·0	11 0	One 11-, one 8·3-, two 6·7-in., fourteen light.
Koning der Nederlanden	1874	269 0	49 3	20 0	5,400	4,500	11·95	8 0	Four 11-in., four $4\frac{7}{4}$-in.
Schorpieon	1868	193 2	38 0	16 0	2,200	2,200	12·8	6 0	Two 9-in.
Guinea	1870	195 6	40 0	15 8	2,378	2,000	12·0	6 0	One 11·2-in., 6 R.-F.
Buffel	1868	195 6	40 0	15 6	2,198	2,200	12·7	6 0	One 11·2-in., 6 R.-F.
Stier	1868	194 10	38 0	15 6	2,200	2,200	12·3	6 0	One 11·2-in., 7 R.-F.
Draak	1877	201 5	49 3	10 10	2,156	800	9·0	8 0	Two 11-in.
Prins-Hendrick der Nederlanden.	1866	229 7	42 7	18 1	3,375	2,000	12·0	6 $4\frac{1}{2}$	Four 9-in., four $4\frac{7}{10}$-in.
Evertsen	1894	283 0	47 0	16 9	3,400	4.735	20·0	6 $9\frac{1}{2}$	Three 8·4-in., two 6-in., 10 R.-F.
Kortenaer	1894	283 0	47 0	16 9	3,400	4,658	20·0	6 $9\frac{1}{2}$	Three 8·4-in., two 6-in., 10 R.-F.
Piet Hein	1894	283 0	47 0	16 9	3,400	4,735	20·0	6 $9\frac{1}{2}$	Three 8·4-in., two 6-in., 10 R.-F.
Monitors.									
Bloedhond	1869	180 0	46 2	9 6	1,530	680	8·0	$5\frac{1}{2}$ 8	One 11·2-in., 3 R.-F.
Cerberus	1869	180 0	44 0	9 6	1,530	680	8·0	$5\frac{1}{2}$ 8	One 11·2-in., 3 R.-F.
Haai	1871	186 0	47 4	9 6	1,650	680	7·0	$5\frac{1}{2}$ 8	One 11·2-in., 3 R.-F.
Heiligerlee	1868	180 0	43 6	9 6	1,530	680	8·0	$5\frac{1}{2}$ 8	One 11·2-in., 3 R.-F.
Hijena	1870	186 0	47 4	9 6	1,650	680	7·0	$5\frac{1}{2}$ 8	One 11·2-in., 3 R.-F.
Krokodill	1868	180 0	43 6	9 6	1,530	680	8·0	$5\frac{1}{2}$ 8	One 11·2-in., 3 R.-F.
Luipaard	1876	186 0	43 7	9 6	1,525	680	7·0	$5\frac{1}{2}$ 8	One 11·2-in., 3 R.-F.
Matador	1878	201 5	49 3	10 2	1,935	691	7·0	$5\frac{1}{2}$ 8	Two 11-in.
Panter	1870	186 4	44 0	9 6	1,566	680	7·0	$5\frac{1}{2}$ 8	One 11·2-in., 3 R.-F.
Tijger	1868	187 0	44 0	9 6	1,530	680	8·0	$5\frac{1}{2}$ 8	One 11·2-in., 3 R.-F.
Gunboats.									
Wesp	1871	186 4	44 0	10 2	1,566	680	7·0	$5\frac{1}{2}$ 8	One 11·2-in., 3 R.-F.
Vahalis	1870	120 5	27 6	5 0	340	200	6·0	$4\frac{1}{2}$ 0	Two 3-in.
Rhenus	1877	151 0	24 11	4 3	367	320	7·0	5 4	Two $4\frac{7}{4}$-in.
Mosa	1878	151 0	28 0	4 3	367	320	7·0	5 4	Two $4\frac{7}{4}$-in.
Isala	1876	151 0	28 0	4 3	367	320	7·0	5 4	Two $4\frac{7}{4}$-in.
Merva	1879	151 0	28 0	4 3	320	320	7·0	5 4	Two $4\frac{7}{4}$-in.

Norway.

Monitors.									
Thor	1872	203 5	49 3	13 2	2,003	600	8·3	$14\frac{1}{2}$ $6\frac{7}{5}$	Two 11-in.
Thrudvang	1869	200 2	45 11	11 3	1,515	500	8·0	$12\frac{1}{16}$ $4\frac{7}{5}$	Two 11-in.
Mjoelner	1868	203 5	45 11	11 3	1,515	450	8·0	$12\frac{1}{16}$ $4\frac{7}{5}$	Two 11-in.
Skorpionen	1866	164 0	43 11	11 3	1,447	350	6·0	$12\frac{1}{16}$ $4\frac{7}{5}$	Two 11-in.

Portugal.

Vasco de Gama	1876	200 0	40 0	17 11	2,479	3,625	13·25	10 6	Two $10\frac{1}{2}$-in., one 5-in., three light.

Russia.

Cruisers.									
Minin	1878	298 6	49 3	21 7	5.740	5,300	13·5	8 $5\frac{7}{4}$	Four 8-in., twelve 6-in.
Duke of Edinburgh	1875	281 4	47 11	21 0	4,602	5,222	15·2	7 $4\frac{1}{2}$	Four 8-in., five 6-in., 12 R.-F.
General Admiral	1873	281 4	47 11	21 0	4,602	4,472	14·0	7 $4\frac{1}{2}$	Six 8-in., two 6-in., 10 R.-F.

Russia (continued).

NAME.	Date of launch.	Length b. p.	Beam.	Mean draught.	Displacement.	Indicated horse-power.	Speed.	Armor.	Armament.
Cruisers.		Ft. in.	Ft. in.	Ft. in.	Tons.		Knots.	Inches.	Guns.
Dmitri Donskoi	1883	295 0	52 0	24 7	6,000	7,300	16·5	10 6	Two 8-in., twelve 6-in., 16 R.-F.
Wladimir Monarch	1882	295 0	52 0	23 0	5,754	7,000	15·8	10 6	Four 8-in., twelve 6-in., 18 R.-F.
Pamyat Azova	1887	377 0	51 0	23 0	6,000	8,000	18·0	9 8	Two 8-in., thirteen 6-in., 14 R.-F.
Gremyashtchy	1892	225 0	41 0	11 0	1,500	2,000	15·0	5 0	One 9-in., one 6-in.
Grosyashtchy	1890	229 0	41 8	11 0	1,492	2,000	15·0	5 0	One 9-in., one 6-in.
Otvainy	1892	220 0	41 0	11 0	1,500	2,000	15·0	5 0	One 9-in., one 6-in., 10 R.-F.
Rurik	1892	396 6	67 0	26 0	10,923	13,250	18·5	10 0	Four 8-in., 16 6-in., 6 4·7-in., 18 R.-F.
Rossia	1896	480 0	68 6	25 0	12,130	15,000	19·0	.....	Four 8-in., 16 6-in., 6 4·7-in., 18 R.-F.
Rurik No. 2	....	446 9	70 0	27 0	12,095	15,000	19·0	.....	Four 8-in., 16 6-in., 6 4·7-in., 18 R.-F.
Battle-ships.									
Tchesmé	1886	331 0	69 0	26 6	10,181	11,000	15·0	16 14	Six 12-in., seven 6-in., 8 R.-F.
Sinope	1887	331 0	69 0	26 6	10,181	12,750	16·73	16 14	Six 12-in., seven 6-in., 8 R.-F.
Catherine II	1886	331 0	69 0	26 6	10,800	11,000	15·5	16 14	Six 12-in., seven 6-in., 8 R.-F.
Admiral Nachimoff	1885	333 0	61 0	25 3	7,781	8,000	16·7	10 8	Eight 8-in., ten 6-in., 10 R.-F.
Nicholas I	1889	327 0	67 0	25 6	8,440	8,000	14·8	14 6	Two 12-in., four 9-in., eight 6-in.
Alexander II	1887	327 0	67 0	25 6	8,440	8,000	16·5	14 6	Two 12-in., four 9-in., eight 6-in.
Gangoot	1890	278 0	62 0	21 0	6,628	8,300	14·7	16 0	One 12-in., four 9-in., four 6-in.
Twelve Apostles	1890	330 0	60 0	25 8	8,200	11,500	16·6	12 14	Four 12-in., four 6-in.
Georghy Pobyedonosets	1891	320 0	69 0	26 7	10,280	15,000	16·5	16 12	Six 12-in., seven 6-in.
Navarin	1891	338 0	67 0	25 0	9,476	9,000	16·0	16 12	Four 12-in., eight 6-in.
Sessoi Veliki	1894	344 6	68 10	....	8,800	8,000	16·5	15·7 10·2	Four 11·8-in., six 5·9-in., 20 R.-F.
Sessoi Veliki No. 2	....	344 6	68 10	....	8,800	8,000	16·5	15·7 10·2	Four 11·8-in., six 5·9-in., 20 R.-F.
Rotislaw	1896	344 6	68 10	....	8,800	8,000	16·5	15·7 10·2	Four 11·8-in., six 5·9-in., 20 R.-F.
Paris	....	357 6	72 2	27 0	12,480	10,600	16·0	18 12	Four 12-in., 12 6-in., 4 4·7-in., 16 R.-F.
Petropaulovsk	1894	367 6	69 0	26 0	10,960	10,600	17·5	15¾ 10	Four 12-in., eight 8-in., 24 R.-F.
Poltava	1894	367 6	69 0	26 0	10,960	10,600	17·5	15¾ 10	Four 12-in., eight 8-in., 24 R.-F.
Sebastopol	1895	367 6	69 0	26 0	10,960	10,600	17·5	15¾ 10	Four 12-in., eight 8-in., 24 R.-F.
Tria Sviatitelia	1893	357 6	72 2	27 0	12,480	10,600	16·0	18 16	Four 12-in., 12 6 in., 4 4·7-in., 56 R.-F.
SEAGOING:									
Turret-ships.									
Peter the Great	1872	328 2	62 4	23 9	8,749	8,258	14·5	14 8	Four 12-in., 13 R.-F.
Admiral Chitchagoff	1868	261 10	43 0	17 6	3,800	2,060	10·75	6 3½	Two 11-in., four 4-pdrs., one 3-pdr.
Admiral Spiridoff	1868	261 10	42 9	17 3	3,700	2,031	10·75	6 3½	Two 11-in., four 4-pdrs., one 3-pdr.
Admiral Greig	1868	261 10	42 9	18 3	3,754	2,000	10·0	4½ 2½	Three 11-in., four 4-pdrs., one 9-in. mtr.
Admiral Lazareff	1867	261 10	42 9	17 10	3,754	2,000	10·0	4½ 2½	Six 9-in., four 4-pdrs., one 9-in. mortar.
Battery-ships.									
Kniaz-Pojarski	1867	263 5	49 0	21 0	4,506	2,835	10·0	4½ 2⅞	Eight 8-in.. two 6-in.
Pervenetz	1864	220 3	52 11	14 3	3,300	800	9·0	4½ 4	Fourteen 8-in., four 4-pdrs.
Netronj-menja	1864	214 8	52 11	16 1	3,870	1,140	8·0	5½ 4	Fourteen 8-in., six 6-pdrs., one 9-in. mtr.
Kreml	1864	215 0	52 11	16 8	3,865	2,822	8·5	6 4	Fourteen 8-in., six 4-pdrs., one 9-in. mtr.
Netron Menya	1864	219 10	53 0	15 6	3,494	2,393	9·0	4½ 4½	Fourteen 8-in.
Single-turreted Monitors.									
Edinorog	1864	200 0	46 0	11 2½	1,406	450	7·0	5 0	Two 9-in.
Bronenositz	1864	200 0	46 0	11 2½	1,381	481	7·7	5 0	Two 9-in.
Circular Ironclads.									
Novgorod	1873	101 0	101 0	13 2	2,490	2,270	7·0	11 9	Two 11-in.
Admiral Popoff	1875	121 0	121 0	13 0	3,610	3,500	9·0	18 16	Two 12-in., four light.
Coast-defense Ships.									
Admiral Oushakoff	1893	278 8	52 6	17 0	4,126	5,000	16·0	10 0	Four 10-in., two 9-in., four 6-in., 20 R.-F.
Admiral Senjavin	1893	278 9	52 6	17 0	4,126	5,000	16·0	10 0	Four 10-in., two 9-in., four 6-in., 20 R.-F.

Spain.

Pelayo	1887	344 6	66 2	24 8	9,902	6,800	‡15·0	17·7	11·8	Two 12-in. B.-L., two 11-in. B.-L., thirteen smaller guns.
Puigcerdá (turret-ship)	1874	127 11	29 6	6 7	553	326	8·0	$3\frac{9}{10}$	3	One $6\frac{3}{10}$-in., two $4\frac{7}{10}$-in.
Broadside Ships.										
Vitoria	1865	316 7	57 0	24 11	7,250	4,500	11·5	5½	4	Eight 9-in., three 8-in.
Numancia	1863	313 7	52 10	25 2	7,305	3,700	8·0	$5\frac{1}{10}$	4	Eight 10-in., seven 8-in.
Sagunto	1869	279 2	54 1	24 3	7,352	3,200	8·0	$5\frac{9}{10}$	4	Eight 9-in., three 7-in.
Zaragoza	1867	270 7	54 1	23 9	5,620	3,700	10·9	$5\frac{1}{10}$	3	Four 9-in., three 7-in., ten $6\frac{3}{10}$-in.
Duque de Tetuan (gunboat)	1874	141 0	31 0	6 11	703	190	8·0	$3\frac{9}{10}$	0	One $6\frac{3}{10}$-in., four 4·72 M.-L.
Armored Cruisers.										
Emperador Carlos V	1892	364 0	65 0	22 0	9,325	15,000	†20·0	6	0	Two 11-in., ten 5·5-in., sixteen light.
Infanta Maria Teresa*	1890	340 0	65 0	21 6	7,000	13,000	†20·0	12	10	Two 11·2-in., ten 4·2-in., sixteen light.
Vizcaya*	1891	340 0	65 0	21 6	7,000	13,000	†20·0	12	10	Two 11·2-in., ten 4·2-in., sixteen light.
Almirante Oquendo*	1891	340 0	65 0	21 6	7,000	13,000	†20·0	12	10	Two 11·2-in., ten 4·2-in., sixteen light.
Cardenal Cisneros	1896	340 0	65 0	21 6	7,000	13,000	‡20·0	12	10½	Two 11·2-in., ten 5·5-in., 16 R.-F.
Cataluña	....	340 0	65 0	21 6	7,000	13,000	‡20·0	12	10½	Two 11·2-in., ten 5·5-in., 16 R.-F.
Princesa de Asturias	1896	340 0	65 0	21 6	7,000	13,000	‡20·0	12	10½	Two 11·2-in., ten 5·5-in., one 3·6 in., 16 R.-F.

* Sunk by U. S. ships in action, July 3, 1898, as also the Cristobal Colon (built like the Italian Giuseppe Garibaldi).

Sweden.

Monitors.										
John Ericsson	1865	197 0	46 10	11 8	1,522	380	7·0	10⅝	4⅞	Two 15-in.
Thordön	1866	197 0	46 10	11 8	1,522	380	7·5	10⅝	4⅞	Two 9½-in.
Tirfing	1866	197 0	46 10	11 8	1,522	380	7·5	10⅝	4⅞	Two 9½-in.
Loke	1871	205 3	45 4	12 0	1,620	460	8·0	17⅝	4⅞	Two 9½-in.
Gunboats.										
Hildur	1871	131 0	22 3	8 3	461	133	8·0	16⅝	2½	One 9½-in.
Ulf	1873	131 0	22 3	8 3	461	155	8·0	16½	2½	One 9½-in.
Björn	1873	131 0	22 3	8 3	461	155	8·0	16⅝	2½	One 9½-in.
Berserk	1873	131 0	22 3	8 3	457	155	8·0	16½	2½	One 9½-in.
Sölve	1874	131 0	22 3	8 3	457	155	8·0	16½	2½	One 9½-in.
Folke	1874	131 0	22 3	8 3	457	155	8·0	16½	2½	One 9½-in.
Skold	1868	104 0	22 7	7 6	240	17	3·7	8½	2½	One 9½-in.
Fenris	1871	104 0	22 7	8 7	260	43	6·0	10½	2½	One 9½-in.
Gerda	1871	131 0	22 3	8 3	461	133	8·0	16⅝	2½	One 9½-in.
Turret-ships.										
Svea	1886	248 4	48 7	11 10	2,900	3,100	15·5	11½	7·8	Four 6-in. B.-L., two 10-in.
Göta	1890	248 4	48 7	11 10	2,900	3,100	15·5	11½	7·8	Two 10-in., four 6-in. B.-L.
Odin	1896	270 0	48 0	17 0	3,403	3,700	‡15·0	.....		Two 10-in., four 4·7-in., 16 R.-F.
Thule	1892	249 4	49 3	15 9	3,135	3,150	‡16·0	11½	7·8	Two 10-in., four 6-in., 5 R.-F.

Turkey.

NAME.	Date of launch.	Length b p.	Beam.	Mean draught.	Displacement.	Indicated horse-power.	Speed.	Armor.		Armament.
Armored Cruiser.		Ft. in.	Ft. in.	Ft. in.	Tons.		Knots.	Inches.		Guns.
Abd-el-Kader	....	341 0	65 6	...	8,000	12,000		14	0	Four 11·2-in., six 6-in., 10 R.-F.
Central-battery Ships.										
Assar-i-Schefket	1868	203 5	42 7	16 5	2,080	1,750	11·0	6	4½	One 9-in., four 7-in.
Assar-i-Tefvik	1868	272 4	52 6	24 11	4,687	3,568	13·0	8	9	Eight 9-in., two 8-in.
Avni-Illar	1869	226 4	36 0	16 5	2,380	2,450	12·0	6	5	Four 9-in.
Feth-i-Bulend	1869	236 3	39 4	18 1	2,806	3,250	13·0	9	6	Four 9-in.
Hamidieh	1885	292 0	55 9	24 10	6,700	4,500	13·0	9	5	Ten 9-in., two 7-in., 6 R.-F.
Idjilalieh	1870	213 3	42 7	17 4	2,266	1,800	11·0	6	4½	Two 9$\frac{1}{6}$-in., two 7-in., one 4-in.
Mesoodieh	1874	332 0	59 0	25 0	9,140	7,910	13·74	12+1½	8	Twelve 10-in., three 6-in.
Muin-i-Zaffer	1869	230 0	36 0	16 5	2,380	2,555	13·0	6	5	Four 9-in., one 5-in.
Mukadim-i-Hair	1872	236 3	39 4	18 1	2,806	3,000	12·0	9	6	Four 9-in.
Nedjim-i-Schefket	1868	203 5	42 7	16 5	2,046	1,900	11·0	6	4½	One 9-in., four 7-in.

NOTE.—Besides these, Turkey has four barbette-ships, one turret-ship, and three armored gunboats.

*United States.**

Battle-ships.										
Alabama	1898	368 0	72 2½	23 6	11,525	‡10,000	‡16·0	16½	14	Four 13-in., fourteen 6-in., sixteen 6-pdrs., six 1-pdrs., four Colts, two 3-in. field.
Illinois	1898	368 0	72 2½	23 6	11,525	‡10,000	‡16·0	16½	14	Four 13-in., fourteen 6-in., sixteen 6-pdrs., six 1-pdrs., four Colts, two 3-in. field.
Indiana	1893	348 0	69 3	24 0	10,288	9,738	15·547	18	15	Four 13-in., eight 8-in., four 6-in., twenty 6-pdrs., seven 1-pdrs., two 3-in. field.
Iowa	1896	360 0	72 2½	24 0	11,340	12,105	17·087	14	15	Four 12-in., eight 8-in., six 4-in., twenty 6-pdrs., four 1-pdrs., four Colts, two 3-in. field.
Kearsarge	1898	368 0	72 2½	23 6	11,525	‡10,000	‡16·0	16½	17	Four 13-in., four 8-in., fourteen 5-in., twenty 6-pdrs., six 1-pdrs., four Colts, two 3-in. field.
Kentucky	1898	368 0	72 2½	23 6	11,525	‡10,000	‡16·0	16½	17	Four 13-in., four 8-in., fourteen 5-in., twenty 6-pdrs., six 1-pdrs., four Colts, two 3-in field.
*Maine***	....	388 0	72 2½	23 10½	12,500	‡16,000	‡18·0	12	12	Four 12-in., sixteen 6-in., sixteen 6-pdrs., four 1-pdrs., auto., two 1-pdrs. R.-F., two 3-in. field, two Colts.
Massachusetts	1893	348 0	69 3	24 0	10,288	10,403	16·21	18	15	Four 13-in., eight 8-in., four 6-in., twenty 6-pdrs., six 1-pdrs., two Colts, two 3-in. field.
Missouri	....	388 0	72 2½	23 10½	12,500	‡16,000	‡18·0	12	12	Four 12-in., sixteen 6-in., sixteen 6-pdrs., four 1-pdrs., auto., two 1-pdrs. R.-F., two 3-in. field, two Colts.
Ohio	....	388 0	72 2½	23 10½	12,500	‡16,000	‡18·0	12	12	Four 12-in., sixteen 6-in., sixteen 6-pdrs., four 1-pdrs., auto., two 1-pdrs. R.-F., two 3-in. field., two Colts.
Oregon	1893	348 0	69 3	24 0	10,288	11,111	16·79	18	15	Four 13-in., eight 8-in., four 6-in., twenty 6-pdrs., six 1-pdrs., two Colts, one 3-in. field.
Wisconsin	1898	368 0	72 2½	23 6	11,525	‡10,000	‡16·0	16½	14	Four 13-in., fourteen 6-in., sixteen 6-pdrs., six 1-pdrs., four Colts, two 3-in. field.
Texas	1892	290 0	64 1	22 6	6,315	8,610	17·8	12	12	Two 12-in., six 6-in., twelve 6-pdrs., six 1-pdrs., four 37-MM., two Colts, one field.
Armored Cruisers.										
Brooklyn	1895	400 6	64 8½	24 0	9,215	18,769	21·91	3	5½	Eight 8-in., twelve 5-in., twelve 6-pdrs., four 1-pdrs., four Colts, two 3-in. field.
New York	1891	380 0	64 10	23 3½	8,200	17,401	21·0	4	5½	Six 8-in., twelve 4-in., eight 6-pdrs., two 1-pdrs., two Colts, two 3-in. field.
Monitors.										
Monterey	1891	256 0	59 0	14 10	4,084	5,244	13·6	14	8	Two 12-in., two 10-in., six pdrs., 4 1-pdrs.
Amphitrite (iron)	1883	259 8	55 10	14 6	3,990	†1,600	12·0	11½	5	Four 10-in. B.-L., two 4-in., 6 R.-F.
Miantonomoh (iron)	1876	259 8	55 10	14 6	3,990	†1,426	10·5	11½	5	Four 10-in. B.-L., two 4-in., 6 R.-F.
Monadnock (iron)	1883	259 8	55 10	14 6	3,990	‡3,000	14·5	11½	5	Four 10-in. B.-L., two 4-in., 6 R.-F.
Terror (iron)	1883	259 8	55 10	14 6	3,990	†1,600	12·0	11½	5	Four 10-in. B.-L., two 4-in., 6 R.-F.
Puritan (iron)	1882	280 0	60 0	18 2	6,000	†3,700	12·4	14	18	Four 10½-in. B.-L., two 4-in., 6 R.-F.
Ajax (iron)	1865	225 0	43 8	13 6	2,100	340	6·0	10	5	Two 15-in. S.-B.
Canonicus (iron)	1862	225 0	43 8	13 6	2,100	340	6·0	10	5	Two 15-in. S.-B.
Comanche (iron)	1862	200 0	46 0	11 6	1,875	340	6·0	11	5	
Catskill (iron)	1863	200 0	46 0	11 6	1,875	340	6·0	11	5	Two 15-in. S.-B.
Jason (iron)	1862	200 0	46 0	11 6	1,875	340	6·0	11	5	Two 15-in. S.-B.
Lehigh (iron)	1863	200 0	46 0	11 6	1,875	340	6·0	11	5	Two 15-in. S.-B.
Mahopac (iron)	1862	225 0	43 8	13 6	2,100	340	6·0	10	5	Two 15-in. S.-B.
Manhattan (iron)	1862	225 0	43 8	13 6	2,100	340	6·0	10	5	Two 15-in. S.-B.
Montauk (iron)	1862	200 0	46 0	11 6	1,875	340	6·0	11	5	Two 15-in. S.-B.
Nahant (iron)	1863	200 0	46 0	11 6	1,875	340	6·0	11	5	Two 15-in. S.-B.
Nantucket (iron)	1863	200 0	46 0	11 6	1,875	340	6·0	11	5	Two 15-in. S.-B.
Passaic (iron)	1862	200 0	46 0	11 6	1,875	340	6·0	11	5	Two 15-in. S.-B.
Wyandotte (iron)	1862	225 0	43 8	13 6	2,100	340	6·0	10	5	Two 15-in. S.-B.
Katahdin	1893	250 9	43 5	15 0	2,183	4,800	17·0	6	0	Four 6-pdrs. R.-F.

UNARMORED VESSELS.*

United States.

NAME.	Date of launch.	Length b. p.	Beam.	Mean draught.	Displacement.	Indicated horse-power.	Speed.	Armament.
First Rate.		Ft. in.	Ft. in.	Ft. in.	Tons.		Knots.	Guns.
Columbia	1892	412 0	58 2½	22 6½	7,375	18,509	22·8	One 8-in., two 6-in., eight 4-in., sixteen R.-F.
Minneapolis	1893	412 0	58 2½	22 6½	7,375	20,493	23·0	One 8-in., two 6-in., eight 4-in., sixteen R.-F.
Olympia	1892	340 0	53 0	21 6	5,500	13,500	20·0	Ten 5-in. R.-F., four 8-in., twenty R.-F.
Second Rate.								
Baltimore	1888	327 6	48 7½	19 6	4,413	10,064	20·1	Four 8-in., six 6-in., twelve R.-F.
Chicago	1885	325 0	48 2	19 0	4,500	5,084	15·3	Four 8-in., eight 6-in., two 5-in., ten R.-F.
Philadelphia	1889	327 6	48 7½	19 2½	4,324	8,815	19·7	Twelve 6-in., thirteen R.-F.
Newark	1889	310 0	49 2	18 9	4,098	8,869	19·0	Twelve 6-in., thirteen R.-F.
San Francisco	1889	310 0	49 2	18 9	4,098	9,913	19·5	Twelve 6-in., thirteen R.-F.

* All vessels are of steel, except as noted after the uame.

** The old Maine was blown up in Havana harbor Feb. 15, 1898.

United States (continued).

NAME.	Date of launch.	Length b. p.	Beam.	Mean draught.	Displacement.	Indicated horse-power.	Sped.	Armament.
		Ft. in.	Ft. in.	Ft. in.	Tons.		Knots.	Guns.
Charleston	1888	312 7	46 2	18 7	3,730	6,666	18·2	Two 8-in., six 6-in., fourteen R.-F.
Atlanta	1884	271 3	42 0	16 10	3,000	4,030	15·6	Two 8-in., six 6-in., ten R.-F.
Boston	1884	271 3	42 1⅜	16 10	3,000	4,030	15·6	Two 8-in., six 6-in., ten R.-F.
Cincinnati	1892	300 0	42 0	18 0	3,183	10,000	19·0	One 6-in., ten 5-in. R.-F, twelve R.-F.
Raleigh	1892	300 0	42 0	18 0	3,183	10,000	19·0	One 6-in., ten 5-in. R.-F., twelve R.-F.
Third Rate.								
Yorktown	1888	230 0	36 0	14 0	1,710	3,392	16·1	Six 6-in., seven R.-F.
Concord	1890	230 0	36 0	14 0	1,710	3,405	17·0	Six 6-in., seven R.-F.
Bennington	1890	230 0	36 0	14 0	1,710	3,436	17·5	Six 6-in., seven R.-F.
Montgomery	1891	257 0	37 0	14 7	2,094	5,527	19·1	Nine 5-in. R.-F., eight R.-F.
Detroit	1891	257 0	37 0	14 7	2,094	5,227	18·7	Eight 5-in. R.-F., eight R.-F.
Marblehead	1892	257 0	37 0	14 7	2,089	5,457	18·4	Nine 5-in. R.-F., eight R.-F.
Dolphin	1884	240 0	32 0	14 3	1,485	2,253	15·5	Two 4-in. R.-F., five R.-F.
Machias	1892	204 0	32 0	12 0	1,177	1,873	15·5	Eight 4-in. R.-F., six R.-F.
Castine	1892	204 0	32 1½	12 0	1,177	2,199	16·0	Eight 4-in. R.-F., six R.-F.
Nashville	....	220 0	38 3	11 0	1,371	1,750	‡ 14·0	Eight 4-in. R.-F., four 6-pdrs., two 1-pdrs.
Wilmington	....	250 9	40 1⅝	9 0	1,392	1,600	‡ 13·0	Eight 4-in. R.-F., two 6-pdrs., four 1-pdrs.
Helena	....	250 9	40 1⅝	9 0	1,392	1,600	‡ 13·0	Eight 4-in. R.-F., two 6-pdrs., four 1-pdrs.
Monocacy (iron)	1865	255 0	35 0	9 0	1,370	850	11·2	Four 8-in. S.-B., two 60-pdrs. B.-L., six 37 H., two 47 H.
Alert (iron)	1874	175 0	32 0	12 9	1,020	365	10·0	Two 9-in. S.-B., one 11-in. S.-B., one 60-pdr. B.-L., 2 37 H.
Ranger (iron)	1874	175 0	32 0	12 9	1,020	365	10·0	
Fourth Rate.								
Petrel	1886	176 3	31 0	11 7	892	1,095	11·79	Four 6-in. B.-L., six R.-F.
Vesuvius	1885	252 4	26 6	10 7	930	3,800	21·5	Three dynamite-guns, three R.-F.
Michigan (iron)	1843	163 3	27 1½	9 0	685	305	10·5	Four 30-pdrs. B.-L.
Pinta (iron)	1865	137 0	26 0	10 0	550	190	8·5	Four 12-pdrs. S.-B.

NOTE.—The U. S. has, in addition, one second-rate, eight third-rate, and one fourth-rate wooden vessels, and seven torpedo-boats.

FRANCIS T. BOWLES.

Ship-worm: any bivalve of the family TEREDINIDÆ (*q. v.*).

Shipwreck (in law): See WRECK.

Shiras, GEORGE, Jr., LL. D.: justice U. S. Supreme Court; b. at Pittsburg, Pa., Jan. 26, 1832; educated at Ohio University, at Yale College, where he graduated 1853, and at Yale Law School; admitted to the bar at Pittsburg and practiced in that city; appointed associate justice of the Supreme Court of the U. S. July 19, 1892. The degree of LL. D. was conferred upon him by Yale University in 1883. C. H. T.

Shiraz, shee'răăz, or **Sheeraz**: town; capital of the province of Fars, in Persia; in lat. 29° 36′ N. and lon. 52° 44′ E. (see map of Persia and Arabia, ref. 4–H); situated at an elevation of 4,500 feet above the sea, in a valley made familiar by Moore's *Lalla Rookh*, and still celebrated for the abundance and excellence of its fruits of every description. Founded in 697, it was during more than five centuries a favorite residence of the Persian princes, and a seat of science and art. Sa'di and Hafiz were born, lived, and died here. Shiraz contains the tomb of Hafiz, and that of Sa'di is a few miles to the N. E. The city suffered fearfully from earthquake in 1812 and again in 1824. Rebuilt, it was almost destroyed by another earthquake 1853. It was again rebuilt, but on a less extended scale. Its manufactures and trade have greatly declined, but its wine, rose-water, carpets, and inlaid work are still famous in the East. Pop. about 25,000. E. A. GROSVENOR.

Shire: See COUNTY.

Shiré, shee'rā: river of Southeastern Africa, issuing from the Lake of Nyassa, in lat. 14° 28′ S. It flows with many rapids and cataracts from the elevated plateau of the interior into the flat coastland, where it forms a broad, calm stream, navigable for the largest vessels, and joins the Zambesi about 90 miles above its mouth.

Shirlaw, WALTER: genre-painter; b. at Paisley, Scotland, Aug. 6, 1838. His parents removed to the U. S. in 1840, and in time he became a bank-note engraver; in 1870 he went to Munich, where he was a pupil of Raab, Wagner, Ramberg, and Lindenschmidt; became a National Academician 1888. His *Sheep-shearing—Bavarian Highlands* (1876), exhibited in 1877 at the National Academy, New York, attracted much attention. As an illustrator his designs for Goldsmith's *Hermit* are notable. Studio in New York. W. A. C.

Shirley, JAMES: dramatist; b. in London, Sept. 13, 1596; educated at Merchant Taylors' School, St. John's College, Oxford, and Catharine Hall, Cambridge; took orders in the Church of England, and obtained a curacy in Hertfordshire, but soon vacated it by becoming a Roman Catholic; taught for some time a grammar school at St. Albans, but, being unsuccessful, became a dramatic writer in London; had produced thirty-nine plays before the Great Rebellion; founded a classical academy at Whitefriars, and wrote several grammatical treatises. D. in London from exposure consequent upon the great fire of 1666, and was buried Oct. 29. His *Dramatic Works and Poems* (6 vols., 1833) were first edited by Gifford and Dyce. He is regarded as the last of the Elizabethan dramatists. *The Traitor* (1631) is, by common consent, his best tragedy, and *The Lady of Pleasure* (1635) his best comedy. Revised by H. A. BEERS.

Shirley, WILLIAM: colonial governor of Massachusetts; b. at Preston, Sussex, England, in 1693; became a lawyer; settled in Boston, Mass., 1734; was commissioner for fixing the boundary-line between Massachusetts and Rhode Island; was royal governor of Massachusetts 1741–45; planned the successful expedition against Cape Breton 1745; was in England 1745–53; returned to Massachusetts as governor in the latter year; treated with the Eastern Indians 1754; explored Kennebec river, erecting there several forts; was commander-in-chief of the forces in British North America at the outbreak of the French war 1755; planned the expedition of Gen. Prideaux against Niagara, and proceeded himself as far as Oswego; was appointed lieutenant-general 1759; became afterward governor of the Bahama islands, but returned to Massachusetts, where he built a fine residence at Roxbury. D. at Roxbury, Mar. 24, 1771. Author of *Electra*, a tragedy; *The Birth of Hercules*, a masque; *A Letter to the Duke of Newcastle, with a Journal of the Siege of Louisburg* (1745); and *The Conduct of Gen. William Shirley briefly Stated* (1758).—His son WILLIAM, an officer in the army, was killed at Braddock's defeat 1755.—Another son, Sir THOMAS, b. in Boston, became a major-general in the British army, was created a baronet 1786, and was governor of the Leeward islands. D. Mar., 1800.

Shir'wa: lake; a little S. E. of Lake Nyassa. Southeast Africa; formerly supposed to have as its outlet the Lujenda river, but discovered (1887) to be nothing more than a huge evaporating-pan with an area of about 350 sq. miles, into which a number of small rivers discharge. Its waters are brackish, are gradually drying up, and there is evidence that formerly the lake stood at a much higher level and discharged into the Lujenda river. C. C. A.

Shi'shak: the Hebrew name of the Egyptian king *Shashanq*, first ruler of the twenty-second (Bubastite) dynasty (966–800 B. C.). He was probably of Libyan lineage, and at the close of the twenty-first (priestly) dynasty grasped the royal power which he had actually wielded previously. This was largely due to the increased influence of the Libyan mercenaries from whom the Egyptian army had been recruited since the time of Seti I. and Ramses II. The dominion of Egypt was much extended by Shishak, who waged war in Palestine against Rehoboam, King of Judah. His inscriptions on the south wall of the Temple of Amon at Karnak contain the names of 128 cities or regions in Palestine and Syria which fell into his hands. The list is really larger, but a considerable number of names are no longer legible. Jerusalem was among the captured places,

and from it he removed much booty (1 Kings xiv. 25, 26). Jeroboam, who had fled from Solomon, sought protection in Egypt under Shishak (1 Kings xi. 40), and later, upon the disruption of the Hebrew nation, became king of the ten tribes, presumably with the support and aid of Shishak. The name also belonged to the fifth, seventh, and ninth kings of the twenty-second dynasty, but particulars concerning them are meager, beyond the statement that the last two reigned fifty-two and thirty-seven years respectively. Their period is one of the darkest and least known in Egyptian history. CHARLES R. GILLETT.

Shit'tim: (1) wood of the shittah-tree, repeatedly mentioned in Exodus as the timber principally employed in building the tabernacle. It has been identified with the *Acacia seyal*, which abounds in the Sinaitic peninsula. The wood is light, but close-grained and enduring, and of a fine orange brown. The leaves are small, and in spring the tree is covered with tufts of yellow blossoms. It yields the gum arabic of commerce. (2) A fertile plain, so called from its acacia-groves, just opposite Jericho, in which the Israelites were encamped before crossing the Jordan. There the Israelites fell easy victims to the seductions of the Moabite women, who prostituted themselves in honor of their god Baal-peor, and there the punishment followed on them and on the Midianites (Num. xxv., xxxi. 1–12). Thence went the spies to Jericho (Josh. ii. 1). Revised by S. M. JACKSON.

Sho'a: the most southern part of the Abyssinia highland, East Africa; formerly an independent state, but since 1888 a part of Abyssinia, the rule of its king, Menelek, having been extended over the whole of Abyssinia, except the northern district, appropriated by Italy. The whole territory of the king became (1889) a protectorate of Italy. The capital and chief residence of the king is Antotto, and there are several other large towns, of which the most important are Ankobar and Roggie, situated about 8,000 feet above sea-level. The soil is very fertile, and most of the inhabitants are Coptic Christians. Pop. less than 2,000,000. Area about 15,000 sq. miles. C. C. ADAMS.

Shoals, Isles of: See ISLES OF SHOALS.

Shock [from M. Dutch *schock*, a bounce, jolt: O. H. Germ. *scoc*, a swing; cf. O. Eng. *scacan*, shake, and Fr. *choc*, collision (from M. Dutch)]: sudden vital depression, the peculiar effect upon the animal system produced by violent injuries. Surgical shock must be distinguished from mental shock, caused by grief, terror, or other mental emotions. Following serious accidents, the crushing of a limb by a railway injury or its removal by a cannon-ball, extensive superficial burns, extensive surgical operations, as amputations or ovariotomy, and as the result of blows over important organs, concussion of the brain, a kick or sudden blow in the region of the stomach over the solar plexus—a powerful impression is made on the nerve-centers proportionate to the extent of the superficial or peripheral nerve-irritation. The condition is induced by paralysis of the vaso-motor centers, but is not limited in its manifestations to the nervous system, all the tissues of the body being affected in sympathy with the injured part. The symptoms of shock are extreme pallor and coolness of the face and surface of the body, a small, feeble, slow pulse, infrequent and often irregular respiration, pinched features, cold sweat, and the appearance of impending dissolution. If the bodily temperature falls more than 2° F., death is apt to follow. In special cases, delirium, hiccough, or convulsions are present. The circulation and respiration may be so depressed that death is immediate, or speedily ensues unless reaction is artificially hastened. Sensation of pain is annulled: in the gravest injury, as the laceration and removal of a limb by a cannon-ball, there may be no pain and no loss of blood during the period of shock. The period of shock, if survived, is followed by reaction, a resumption of ganglionic or central nerve-power, and revival of the dependent functions. Extreme loss of blood renders the patient more susceptible to shock, producing sudden anæmia, inanition, and disturbed action of nerve-centers. Concussion of the brain is often accompanied by shock, but is in itself an entirely distinct condition. Exposure to cold increases shock, and is particularly to be avoided in operations. No satisfactory lesion or organic change has been found to explain shock, the only marked *post-mortem* lesion being distension of the right side of the heart and great venous trunks with blood, sometimes fluid and always coagulating with difficulty. The treatment of shock is to be directed to the immediate development of reaction. The sinking pulse must be rallied by ammonia and alcohol, by stimulating enemata, by heat to the extremities and surface. Hypodermic injections of digitalis, atropia, strychnia, ether, or brandy are often useful. Quinine is sometimes given before an operation as a prophylactic. In mild cases of shock external warmth, a little diffusible stimulant and rest are all that is required. Reaction is sometimes excessive, the patient passing into a condition of traumatic delirium, or may be imperfect, when he falls into the state of prostration with excitement. What is called secondary or insidious shock is due to the formation of heart-clot, and often proves fatal.

Revised by JOHN ASHHURST, Jr.

Shoddy [originally, the wool that was *shed* or wasted in carding and spinning]: in a strict sense, a fiber made by tearing in pieces in a suitable mill rags of worsted or combed-wool goods. The corresponding fiber of carded-wool rags is called mungo; but more frequently both kinds are classed together as shoddy or "devil's dust." Some classes of useful goods can not be profitably made without shoddy; and if used in reasonable proportion its presence can not be detected, and the wear of the goods is not much diminished. None but the very best sorts of woolen goods are perfectly free from shoddy.

Shoe [O. Eng. *scōh*: O. H. Germ. *scuoh* (> Mod. Germ. *schuh*): Icel. *skōr*: Goth. *skōhs*]: in general, any covering for the foot (with the exception of hosiery) of which warmth and protection are the special purposes. If the foot-covering consists mainly of a sole, it is called a sandal; if it also has a part coming up to the ankle, it is called a shoe; while one that covers a portion of the leg is called a boot. (See BOOTS.) A loose light shoe into which the foot may be easily slipped is appropriately called a "slipper." The earliest form of the shoe was the simple sandal, which was secured to the foot by thongs, and often by a button coming between the first and second toes. Almost every material has been used for the construction of shoes, the skins of animals, tanned or untanned, more frequently than any other. In some parts of Europe wooden shoes, or *sabots*, are very common among the poorer classes. In Japan the sandals worn by the common people are made of straw; in South America they are made of plaited thongs of hemp. There have been great changes in the forms of shoes as worn in different countries and at different periods among civilized nations. The early Greeks usually went barefoot, or confined themselves to simple sandals, which in time came to be highly ornamented. The early shoes of the Romans were buskins, not very dissimilar to the moccasins of the American Indians; thick soles, sometimes of metal, were a later invention. In time they grew into shoes, or even boots, sometimes covering the entire leg. In Europe, during the Middle Ages, shoes often were made in fantastic shapes. At one time they had pointed toes about two feet long, which were often brought up and tied to the knee; and not unfrequently a man of fashion would wear them of different colors, as a red one on one foot and a yellow one on the other. For many years there has been very little change in the general form of the covering for the foot as worn by either sex; the main variations being in the height of the heel and the shape of the toe, whether pointed, round, or square.

Manufacture.—A boot or shoe consists essentially of two parts, the sole, almost universally made of thick leather, and the upper, usually of a softer leather, but not unfrequently of cloth of some kind, for women often of silk or satin. These parts are attached to each other in various ways, usually by sewing. A few years ago a boot or shoe was made throughout by a single person; at present the production of a shoe is the work of several persons, each performing only a single part of the operation, a considerable portion being done by ingenious machinery. Indeed in no single trade is there a more perfect division of labor or a greater adaptation of machinery. Boots and shoes put together by pegging were in extensive use a few years ago. Now only some of the cheapest grades are pegged, much of the work being done by the pegging-machine invented by A. C. Gallahne in 1851. Pegging, however, as a method of fastening the soles to the uppers, has been almost entirely superseded by a process known as the "standard screw," in which the outer soles are fastened to the inner soles and the uppers by a machine that uses a threaded brass wire, which is supplied from a reel. In the performance of its work the machine thrusts a portion of the wire into the substance of which the shoe is composed, gives it a half turn, and automatically detaches it. An-

other important invention is that of a machine for sewing soles, which was improved by Gordon McKay. One of these machines in the hands of a good operator will easily sew on the soles of 800 pairs of women's shoes in ten hours. Originally, shoes made by the McKay process were not so well finished as to the inner part of the sole where the stitches came through, but this defect was overcome by the use of a smooth inner sole, cemented to the sole in such a way as entirely to cover the stitches. A later and more important invention is that of the Goodyear welt machine, as it is called, which has enabled manufacturers of shoes to produce footwear so closely resembling hand-work in appearance and durability as to render it extremely difficult to distinguish one from the other. Indeed in the best grades what difference exists may be fairly said to be in favor of the machine-sewed goods. A great part of the boots and shoes used in the U. S., especially the finer kinds, are made in large establishments in New York, Philadelphia, Baltimore, and other large cities, but more in several towns in Massachusetts, Maine, and New Hampshire; Lynn, Mass., is the greatest seat of this manufacture, and among the other large centers are Haverhill, Brockton, Milford, Marblehead, Worcester, Braintree, and Danvers, in Massachusetts; Portland, Augusta, and Lewiston, in Maine; Dover and Farmington, in New Hampshire. Until about 1890 the U. S. did but little export business in boots and shoes.

Revised by VAUGHAN SNIDER.

Shoebill: a large wading bird (*Balæniceps rex*) inhabiting the region of the White Nile, Africa. It is named from its large, peculiarly shaped beak, and is also termed whale-headed stork, although its affinities are rather with the herons. It stands nearly 5 feet high, is gray, and has a little recurved crest. F. A. L.

Shoebill.

Shoe'buryness: a promontory in the county of Essex, England; on the northern shore of the estuary of the Thames, directly opposite Sheerness (see map of England, ref. 12–L). Shoeburyness was selected by the Government as the locality of experimental firing at armored targets and for trial of new guns. It is the seat of a school of gunnery, with artillery, barracks, batteries, targets, etc.

Shoeing of Horses: See FARRIERY.

Shōgun (Jap., liter., general, the Chinese *Tsiang-Kiun*): a Japanese military title, said to have been first employed by the Emperor Suijin in the first century B. C., when he divided the empire into four military divisions. The name began to have a political significance with YORITOMO (*q. v.*), who was appointed in 1192 *Sei-i-tai-Shogum*, or generalissimo, against the barbarians. Henceforward the shogunate more and more represented the real governing force in the empire, until in the seventeenth century the Tokugawas (see IYEYASU) became a real reigning dynasty. The empire was centralized afresh from Yedo, so that in 1868 when the emperor resumed power he merely fell heir to the bureaucratic system developed by these rulers. J. M. DIXON.

Sholapur': district and city in the southern part of the Bombay Presidency, British India; on the border of Haidarabad. The district lies between the parallels 17° 13′ and 18° 35′ N.; has an area of 4,521 sq. miles; is bleak and treeless, and generally flat or slightly undulating, and is subject to great irregularity in the amount of rainfall, making agriculture dependent on irrigation. Its silks, finer cotton cloths, and blankets have a good name, and the chief exports besides cloths are oil, oil-seeds, ghee, and turmeric. The population numbers about 600,000, mostly Hindus. The city of Sholapur, chief town and administrative headquarters of the district, is in lat. 17° 40′ N., lon. 75° 57′ E., near the Sina river (see map of S. India, ref. 4–D). It is a station on the Great Indian Peninsular Railway. It is one of the principal cotton-markets of the Dekkan. Pop. (1901) 74,521. MARK W. HARRINGTON.

Sho'mer, Shammer, or **Jebel Shomer**: a territory, part of the great central plateau of Arabia; bounded N. by the Syrian desert, from which it is separated by mountains 9,000 feet high, N. E. by Irak Arabi, S. by the sultanate of the Wahabees, and W. by Turkish Arabia. The Arabs here have always remained in a savage condition, little influenced by the rise of the Mussulman empire. About the end of the eighteenth century they came under the power of the Wahabees, but since the overthrow of the latter have been independent. The country is divided into five provinces, said to contain eighty-six towns and villages, the chief of which is Hayel. Between it and Medina considerable trade is carried on. Corn and fruit are raised by artificial irrigation. Dates, cotton, horses, and asses are exported. Pop. of territory estimated at 450,000. E. A. G.

Shooting Stars: See METEORS.

Shore: See COAST.

Shore, JANE: mistress of Edward IV.; b. in London, England, about 1445; married a rich London goldsmith named Matthew or William Shore; became mistress of King Edward IV. about 1470, and of Lord Hastings after the death of the former, 1483. She was accused of witchcraft as an accomplice of Hastings, who was beheaded for that pretended crime, though the real reason for the proceedings against them was their known partiality to the cause of the young princes. According to More's account, Jane Shore was charged by King Richard III. with having withered his arm by her arts of sorcery; was committed to the Tower and her property confiscated; was never brought to trial, but was compelled by the Bishop of London to do public penance for impiety and adultery. The king's solicitor, Thomas Lynon, desired to marry her after the death of Hastings, but Richard tried to dissuade him, and whether the marriage took place is not known. She survived until after the accession of Henry VIII., and popular legend represented her as having died of hunger in a ditch—a version which long retained currency through the famous drama of Rowe bearing her name; but the legend was probably derived from the name of a London locality still called Shoreditch. Sir Thomas More bears emphatic testimony to her beauty, kindliness, and wit.

Shore, Sir JOHN: See TEIGNMOUTH, BARON.

Short, CHARLES, LL. D.: educator; b. at Haverhill, Mass., May 28, 1821; received his early education at Bradford Academy and Phillips Andover Academy; graduated at Harvard 1846; classical instructor in Roxbury and Philadelphia 1847–63; president of Kenyon College, O., and Professor of Intellectual and Moral Philosophy 1863–67. On the death of Dr. Anthon, Professor of Greek in Columbia College, New York, Dr. Henry Drisler was transferred to the Greek chair, and Dr. Short succeeded Dr. Drisler as Professor of Latin in 1868. He edited, with additions, *Advanced Latin Exercises* in Schmitz and Zumpt's Latin Series (1860); revised Mitchell's *New Ancient Geography*; wrote an elaborate essay on the *Order of Words in Greek*, prefixed to Dr. Drisler's edition of Yonge's *English-Greek Lexicon* (1870); and, with Charlton T. Lewis, revised (1879) Andrews's *Freund's Latin Dictionary*. He contributed many articles, mostly critical, to reviews and other periodicals, chiefly to the *Bibliotheca Sacra*. He was from the outset a member of the American committee co-operating with the British committee in the revision of the English Bible. D. in New York, Dec. 24, 1886.

Revised by BENJ. IDE WHEELER.

Short, WILLIAM: diplomatist; b. at Spring Garden, Va., Sept. 30, 1759; studied at William and Mary College; was at an early age a member of the executive council of Virginia; accompanied Thomas Jefferson on his embassy to France as secretary of legation 1784; was appointed *chargé d'affaires* to France by Washington 1789 (being the first commission signed by him as President), and was subsequently minister to the Netherlands and to Spain, where in 1795 he concluded the negotiations which resulted in the treaty of friendship, commerce, and boundaries. D. in Philadelphia, Pa., Dec. 5, 1849.

Shorthand: See PHONOGRAPHY and STENOGRAPHY.

Shorthorns: a breed of beef-cattle which originated in the valley of the river Tees, between the counties of Durham and York, in England. They are often called Durham, shorthorned Durham, and Teeswater cattle. Since very early times the cattle of the northeastern coast of England have differed in type from those of other parts of Great Britain, and there are many reasons for believing that this is due to an admixture of the blood of the cattle of the adjacent countries of continental Europe, brought over at the time

of the Danish invasions. At all events, in their large size, heavy heads, short horns, and angular forms the aboriginal cattle of this part of England closely resemble the Danish, Dutch, and Flemish races of cattle. Durham, Yorkshire, and Northumberland have long been famous for the amount and superior quality of the beef produced there, and early in the eighteenth century numerous breeders became famous for the size, quality, and great fattening propensities of their cattle.

However, it is to a few men who were in active life in the closing years of the eighteenth century and the early part of the nineteenth that most of the fame of the breed as we now know it is due. The more famous of these men were Charles and Robert Colling, Thomas Bates, and Richard and John Booth. The Collings were the earliest improvers of the shorthorns. Charles in particular practiced extensively and with great skill the closest inbreeding in the foundation of all or nearly all his various families. The bull Comet brought at public sale in 1810, when six years old, 1,000 guineas.

The Durham Ox and The White Heifer that Traveled, animals bred by Charles and Robert Colling respectively, were fattened to a great weight, and were taken from town to town to be exhibited. Their fame had a great effect in making the breed widely known throughout Great Britain. The Durham Ox, supposed to have been the largest animal of the cattle kind ever bred up to that time, is estimated to have weighed 3,400 lb.

The most famous family of the shorthorns is that known as the Duchess, or Bates Duchess. They are descended from a cow, Duchess, that Charles Colling bought from the Stanwick estate of the Duke of Northumberland, and the bulls Hubback and Favorite. They were closely inbred by Colling, and afterward by Thomas Bates, who for nearly forty years (1810–49) bred this family with scarce an admixture of outside blood. After Bates's death some of the best representatives were taken to the U. S., where they were still kept pure in the herds of Samuel Thorne, of Thornedale, Dutchess co., N. Y., J. O. Sheldon, of Geneva, N. Y., and Wolcott and Campbell, of New York Mills. Their fame grew both in the U. S. and in England, and culminated in Sept., 1873, when the eighth Duchess of Geneva brought at public sale $40,600.

Shorthorns are large, symmetrical, squarely built animals, maturing early, and producing large amounts of best-quality beef. In color they are red, white, or any admixture of these two colors. Roan is a very common color. White or a large proportion of white is not liked in the U. S. Their legs are short, the bone fine, the hair soft and thick, and the horns short, incurved, and of a waxy texture.

In numbers they far exceed all other breeds of pure-bred cattle in the U. S. *The American Shorthorn Herd-book* (39 vols.) records the pedigrees of nearly 120,000 bulls, and a much larger number of cows and heifers. H. H. Wing.

Shorthouse, John Henry: novelist; b. in Birmingham, England, in 1834; was educated at Grove High School, Tottenham, and engaged in manufacturing at Birmingham. He is best known from his novel *John Inglesant* (1881), a tale with a strong Anglo-Catholic or Tractarian flavor. Others of his books are *The Little Schoolmaster Mark* (1883–84); *Sir Percival* (1886); *A Teacher of the Violin* (1888); and *Blanche, Lady Falaise* (1891). H. A. B.

Shosho'nean Indians: a linguistic stock of North American Indians. The term Shoshoni, of which the stock name is an adaptation, is not a Shoshoni word, although recognized by the tribe as applying to themselves. *Shoshon* signifies female dog in the Teton dialect; *shishoka*, robin, and *shoshona*, long-eared (alluding to the mule), in Yankton. It is not improbable that *shoshoni* originated in one of these roots, and was of opprobrious significance. The habitat of this great stock extended from the head-waters of the Missouri in Central Montana to Southern Texas, and from Western Kansas to Western Central Oregon, and the coast of Southwestern California. See the map accompanying the article Indians of North America.

According to some authorities the Shoshonean stock, as here recognized, is but part of a linguistic group embracing the Shoshonean, Piman, and Aztecan or Nahuatl tribes; but the relationship of these peoples is not proved. The principal Shoshonean tribes are Bannock, Comanche, Gosiute, Paiute (including the Chemehuevi), Paviotso, Shoshoni (including the Tukuarika), Tobikhar, Tusayan, Ute. The estimated population is 20,000.

Owing to the extent of country occupied, and its varied climatic and topographic features, the Shoshonean tribes differ widely. The habits of the Shoshoni, Bannock, Ute, and Comanche divisions in the north were essentially those of hunting Indians. The Comanche and Eastern Shoshoni alone can be said to have been "buffalo Indians," although the buffalo was hunted more or less by all the northern Shoshonean tribes. In general character these were fierce and warlike. To the W. of the Rocky Mountains the tribes (Paiute, Paviotso, Gosiute, and western Shoshoni) were of a different character. Rabbits and small game generally, fish, roots, and seeds formed the chief support of these tribes, among which were included the lowest representatives of the stock. It was principally to these that the name Diggers was opprobriously applied, although they were by no means so low as many writers have asserted. They made and used bows and arrows, were potters, lived under a complex social system, and even practiced a rude agriculture.

Bannock.—The native tribal designation of the Bannock is Panaqti, from which their common name is derived. This tribe was divided into two geographically distinct portions—one claiming the territory between lat. 42° and 45° and from lon. 113° to the main chain of the Rocky Mountains; the other division, or northern Bannock, formerly occupying Southwestern Montana, where they had been forced by the Blackfeet. It is probable that at no very distant time the scattered bands of both divisions were united in one locality—Southeastern Idaho and extreme Western Wyoming, where they were pressed upon by the Shoshoni, and to some extent incorporated with them. The Bannock were a tribe of widely roving habits, which favored their dispersal and separation. In language they differ markedly from the Ute, Comanche, Paviotso, and others. About 1829 the southern Bannock—always the more populous division—numbered about 8,400 in 1,200 lodges. Many of them affiliated with the Shoshoni of Western Wyoming, and as early as 1859 had extensively intermarried with them. In 1869 500 or 600 of this division were placed on the newly established Wind river reservation, Central Wyoming (where they are now officially classed as Shoshoni). In 1874 all the scattered Bannock and Shoshoni of Southeastern Idaho were assigned to Fort Hall reservation, Idaho. The northern or Salmon river Bannock, after having been decimated by the smallpox and ravages of the Blackfeet, numbered in 1869 about 350 in fifty lodges. There were 455 Bannock on Fort Hall reservation in 1891, and 75 on Lemhi reservation, Idaho, in 1890.

Comanche.—The popular name of this tribal division originated with the Spanish Mexicans. Their own tribal designation is *Nüma*, i. e. people, Indians. This was formerly one of the most powerful divisions of the Shoshonean family. Evidence, mostly traditional, tends to show that their priscan habitat was in the Snake river region of the northwest, more recently occupied by the Shoshoni. In the sixteenth and seventeenth centuries they were found under the name Chuman and Jumano in Western Texas, in the east of New Mexico, and in northern Chihuahua; in 1724 they were on upper Kansas river, and later appear to have entered to the S. of the Red river, Texas. The later Comanche territory may be given as the extensive plains from the Rocky Mountains eastward into Indian Territory and Texas, to about lat. 97°, although they raided the country from Kansas southward as far as Durango, Mexico, a distance of 800 miles. Always a wandering tribe, the early possession of the horse by the Comanche intensified their nomadic propensities and gave full scope to their martial character. The theft of horses and the capture of women and children for adoption or ransom were the chief motives for their raids, particularly into Mexico, until 1783, when their power in that direction was broken. They suffered severe loss in numbers at the hands of the Texans in the Texo-Mexican war. They depended largely upon the buffalo for subsistence, and lived in skin tents or tipis during their periodical settlements. They have a tribal chief, and are divided into fourteen bands, each headed by a recognized chief. In 1780 the warriors were estimated to number 5,000, equivalent to a population of about 25,000. The reservation in Oklahoma occupied by the Comanche was set aside for them in 1867, when their population was about 2,500. In 1891 they numbered 1,624.

Gosiute.—This name, with the variants Goshoot, Goshaute, etc., is contracted from Goship (the name of a former chief) and Ute. The group was a confederacy of five tribes—the Pagayuats, Pierruiats, Torountogats, Tuwurints, and

Unkagarits—inhabiting the northwestern part of Utah, west of Utah and Great Salt lakes, and a strip in Eastern Nevada. They were one of the few Shoshonean divisions engaging in agriculture, and were scattered over the country as the springs and watercourses afforded arable land. According to some authorities the Gosiute are a mixture of Shoshoni and Ute. There seems to be no aboriginal name of the confederacy—a fact indicating very recent organization as such. Pop. (1890) 256.

Paiute.—The generally accepted idea is that the term originated from *pah*, water, and Ute, hence "water Ute"; more likely it is derived from *pai*, true, and Ute, thus signifying "true Ute." The name has been applied at various times to most of the Shoshonean tribes of Eastern Utah, Northern Arizona, Southern Idaho, Eastern Oregon, Nevada, and Eastern and Southern California, whereas it properly belongs exclusively to the Corn creek tribe of Southwestern Utah. Paiute, however, is a convenient divisional name for the tribes occupying the southwestern part of Utah, Central Nevada, and Northern Arizona, and including the Chemehuevi of Colorado river. Under it are also included the tribes of Southeastern California from the neighborhood of Owens valley along the eastern slopes of the sierras, and to the S. of Tulare Lake and E. of the Coast Range. The principal Paiute tribes are: Chemehuevi or Tantawats, formerly about the great bend of Colorado river and now attached to the Colorado river agency—population about 200; Kwaiantikwokets, formerly E. of Colorado river, in Arizona, where they affiliated largely with the Navajo, and numbered 62 in 1874; Shivwits and Uinkarets in Northern Arizona—population 182 and 40, respectively, in 1874. There are 19 insignificant tribes or bands in California, among them the Mono (a term collectively applied), Keats, and Moquats; 17 in Nevada, and 8 in Utah (including the Kaivavwits and Unkakaniguts). The Paiute population approximates 2,500, there being in Utah 500, Northern Arizona 500, Southern Nevada 1,000, and Southeastern California 500.

Panamint.—This division is linguistically related more closely to the Shoshoni than to any other of the tribes of the stock, and it is not improbable that they became detached from that body through the intrusion of the Gosiute, and gradually drifted to their later habitat in and around Panamint and Death valleys, between lat. 36° and 37°, Eastern California. A few individuals live in the mining town of Darwin, while about 150 are scattered in the desert country to the E. of Panamint valley.

Paviotso (strong, able).—These Indians form a confederacy of twenty-eight insignificant tribes, chiefly in Western Nevada, but extending into Oregon as far north as Lakes Harney and Malheur, and westward to about Warner Lake near the southern boundary, and Camp Bidwell in Northeastern California. The shores of Honey Lake in Eastern California were also occupied by them. In the east they extended to the Shoshoni territory in lon. 117° 30′. Their lowermost settlements were in Owens valley, Eastern California. Like many other tribes of this region, the Paviotso were early confounded with the Paiute, whom they closely resemble. Their extension north into the Pyramid Lake region of Western Nevada and into Oregon has been comparatively recent, having after a long conflict displaced the Saitüka. They probably number about 4,000.

Shoshoni.—This is the most northerly division, and formerly occupied Wyoming, the entire central and southern parts of Idaho, except the area occupied by the Bannock, a small part of Eastern Oregon, Eastern and Central Nevada, and a small strip of Utah W. of Great Salt Lake. The Snake river country in Idaho is perhaps to be considered their chief seat, whence they are also called Snake Indians. In 1803 Lewis and Clark found the northern bands of the Shoshoni on the head-waters of the Missouri in Montana, but they had earlier ranged farther east on the plains, whence they had been driven into the Rocky Mountains by the hostile Atsina and Blackfeet, who early obtained firearms.

The more northerly and eastern Shoshoni were horse and buffalo Indians, and in character and warlike prowess compared favorably with most western tribes. Those of Snake river and to the south in Nevada represented a lower type, since most of this country was barren and comparatively devoid of large game. They depended for food to a large extent upon fish, supplemented by rabbits, roots, nuts, and seeds. The Shoshoni, more commonly than any others of the Shoshonean tribes, were called Diggers and Shoshokos (walkers.) None of them were agriculturists. In general, the style of their habitations corresponded to the two types of Shoshoni. In the north and east they lived in pole and skin lodges, but in the sage country to the west brush shelters were used, some of them in the Snake river region being mere roofless semicircles that afforded little protection against the wind and snow. There were many dialects corresponding to the degree of isolation of the several tribes, but mutually intelligible. The most important of the original divisions or bands of the Shoshoni are the Tukuarika or Sheep-eaters, Tussawehe, and Wihinasht. They have materially decreased in numbers; those surviving are in Nevada; on Fort Hall and Lemhi reservations, Idaho (pop. 948 and 357 respectively); western Shoshoni reservation, Nevada (pop. 367), and the Shoshoni reservation, Wyoming (pop. 883). Their entire number approximates 5,000.

Tobikhar.—This term, meaning settlers, belongs strictly to a group of small tribes formerly about San Gabriel mission and Los Angeles, Southern California, but has been adopted as a group name to include the Shoshonean tribes who spoke related dialects, and lived about the missions of San Luis Rey, San Juan Capistrano, San Fernando, Los Angeles, San Bernardino, and San Gabriel. These formed the southwestern or coast division of the stock, and their remnants compose the bulk of the so-called Mission Indians, which embrace also a few representatives of the Yuman stock. The status of the Indians of this group and their relation to the State government have never been fully defined. They appear not to have been agriculturists prior to the mission period; hence upon the disestablishment of the missions some of the Indians returned to their primitive mode of life, while others practiced the rude arts of agriculture learned under mission sway. Notwithstanding their docile and submissive character the Tobikhar, like most of the Shoshonean tribes, were doubtless once of a more aggressive and warlike disposition, and were able to force their way to the coast through the Chumashan and Mariposan tribes on the north, and those of Yuman stock on the south. The population is about 2,200.

Tusayan (probably from the Navajo *Zilh-Täsäun*, signifying country of the isolated buttes).—The so-called province of Tusayan comprises seven pueblos on the summits of four mesas in Northeastern Arizona, about 50 miles E. of the Rio Colorado Chiquito, and about the same distance S. of the Rio San Juan. The pueblos constitute three groups: Walpi, Sichumovi, and Hano or Tewa in one; Mashongnovi, Shumopovi, and Shupaulovi the second, 7 miles westward; Oraibi the third, 8 miles still farther west. Six of these villages are inhabited by the Hopi (signifying "people," but improperly called by the opprobrious Zuñi term Moki), the seventh pueblo, Hano, being occupied by a division of the Tewa tribe, of Tanoan stock, who left their kindred on the Rio Grande about 1680, and settled at Tusayan, where they maintain their distinctness. The Hopi afford the only instance of tribes of the predatory Shoshonean stock who have adopted a strictly pueblo life. Tusayan was known to the earliest Spanish explorers of the Southwest. Marcos of Niza in 1539 spoke of it under the name Totontcac. It was first visited by whites in 1540, when Tobar and Padilla, and afterward Cardenas, of Coronado's army reached the so-called province from Zuñi. Expeditions to Tusayan were also made by Espejo in 1583 and Oñate in 1598. Missions were established at the now ruined pueblos of Awatobi and at Mashongnovi and Shumopovi at an early date, but were abandoned upon the murder of the missionaries and destruction of the churches during the Pueblo revolt of 1680. Tusayan tradition seems to indicate that the present Hopi villages are a confederacy of phratries, or perhaps independent groups, who, after various wanderings, settled in one place. The union is not a close one, and tradition points to feuds and even to bitter wars between the towns, during one of which Awatobi (once the principal pueblo) was totally destroyed. Like the other Pueblo tribes, the Hopi have been agriculturists since first known to history. They early acquired possession of sheep, and are expert weavers, potters, and basket-makers. The estimates of population given by the early explorers are greatly exaggerated. They number about 1,750.

Ute.—This division formerly occupied the central and western portions of Colorado and Southeastern Utah, including the eastern part of Salt Lake valley and Utah valley. They extended also into New Mexico, occupying much of the drainage area of the Rio San Juan. None of the Ute were agriculturists, but they appear to have been always a warlike people, and their early possession of horses intensified their aggressive character. The various divisions or

geographic bodies were probably originally united into a loose confederacy, and, while dialectic differences exist in the language, intercourse was carried on with little difficulty. The Ute divisions in the northeastern part of the range have intermarried more or less extensively with the Bannock, Shoshoni, and Paiute, and in the south with the Jicarilla Apache. The first Ute treaty was proclaimed Sept. 9, 1850. In 1864 a treaty was made with the Tabaguache band and a reservation set apart for it and the Muache band in Southwestern Colorado. In 1868 a third treaty provided for all the different bands, while the final treaty, by which the Ute are confined within the present reservation limits, was made in 1873. The restless character and unfriendly spirit of these Indians have rendered even an approximately correct census impossible. The official figures of the reserves for 1891 are: Southern Ute agency, Colorado, 998; Ouray reserve, Utah, 1,028; Uintah reserve, Utah, 840—total, 2,866. There are probably twice as many more not confined to reservations. See INDIANS OF NORTH AMERICA.

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Shoshone (shō-shō-nee') **Falls**: a cataract in Idaho; formed by Snake river plunging over a cliff of trachyte 190 feet high. Half a mile above the falls the river is 1,200 feet broad, and flows in a cañon 800 feet deep. At the falls the stream narrows to 1,000 feet, and descends into a gorge 1,000 feet deep. The falls are due to the fact that the river in deepening its channel in horizontal sheets of basalt has reached a ridge of more resistant rock beneath. I. C. R.

Shot: projectiles for firearms. For those used in cannon, see PROJECTILES. The smaller kinds, ranging in size from buck-shot to dust-shot, are composed of an alloy of lead with about 1 per cent. of arsenic, the addition of which gives greater softness and ductility. They are made in shot-towers by pouring the molten metal through colanders perforated with holes from $\frac{1}{30}$th to $\frac{1}{360}$th inch in diameter, and letting the particles fall from 100 to 150 feet into water. Another method lessens the height through which the particles must fall in order to assume the spherical shape and harden, by using a tube through which a strong upward current of air is forced. The shot are afterward assorted, rolled down an inclined plane so arranged that the misshapen shot fall out, and finally polished by being placed in a rotating cylinder with some powdered graphite.

Shoup, FRANCIS ASBURY: See the Appendix.

Shoveler, or **Spoonbill Duck**: a river duck of the genus *Spatula*, so named from the widening of the bill toward the tip. The common shoveler (*S. clypeata*) of the northern hemisphere has the head and neck green, breast white, belly chestnut, wing-coverts blue, speculum green (bordered by black and white), rump and tail-coverts black. The female is brownish, with blue wing-coverts. *S. platalea* (South America), *S. capensis* (South Africa), *S. rhynchotis* (Australia), and *S. variegata* (New Zealand) are the other species.

Shrapnel: See PROJECTILES.

Shreve, HENRY MILLER: inventor; b. in Burlington co., N. J., Oct. 21, 1785; was reared in Western Pennsylvania, and became interested in the navigation of the Western rivers. In 1810 he took a cargo of lead from Galena river to New Orleans, and opened a business which had been previously monopolized by the British. In 1814 he took command of a steamboat, and a few days before the battle of New Orleans carried supplies to Fort St. Philip, passing the British batteries, his vessel being protected from their fire by cotton-bales. In May, 1815, he ascended the Mississippi to Louisville in the Enterprise, the first steam-vessel that had ever performed that voyage, and subsequently built the Washington, of 400 tons burden, with improvements upon Robert Fulton's steamboat, especially in the saving of fuel. On Mar. 3, 1817, the Washington made her first trip. The return trip from New Orleans was made in twenty-five days. The enterprise of Capt. Shreve soon excited the hostility of Fulton and his associates, who had obtained the exclusive rights to "navigate all vessels propelled by fire and steam" in the rivers of the Territory of Orleans. His boats were seized in New Orleans, and he was arrested. A protracted lawsuit followed, which was finally decided in his favor. He finished the George Washington in 1824 upon a new model, which continued in use for over fifty years, having side-wheels each worked by a separate engine. In 1829 he completed his snag-boat, the Heliopolis, for removing snags and sawyers from rivers, and with it removed the great Red river raft, a collection of timber and driftwood 15 miles in length. In 1829 Capt. Shreve invented a steam marine battering-ram for harbor defense. He was made superintendent of Western river improvements in 1826, and continued in that position until 1841. D. in St. Louis, Mar. 6, 1854.

Shreve, SAMUEL HENRY, A. M., LL. B.: civil engineer; b. in Trenton, N. J., Aug. 2, 1829; graduated at Princeton 1848, at Harvard Law School 1850; studied civil engineering; was chief engineer of several railroads; published in 1873 a treatise on the *Strength of Bridges and Roofs*, and became in 1875 engineer of the New York Rapid Transit Commission. He was consulting engineer of the Metropolitan Elevated Railroad and engineer-in-chief of the Brooklyn Elevated Railroad. D. in New York, Nov. 27, 1884.

Shreveport: city (incorporated in 1839); capital of Caddo parish, La.; on the Red river, and the Houston and Shreve., the Queen and Crese. Route, the St. Louis S. W., and the Tex. and Pac. railways; 41 miles S. of Louisville, Ky., and 326 miles N. W. of New Orleans (for location, see map of Louisiana, ref. 6–B). It is the second city in population in the State, is in a cotton-growing region, has an extensive river trade, and handles large quantities of cotton, hides, wool, and wax. The city is provided with improved waterworks, gas and electric-light plants, sewers, and street-railways, and contains a U. S. Government building, parish court-house, a public hospital, the headquarters of the State board of health, several cotton-compresses, cottonseed-oil mill, ice-factories, and machine-shops. There are 10 public-school buildings, public-school property valued at $20,000. 2 national banks with combined capital of $300,000, an incorporated bank with capital of $150,000, a private bank, and 3 daily and 3 weekly newspapers. In 1892 the city had a total assessed valuation of $3,250,000, and in Feb., 1894, the total debt was $156,500. Pop. (1880) 8,009; (1890) 11,979; (1900) 16,013.

Shrew, or **Shrew-mouse**: a small, insectivorous, mouse-like mammal of the family SORICIDÆ (*q. v.*). Shrews are found in nearly all parts of the northern hemisphere; they are

Shrew.

nocturnal, frequently aquatic, produce their young blind and naked, do not hibernate, and have an elongated and pointed muzzle, small eyes, plantigrade, five-toed feet, and glands which secrete a musky fluid.

Shrewsbury (anc. *Penywerne*): capital of Shropshire, England; on the Severn, which is crossed here by three bridges; 42 miles W. by N. of Birmingham and 163 N. W. of London (see map of England, ref. 9–G). It is an old and picturesque town, though the streets are steep and narrow. The Norman castle still remains, and of the same date is the Church of the Holy Cross. St. Mary's church, a cruciform building with a tower and spire, was founded in the tenth century. Among other buildings are the market-house (1595), the shire-hall, rebuilt in 1883, and the new market-hall (1868). Shrewsbury School, founded in 1551, is one of the seven great public schools of England, and has a rich endowment. Near here on July 21, 1403, Henry IV.

defeated Hotspur, and in 1644 the town was besieged by the parliamentary army. Shrewsbury sends one member to Parliament. Pop. (1891) 26,967.

Shrike [O. Eng. *scrīc*, thrush, (perhaps also) shrike : Icel. *shrīkja*, shrike, liter., shrieker; cf. Eng. *shriek*]: any one of the *Laniidæ*, a family of passerine birds. The best known North American species is the butcher-bird (*Lanius borealis*). They are noted for their habit of impaling insects and small birds upon the points of thorns. See Wood-swallows.

Shrimp [cf. *shrimp*, another form of *scrimp*]: a name properly restricted to crustaceans of the genus *Crangon*, but

The shrimp.

more usually applied to any of the smaller long-tailed crustaceans. The common shrimp of Great Britain, *C. vulgaris*, is esteemed a delicacy as food.

Shropshire, or **Salop**: a west midland county of England; on both sides of the Severn, and bounded W. by Wales. Area, 1,319 sq. miles. The northern part is level, with the exception of the Wrekin (1,320 feet), and is chiefly under tillage; the southern is hilly, reaching 1,800 feet in the Clee Hills, and mainly devoted to cattle-breeding. The county has a fine breed of sheep. There is a considerable production of coal and some of iron, limestone, and freestone. Pop. (1891) 236,827; (1901) 239,297.

Shrove-Tuesday [from *shrive*, to confess sin]: the day preceding Ash-Wednesday, so called from the old custom of confessing and receiving shrift on that day as a preparation for the forty days' fast. It is in general a day of pleasure in most Roman Catholic countries. It is the Carnival of the Italians, the Mardi Gras of the French, and the Pancake-Tuesday of former days in England.

Shu'brick, William Branford: rear-admiral U. S. navy; b. on Bull's island, South Carolina, Oct. 31, 1790; entered Harvard in 1805, but was appointed midshipman June, 1806. He became lieutenant Jan., 1813; commanded a gunboat in Hampton roads in 1813, and assisted in the defense of Norfolk and the navy-yard at Gosport; in 1813 was transferred to the Constitution, and made two cruises, aiding in the capture of three ships of war, including the Cyane and the Levant; was awarded a sword by his native State and a medal by Congress; was promoted to the rank of commander 1820, and served at the navy-yards at Charlestown, Mass., and New York until Apr., 1826, when he was appointed to the command of the Lexington; in 1831 was commissioned captain; commanded the West India squadron 1838–40; was in command of the navy-yard at Norfolk, Va., Oct., 1840–Oct., 1843; chief of the bureau of provisions and clothing for the navy 1845–46; was appointed to command the Pacific squadron July, 1846, and during the war with Mexico captured several ports; was appointed to the lighthouse board Sept., 1852; placed in command of the eastern coast squadron for the protection of American fishermen July, 1853, and in September returned to Washington and resumed his duties as chairman of the lighthouse board; appointed president of board to prepare regulations for the navy Aug., 1857; commanded the Brazil squadron and Paraguay expedition 1858–59, returning to resume duty as chairman of the lighthouse board; was retired in 1861, but continued a member of the advisory board until 1870; was commissioned rear-admiral in 1862. D. in Washington, D. C., May 27, 1874.

Shu'feldt, Robert W.: rear-admiral U. S. navy; b. in Red Hook, N. Y., Feb. 21, 1822; entered the navy as a midshipman May 11, 1839; commanded several vessels on the coast during the civil war, and was actively engaged against the defenses of Charleston; commanded the flag-ship of the East Indian squadron during 1865 and 1866, and that of the Mediterranean from 1871 to 1873; in 1875 appointed chief of the bureau of equipment and recruiting. He was consul-general to Cuba during the first year of the civil war, and acted with admirable judgment and discretion. Retired Feb. 21, 1884. D. in Washington, D. C., Nov. 7, 1895.

Shullsburg: city; Lafayette co., Wis.; on the Chi., Mil. and St. P. Railway; 24 miles E. by N. of Dubuque, 60 miles S. W. of Madison (for location, see map of Wisconsin, ref. 7–C). It is in an agricultural and lead-mining region, and contains 4 churches, 3 hotels, a national bank with capital of $50,000, a State bank with capital of $50,000, and two weekly newspapers. Pop. (1880) 1,168; (1890) 1,393; (1900) 1,250. Editor of "Pick and Gad."

Shu'magin Islands: small archipelago of Alaska, in lat. 55° N., lon. 160° W., just E. of the peninsula of Alaska, from which they are separated by Unga Straits, consisting of Unga, Nagai, Popoff, Korovin, Big Koniushi, Little Koniushi, Simeonoff, and many smaller islands and islets. Unga is about 10 miles long by 7 broad, and contains the only settlement of any size on the islands, viz., the little town of Unga near the southeast angle. Nagai is about 30 miles long by 4 broad, and of very irregular shape. The islands are generally mountainous, are without tree-growth, have abundant rainfall, and several excellent harbors. Good lignite has been found on Unga. Salmon abound in the streams in early summer, and good cod-banks are near by. These islands were discovered by Lieut. Waxel in 1741, and were given the name of one of his sailors buried there. Area about 600 sq. miles. Mark W. Harrington.

Shumla: town; in Bulgaria, half way between Rustchuk and Varna; in a fertile plain, inclosed on three sides by inaccessible spurs of the Balkans and strongly fortified (see map of Turkey, ref. 3–D). It is also an important commercial center and manufactures leather, copper ware, and cloth. Pop. (1893) 23,517. E. A. G.

Shur [Heb., wall]: the name applied by the Hebrews to the desert which bordered Egypt on the E. of the southern half of the Isthmus of Suez (Ex. xv. 22). Some have derived the name from the wall, 1,500 stadia long, which is alleged by Diodorus (i., 57) to have been built by Sesostris from Pelusium to Heliopolis for the defense of Egypt against the eastern Bedouin. (Trumbull, *Kadesh Barnea*, pp. 44 ff.) An *anbu ḥaq* (wall of the ruler) in this region certainly is mentioned in a papyrus of the twelfth dynasty, but it antedated Sesostris-Ramses by more than the whole Hyksos period. In most of the Old Testament passages Shur seems to have been the name of a place near Egypt (Gen. xvi. 7, xx. 1, xxv. 18; 1 Sam. xv. 7, xxvii. 8), and it has been conjectured that it corresponded with the Egyptian *Anbu* (wall, Gr. *Gerrhon*), which probably lay near the Mediterranean to the N. of the isthmus, and was a fortified place on one of the highways to the East (Strabo, *Geogr.*, xvi., 2, 33). Charles R. Gillett.

Shurtleff, Nathaniel Bradstreet, M. D.: antiquary; b. in Boston, Mass., June 29, 1810; graduated at Harvard 1831, and at the Medical School 1834; became a physician in Boston; mayor of Boston 1868–70. He was the author of *An Epitome of Phrenology* (1835); *A Perpetual Calendar for Old and New Style* (1848); *Passengers of the Mayflower in 1620* (1849); *Notice of William Shurtleff of Marshfield* (1850); *Genealogy of the Leverett Family* (1850); and *A Topographical Description of Boston* (1871), besides many minor publications and contributions to *The Genealogical Register*. He edited *Records of the Governor and Company of Massachusetts Bay 1628–86* (6 vols. 4to, 1853–54), and, with David Pulsifer, *Records of the Colony of New Plymouth* (12 vols. in 11, 4to, 1855–61). D. in Boston, Oct. 17, 1874.

Shurtleff, Roswell Morse: See the Appendix.

Shusha: town of Elisabethpol, Asiatic Caucasus, Russia; lat. 39° 46′ N., lon. 46° 25′ E.; formerly a fortress, on an isolated rocky hill, inaccessible on three sides; celebrated for its silk-culture, carpets, and horses; 70 miles S. by E. of the city of Elisabethpol (see map of Russia, ref. 12–G). The climate is rigorous. This place was formerly capital of the khanate of Karabagh, annexed by Russia in 1822. Pop. (1897) 25,656. M. W. H.

Shuvaloff: another form of the name Schuvalov (*q. v.*).

Sial'agogues [Gr. σίαλον, saliva + ἀγωγός, leading, deriv. of ἄγειν, lead]: drugs that cause an increased secretion of saliva. Mercury has this property more than any other substance, but as the increased salivary flow is simply one among many effects of a poisonous dose of the drug, the term sialagogue is not a proper definitive appellation.

Sialkot', or **Sealkote**: ancient city of the Punjaub, British India; 65 miles N. of Amritsar, lat. 32° 31′ N., lon. 74° 36′ E.; not far E. of the Chinab, a station on the braneh railway from Ramnagar to Janin; capital and commercial eenter of the district of Sialkot (see map of N. India, ref. 3–D). It is a well-built and healthful city, with wide paved principal streets and sewers. In the center are the ruins of a very old fort used during the revolt of 1857–58. It is a saered plaee for the Sikhs, and contains the mausoleum of Baba Nanak, their first apostle or *guru*. The old highways converge from Lahore, Amritsar, Gurdaspur, and Gudpranvalla at the bridge near this place over the Aïk, tributary to the Chinab, but are usually lost in the sand before reaching that stream. It is a center for great bankers and merchants, who are usually Jains. Cottons and paper are manufaetured, but the industry is deeaying. The foundation of the city is attributed to heroes of the *Mahâ-bhârata*. Pop. (1891) 55,087, two-thirds Mohammedans. M. W. H.

Siam, sĕe-aam′, or sī-ăăm′ [from Malay *Sāyām*, the brown race; Siamese *Muang Thai*, liter., kingdom of the free]: kingdom of Central Indo-China. consisting of a eentral kingdom in the Menam valley and several tributary states around it and on the Malay Peninsula (see map of East Indies, ref. 3–B). On the E. it was long limited by the Annam watershed, but in 1893 France took possession of the whole territory E. of the Mekong. On the S. E. it is bounded by Cambodia. On the N. and W. the boundaries are ill defined and subjeet to negotiations with the British and French, but Siam claims the territory N. to beyond the parallel of 20° N. and westward to the Salwen river in latitudes 18° to 20° N. Farther S. the boundary is more to the eastward and is irregular. On the Malay Peninsula the Siamese influenee is exerted on the east coast from the head of the Gulf of Siam to Pahong, lat. 4° 50′ N., and over the whole peninsula from the Isthmus of Kra to the British provinee of Wellesley in lat. 5° 35′ N. The total area is about 200,000 sq. miles.

Configuration.—Siam is bounded N. and W. by mountain-ranges having a general N. and S. direction, and consists of three distinct areas. Thc first is the Menam basin, praetieally a plain rising to the northward, at first slowly, then rapidly, and occupied by the kingdom proper and some of the tributary states to the N. It is about 400 miles long by 150 broad, and ascends only 300 feet in the first 200 miles, but 700 to 1,000 feet in the next 150. The northern end, in which lie the sourees of the Menam, is mountainous. The second is the Mekong or Lao plateau, to the E. of the preceding, about 300 miles N. and S. by 250 E. and W., separated from the preceding by hills and low mountains, and drained by the left-hand affluents of the Mekong, S. of its great bend to the eastward. It is somewhat more elevated than the Menam basin adjacent. The last is the Malay Peninsula, consisting of a central ridge of mountains flanked by extensive plains. The kingdom is well watered. The Menam has so level a course that it divides several times into two or more streams which unite farther down after inelosing islands of large size. This delta-like characteristic extends to about 250 miles from the mouth. The stream is well suited to navigation by native craft and by rafts. The climate is tropical, but moderate and generally healthful. There are three seasons in the year, each of four months' duration. The hot season begins in January and the temperature rises until the rains begin in early May. The mean temperature in April in Lower Siam is about 83°. The rains come with the S. W. monsoons, but are less heavy than on the Burmese coast. The rainfall is heaviest on the west coast of the Malay Peninsula (100 inches) and deereases northeasterly to 40 inches. The cool season begins in September and brings pleasant temperatures, clear skies, and serene weather. The thermometer at Bangkok may deseend in this season to 55°, or even lower. This is the season for public festivals, to which the Siamese are much devoted.

Mineral Products.—Siam is rich in minerals, especially in the peninsula and along the western mountains. Gold, tin, iron, copper, argentiferous galena, and antimony have been found, but only the first two are mined. Preeious stones are found in considerable quantities in the southeast. The production of rubies is important; that of sapphire, onyx, topaz, and jade less so. Rich mines of sapphire were opened near Chantabun in 1874, but were soon abandoned because of the insalubrity of the climate. Coal has been found in the peninsula; petroleum springs oecur in the Shan states to the N., and roek-salt in several plaees. Considerable marine salt is produced along the eoast of the gulf.

Vegetation and Agricultural Products.—The forests of Siam have been much eneroached on where they lie along rafting streams, but elsewhere they eontinue in unexcelled luxuriance, and contain many valuable woods, as teak and ebony. At the higher elevations in the north the forests become like those of the temperate zone, resembling those of Central Japan and eontaining oaks and pines. The soil is alluvial and very fertile, and eopious erops are produeed with little labor. The chief agrieultural product and the staple article of diet is riee, of which the Siamese have about forty varieties. In 1893 it is estimated that the rice product was about 600,000 tons. Other crops are pepper, sesame, hemp, ramie, opium, tobacco, cotton, coffee, and maize, most of them only in quantities sufficient for loeal consumption.

Fauna.—The fauna is very rich and varied. This is the traditional land of the elephant, though the natives are not so skillful in rearing and breaking them in as are the natives of Hindustan. The tributary state of Chiengmai is estimated to have 8,000 domesticated elephants, that of Lakhon 10,000, and they are not less numerous elsewhere. The priee of an elephant is from $750 to $1,000. So-ealled white elephants are eonsidered sacred and are tenderly eared for. These are albinos, and the test is not so much the color of the skin as of the eyes and the hair on the temples. Albino monkeys are also sacred. The simians are very numerous, and their most important representatives are the gibbons, anthropoid apes, of whieh there are several speeies. Bats are abundant, and in mountain eaves form large collections of guano. Edible birds'-nests are colleeted in such quantities that the tax on them produees $135,000 annually. Among the numerous and varied domestic animals, besides the elephant, may be mentioned the ox, several kinds of horse, a peculiar raee of hog, the sheep, the goat, and several kinds of domestic fowls. The horned eattle form the most important souree of wealth. About 70,000 are annually exported to Singapore, the Shan states, and Burma. Fishing is an important industry, and considerable quantities of dried fish are exported.

Inhabitants.—The population is estimated at 5,000,000, of whom about two-fifths are Siamese proper and the remainder about equally divided between other Shans, the Chinese, and the Malays. The Chinese are generally from Kwangtung, and there are many Sino-Siamese half-breeds. They are for the most part in the kingdom proper, where they have largely appropriated trade and commerce to themselves, and form the chief souree of free labor. They are of independent spirit, and their turbulent charaeter causes the Government mueh trouble. The other people of the same ethnic race as the Siamese are the Shans proper in the north and the Laos in the northeast and east. They occupy the tributary states, and the Siamese influenee has been extended over them by conquest. The Malays are found chiefly in the tributary states of the peninsula.

The Siamese proper are found ehiefly up the Menam valley to the vieinity of Pitsanulok (about lat. 17° N.) and around the head of the gulf. Though for many centuries warlike, they appear indolent, gentle, and patient. They are small but well formed, with an olive or yellowish complexion and jet-blaek hair, hospitable, humane, not inventive, untruthful, and eaprieious. In eustoms, manners, and eivil institutions they are curiously intermediate between India and China, and thus especially deserve the name of Indo-Chinese. The religion is Buddhist. Indeed Siam assumes in an espeeial way the character of protector of Buddhism, and this has made the relations between Siam and Ceylon especially elose.

Language and Literature.—The language is of the Shan stock, monosyllabic in character, very different from Annamese and Burmese, and written with a script borrowed from the Pali. The literature is abundant and varied, consisting of religious, legal, and scientific books and a considerable body of *belles-lettres*. The religious works are largely derived from Buddhist sources; the others are chiefly of indigenous origin. The chief science is astronomy, and they have their own system of ehronology. The romances and stories are said to be tedious and lacking in refinement. There is relatively little industry because of a system of foreed labor under which each man, except a few privileged classes, owes the Government three months' labor each year. Domestic slavery is little practieed, and is in process of abolishment. Free labor is difficult to obtain. Foreign ideas are making considerable progress. Edueation is generally in the hands of the priests and is much hampered by tradition. Three large public schools have been established in Bangkok, where

European arts, sciences, and languages are taught, and for many years it has been the custom to send a few young Siamese abroad for a technical education.

Government.—The throne is hereditary, but the king may choose his successor in his own family. The legislative power is in the hands of the king, assisted by a council of ministers. The tributary states are ruled sometimes by their own princes, sometimes by a royal commissioner, and there is a strong tendency toward increased centralization. The kingdom proper is divided into forty-one districts under royal governors. The king's annual revenue is estimated at $10,000,000, produced by a land-tax, customs, taxes on opium, spirits, tin mines, fruit-trees, edible birds'-nests, fisheries (in the order of the amount of revenue from each), and other sources. All taxes, except customs, are farmed. There is no public debt. The standing army consists of 12,000 men, well supplied with arms and artillery, is largely officered by Europeans, and is said to be in a very effective condition. All males of suitable years are subject to military duty. The Government has a small navy, and the mouth of the Menam is fortified at Paknam.

Commerce.—Bangkok, the capital, is also the commercial center and chief port. In 1899 the imports were valued at $12,306,186 and the exports at $15,181,546. About one-fourth of the imports in value was cotton goods, and of the exports five-sevenths consisted of rice. Other exports were teak, pepper, salt and dried fish, and bullocks and hides. Both imports and exports are chiefly exchanged with Hongkong and Singapore, and there is a considerable trade to the northward to the Shan states and Yunnan. In 1899 462 vessels (301 of them British) entered Bangkok, and 467 vessels (303 British) cleared from that port. A railway, 14 miles long, connecting Paknam, at the mouth of the river, with Bangkok was opened in 1893. A railway from Bangkok to Korat, 165 miles N. E., was opened Nov. 1, 1900, and many others have been projected. Bangkok has an electric tramway in operation. Telegraph lines with a total length of 1,820 miles, connect Bangkok with Chiengmai, Chantabun, and other Siamese cities; also with Saigon in Tonquin and Maulmein in Burma. There is a postal service with 168 stations outside of Bangkok (1899), and Siam belongs to the International Postal Union. In 1899 479,648 domestic and 436,243 foreign letters were handled. The unit of money is the *tical*, a silver coin worth forty-one cents in average exchange. Silver and bronze are coined in fractions of the *tical*, and paper money is current in multiples of this coin. The unit of weight is the *chang* (2⅔ lb., avoirdupois); and of length, the *niu* (1⅔ English inches) or the *wah* (48 niu = 80 inches).

History.—The Siamese apparently came from the north and first appear in history in 575 A. D., when they founded Labong, about lat. 18° N., in the Upper Menam valley. The date of introduction of Buddhism among them is put at 638 A. D. They pressed steadily southward as invaders until in the thirteenth century they had reached the gulf and peninsula, and had apparently more territory than they have now. In 1350 they made Ayuthia the capital, and it so continued until 1782, when the Government removed to Bangkok, where it remains. For many centuries they carried on wars with their neighbors, the Burmese, Peguans, Cambodians, and with the people they displaced, with varying fortune but final success. The Burmese twice took their capital (1555 and 1767), the second time only after two years' siege. In 1592 Siam entered into close diplomatic and commercial relations with Japan, and many Japanese settled in the country, where they played the part now taken there by Europeans, but native jealousy finally resulted in their expulsion with violence in 1632. Very similar is the history of their relations with France, begun in 1684. The present dynasty succeeded a Chinese one, and began with the removal of the capital to Bangkok (1782). The conquests of Shans and Laos have been chiefly under this dynasty. The last three kings have made especial effort to extend the relations of Siam with the Western world. Maka Mongkut (1852 to 1868), the immediate predecessor of the present king, was a man of great learning and enterprise, and the present king, Chulalongkorn, continues his broad-minded policy. Siam is, however, weak, and, wedged in as she is between British and French possessions, owes her continued existence to sufferance on their part. In 1893 France possessed herself of Siam's territories across the Mekong; but in Jan., 1896, the central region, watered by the Menam and several smaller rivers flowing into the Gulf of Siam, was declared neutral by France and Great Britain, and its integrity guaranteed to Siam.

References.—The classical work on Siam is that of Mgr. Pallegoix, *Description du royaume Thaï ou Siam* (2 vols., 1854). See also Bowring, *The Kingdom and People of Siam* (2 vols., 1857); Mouhot, *Travels in the Central Parts of Indo-China*, etc. (2 vols., 1864, translated from the *Tour du Monde*); Vincent, *Land of the White Elephant* (1874; new ed. 1889); Leonowens, *An English Governess at the Siamese Court* (1870); Bock, *Temples and Elephants* (1884); Colquhoun, *Among the Shans* (1885). Mark W. Harrington.

Siamese Twins: See Eng and Chang.

Sibe'ria [from Russ. *Sibirĭ*, Siberia, a word perhaps of Tartar origin from *Ssibir*, the name of the seat of the Tartar rulers on the Irtish]: a territory in Northern Asia, belonging to Russia. It is bounded on the N. by the Arctic Ocean from the mouth of the Kara river on the W. to Bering Straits; on the E. by Bering Sea, the Sea of Okhotsk, the Tartar Channel, and the Sea of Japan S. to the mouth of the Tumen-kiang on the Korean frontier; on the S. by Korea, Manchuria, Mongolia, and the Russian provinces Semipalatinsk, Akmolinsk, and Turgai of the steppes; on the W. by the upper Ural river, the Ural Mountains, and the Kara river. It includes portions of the governments of Orenberg and Perm usually classed as European. Thus limited Siberia has an area of 4,925,000 sq. miles, and a population of about 7,000,000. It is about a quarter larger than all Europe, but its population is not much greater than that of Belgium.

Political Divisions.—Politically, Siberia includes Saghalien with the above, but excludes Orenburg and Perm, giving an area of 4,833,496 sq. miles, and a population, in 1897, of 5,731,732, or a little more than one to the square mile. In this territory are the governments of Tobolsk and Tomsk, formerly composing the government of Western Siberia, but now directly administered under the Russian Minister of the Interior; the governments of Yeniseisk and Irkutsk, and the province of Yakutsk, formerly composing the general government of Eastern Siberia, now called the general government of Irkutsk; the provinces of Transbaikalia, and of the Amur, the Coast Province or Primorskaia Oblast, and the circle of Saghalien, forming the general government of the Amur. For details as to these governments and provinces, see each under its own heading.

Configuration.—The Ural Mountains, which separate Siberia from European Russia, reach an elevation of only 5,522 feet at their culminating point at Mt. Konchakof in the government of Perm. They can be traversed without difficulty, and their slopes are especially gentle on the Asiatic side. These mountains aside, Siberia has a very simple structure, consisting of an elevated plateau in the southeast, set in mountains, and passing toward the W. and N. by an enormous plain. The plateau is called the plateau of Vitim, from the branch of the Lena which takes its rise there. It is the northward extension of the great plateau of Asia, which has its highest and broadest part abutting the Himalaya Mountains and extends nearly to Bering Straits. In Siberia it is narrow and relatively low, rarely surpassing 3,000 feet. In this plateau all the great rivers of Siberia take their rise. The margins consist of a series of mountain ranges with relatively gentle slope where they abut on it, and abrupt descents toward the plain or sea. On the sea of Okhotsk the mountains rise abruptly from the water, and there is an outlying range in Kamchatka. In the Amur region plains of considerable magnitude intervene between the ranges at the eastern margin of the plateau and the coast ranges, which extend from Korea to the mouth of the Amur. The termination of the plateau toward the N. E. is in a region very imperfectly explored. The area so far described includes only about one-fourth of Siberia. The remainder consists of an enormous plain extending W., N. W., and N., and sloping N. and W., with an ill-defined intermediate hilly region. This is the great plain of Asia, and is continued beyond the Urals in the plain of Russia and Germany. In Asia it consists southwestward of steppes, grassy and sandy, which rise very gradually to the low, rounded, imperceptible watershed between the Arctic and Turkestan systems of drainage. Its slope northward is rapid near the mountains, thence growing more and more gradual. The steppes pass gradually into the tundras of the north, which extend to the Arctic Ocean along the entire northern boundary. They are level or rolling plains, subarctic and arctic in character, with an alluvial soil. They are of a depressing sameness, are well-watered, and would be suitable for cultivation did the climate permit. Their

slope northward is extremely gentle, and is continued under the Arctic Ocean as far as soundings have been made. At 150 miles from the coast soundings have given depths of 13 or 14 fathoms only.

The coasts of Siberia measure 19,000 miles, of which 10,000 belong to the Arctic Ocean. The northernmost point of the mainland is Cape Cheliuskin in lat. 77° 36′ N., about 5° farther N. than Point Barrow, the northernmost point of the U. S., and 6° farther N. than North Cape of Norway. On the north coast are the great indentation called the Gulf of Obi, the two great peninsulas of Yalmal and Tamyr, and to the N. of Yakutsk the large archipelago of the New Siberian islands, the northernmost known point of which is on Bennett island in about the same latitude as Cape Cheliuskin. Nordenskiöld first traversed this coast in 1878–79, in his celebrated voyage in the Vega. The rigor of the climate of these high northern latitudes prevents profitable commerce, notwithstanding the ready access given to the interior in summer by the great Siberian rivers. The shores of Bering Sea are provided with harbors, and are accessible for a longer season each year, but the country inland is barren and relatively inaccessible. Along the Sea of Japan the coast is bold and rocky, furnishing generally little protection for commerce. The exceptions are the bays of St. Vladimir (lat. 43° 55′ N.), of St. Olga (lat. 43° 44′ N.), which afford good anchorages, and the Gulf of Peter the Great near the Korean border, where the Russian naval station and town of Vladivostok is situated. It has several smaller bays, and the town is on a peninsula between the Bay of America and the Bay of Ussuri. At the Korean border is the Bay of Possiet, with the Pallas anchorage and two interior bays. The entire Siberian coast is rising slowly, and marine shells are found far inland from the Arctic shore.

Hydrography.—Siberia is provided with a magnificent series of rivers. Belonging entirely or in part to it are 38 streams 400 miles or more long, when the minor meanders are neglected, 27 more than 600 miles long, and 8 which are 1,250 or more miles long. The four longest are the Obi (3,200 miles), the Lena (2,880 miles), the Amur (2,800 miles), and the Yenisei (2,500 miles). All rise about the plateau already described—if of sufficient length—and all, except the Amur and Anadyr, contribute to the Arctic Ocean. The long and relatively straight course of many of these streams adapts them to display the effects of the earth's rotation under which all moving bodies in the northern hemisphere tend to diverge toward the right of their course. The long Siberian rivers show a decided tendency to leave their left-hand (western) banks, leaving them low, flat, and subject to overflow, while they eat out their right (eastern) banks, making them high and steep. The Siberian towns are practically all riverine. The length and magnitude of the streams greatly favor navigation in its season, and in 1893 there were 102 steamers plying on the streams of Western Siberia, with an aggregate traffic of 322,000 tons. There were also sixty-eight steamers on the interior waters of Eastern Siberia. The case of river traffic N. and S. is evident, but their great bifurcations also adapt these rivers to an east and west traffic, and Siberia can be crossed from Ekaterinburg to Nikolaevsk, at the mouth of the Amur, almost entirely by water. The principal land stretch is at the western end from Ekaterinburg to Tiumen, and this was supplied with a railway in 1885. The principal difficulties to navigation are to be found in shiftings of the channels and in the shortness of the warm season. The rivers are closed by ice from two to eight months; the opening begins at the S. and proceeds slowly N. In front of the open water accumulate great ice-packs, and these serve as dams and cause the most serious floods. Several parts of Siberia are rich in small lakes. The plains of the west are thickly strewn with them, usually shallow, and in the midst of marshes, and their diminution in area and depth is progressing more rapidly than usual elsewhere. The plateau of Vitim is also thickly studded with small bodies of fresh water. On the other hand, large lakes are relatively rare. The largest is Lake Baikal, area 13,200 sq. miles, just W. of the plateau of Vitim, long and narrow, in a deep valley between two mountain ranges, drained by the Angara, an affluent of the Yenisei. There are two others with areas between 1,000 and 1,500 sq. miles, two of between 700 and 1,000 sq. miles, three of between 400 and 700 sq. miles, and ten of between 200 and 400 sq. miles.

Climate.—The climate of Siberia is continental, rigorous, and cold. The temperatures are especially low; they are like those around Hudson Bay, but are colder. The mean annual temperatures through Central Siberia from Tobolsk to Kamchatka are like those of the Yukon basin in Alaska and of Labrador. They vary from a mean annual temperature of 32° F., along a line which extends from Archangel on the White Sea to Lake Baikal and thence eastward, to 15° F.—or 17° below freezing—along a line which extends from Nova Zembla to Yakutsk and thence northeastward. To the S. of the first line is a narrow strip with the temperatures of New Brunswick and Manitoba. To the N. of the second line the mean temperatures are below 15°, and for a considerable part of the coast are near 0° F. The coldest place known in the world, and not at high altitudes, at which observations are taken is Verkoyansk (lat. 67° 54′, lon. 133° 52′ E., on the Yona river), where the mean annual temperature is 2° F. The mean temperature of January is 20° below zero, and the observed minimum is 80° F. below zero. This is the best-known pole of cold on the earth. All Siberia is colder than the average for the other places on the same parallels of latitude, and at this pole of cold it is about 20° colder. At the same time the change of temperature between summer and winter is greater than known elsewhere at low altitudes, and at Verkoyansk the difference between the January and July mean temperatures is 116°. For the Missouri valley it is only 55°, and for Manitoba 65° or 70°. With the other continental features Siberia is dry, having a rainfall varying from 5 to 45 inches. In general the rainfall or snow is about that of the Great Plains E. of the Rocky Mountains, but in the northeast it is still less. The principal rainfall is in summer and autumn. Blizzards are not rare, and are very destructive to stock toward the end of winter.

Mineral Productions.—The most productive metalliferous districts of Russia are along the Urals, and especially in those governments which lie partly in Asia, partly in Europe. It is not always possible therefore to separate the Asiatic from the European statistics, but the Asiatic versant of the Urals is in general much richer in mineral products than the European. Siberia is celebrated for her gold, platinum, and precious stones. The mines belong chiefly to the state, and their income to the imperial family. Gold is for the most part from places in the Urals and Altai Mountains, but has been found in several other districts. The production began in 1726, reached its maximum in 1825–50, and has since declined, except for a favorable fluctuation in 1871–76. The total production of the Russian empire (mostly from Siberia) to 1876 has been estimated at two-thirds of a billion of dollars, and the annual product remains about one-sixth of the world's total output of gold—in 1898 it was 38,792 kilogrammes. Russian platinum is from the Urals, chiefly from the Asiatic slope in Perm. Most of the platinum product of the world comes from this area. Mines of precious stones are numerous, and their product large, and the best are on the eastern slope of the Urals—diamonds, sapphires, emeralds, superb beryls from several places in Perm, aqua-marines and topazes from Ilmen in Orenburg, etc. There are equally rich mines in the Altai Mountains and in Transbaikalia. Silver, copper, iron, carbon, graphite, and rock-salt are also important products.

Flora and Fauna.—The flora is very varied, as might be expected for so large an area, but it falls naturally into five principal types, viz., that of Kamchatka and the islands, which is closely allied to that of the Aleutian islands of the U. S.; that of the Amur basin, which is a continuation of the Manchurian; that of the southwest steppes, which are an extension of those of Russian Turkestan; that of the tundras along the Arctic Ocean; and that of the forests covering Central Siberia, an extension of those of Russia. The tundras have a considerable variety of low woody plants or shrubs, especially of the genera *Rubus* and *Vaccinium*, also alders and willows. Mosses predominate, but some flowering plants extend even to Cape Cheliuskin. The northern margin of the forest area is generally formed by two species of larch which, between the Yenisei and the Kolyma, reach N. of the Arctic Circle, sometimes passing the parallel of 70° N., and on the Bay of Khatanga reaching 72° 30′ N. W. of the Yenisei the margin of forest growth descends below the Bays of Tazovsk and Obi, and E. of the Kolyma the forest-line descends rapidly southward to Kamchatka. Next to the larches come the pines, spruces, the poplar, and birches, and the last replaces the larches in the extreme east. The forest area of Siberia is enormous. That of Tomsk and Tobolsk is estimated at 250,000 sq. miles, and probably this is only a third or a quarter of the area for all Siberia, but the forests are visibly decreasing in Asiatic as in European

Russia. The Siberian forests are sometimes dense and continuous, but they are more often open, with intervening prairies. The oaks, lindens, and maples are found only on the Pacific versant, and here they are of unfamiliar species. The common fruits—the apple, pear, cherry, gooseberry—do not flourish in Siberia, but the hop is very common. The northern limit of cereals is about 60° N. lat. in the basin of the Obi, and rises to 61° or 62° in Yakutsk and the Aldan basin, but descends to 54° N. on the Sea of Okhotsk and in Kamchatka. They do not flourish on the elevated plateaus.

The fauna is not unlike the European, except in the southwest, where it is like that of Turkestan, and the southeast, where it is closely allied to the Manchurian. The northern shores have the reindeer, the northern hare, two species of fox and a wild dog, two species of lemmings, and the Siberian bear, the last becoming more and more rare. The mammoth and a rhinoceros abounded in these plains apparently at a time antedating the Glacial epoch. Farther S. animal life is abundant, and even the tiger penetrates into the Amur valley. Lake Baikal, though a body of fresh water, has its own species of seal, and the waters, both running and standing, abound in fish. Among the domesticated animals is the reindeer, which here descends to lat. 50° N. on the mountains bordering on Mongolia, where its habitat touches that of the camel. Siberia offers abundant pasturage, and is especially suited to the raising of live stock. According to recent estimates, it possessed over 2,000,000 each of horses and horned cattle, nearly 3,000,000 sheep, 500,000 swine, 200,000 goats, 146,000 domesticated reindeer, and 3,600 camels. The collection of furs (fox, ermine, marten, sable, bear, squirrel) forms an important industry.

Agriculture.—The amount of arable land is estimated at from one-third to one-fifth of the total area, more in proportion in Western than in Eastern Siberia. The maritime province, adjoining Manchuria and the Pacific, is more favorable for agriculture, so far as climate and water-supply are concerned, but it is little known. Agriculture is very primitive, but the virgin lands yield enormous crops. The chief crops are wheat (spring and winter), rye, oats, barley, the potato, and tobacco. There are few manufacturing industries. Trade is mostly with European Russia, but is very profitable, with high prices and high rates of interest.

Population.—The population is most dense over a long and slender triangle, whose base is on the Ural Mountains, and whose axis passes from Ekaterinburg to Vladivostok, through Lake Baikal. In this space the greater portion of the inhabitants are of European descent, mostly Russians, with a few Poles and still fewer Germans. N. of this area, and over three-fourths of Siberia, the population is very sparse, and consists of tribes of Finnish relationship in the west (Ostiaks, Samoyedes, etc.) and of uncertain relationships in the east (Chukchees, Koriaks, Kamchadales, etc., with a few Eskimos about Cape East). S. of the area above described are Turco-Tartars in the west (Kalmuks, etc.) and Mongols in the east (Buriats, Tunguses, etc.). The Buriats occupy much of the Amur valley, and the Tunguses extend northward into the Yenisei basin until their area adjoins that of the Samoyedes. There are also a few thousands of Jews and gypsies scattered through Siberia. The abundant archæological remains show that Siberia has been occupied from the earliest times, and the peoples along the Arctic coast appear to be the ethnic remnants of the aborigines. Peoples of Turkish or Mongolian races in wave after wave have swept over the country and left remnants of their own tribes in its southern parts. The lot of the indigenes, whether aboriginal or not, is not pleasant. Oppressed by imposts of the nature of tribute, robbed of their lands most suited for the chase, fleeced by functionaries and merchants, exposed to new and destructive maladies, and demoralized by spirituous liquors, their number is decreasing rapidly.

The religions are as diverse as the peoples. The Russians are generally Orthodox, but many dissenters have been deported. The Poles are usually Roman Catholics, the Tartars Mohammedans, the Mongols Lama-Buddhists, and the northern indigenes pagans of the Shaman type. Missionary effort is active throughout the country, and especially in the west. Many of the indigenes profess Christianity.

The conquest of Siberia was begun in 1582. The latest addition to its territory was Saghalien (*q. v.*) in 1875. From the beginning a stream of voluntary colonists has poured into Siberia from European Russia, although immigration was at times forbidden by the Government and is strictly regulated. The number of such colonists from 1860 to 1880 is officially estimated at about 100,000. In the latter part of the eighties it had increased to abont 35,000 per year, and since the Samara famine it has greatly increased, and is estimated to have been 100,000 in 1892 and 175,000 in 1897.

Increase through Deportation.—Deportation to Siberia was important in the seventeenth century, and adds annually about 20,000 to the population, of whom about one-fourth are voluntary, accompanying their families. From 1823 to 1869 there were over 600,000 persons deported to Siberia, and of them 167,000 were voluntary. About 15 per cent. of the deported were women; 12 per cent. were sentenced to hard labor, 20 per cent. to loss of civil rights, 13 without such loss, and 2½ were free to change residence in Siberia; 52 per cent. were deported by executive act, or otherwise without process of courts. When deported they are sent to prisons at Tiumen and thence distributed, some to the extreme north, some to hard labor in mines in the Amur, some to the convict island of Saghalien, but generally to some less remote or less forbidding place where the chief reminder of their condition is the strict police surveillance to which they are subjected. The political exiles are the most intelligent and worthy, but the worst treated. The criminals sometimes become vagabonds, and may continue their unlawful careers. The exiles in Siberia make 5 per cent. of the population as a whole—1 in Yakutsk, 3 in Tomsk, 4 in Transbaikalia, 5 in Tobolsk, 10 in Yeniseisk and Irkutsk, and in Saghalien about 70.

Vital Statistics, etc.—Aside from the unfavorable conditions induced by the introduction of criminals by deportation, the social state of Europeans in Siberia is not bad. The birth-rate is very high (45·5 in 1890) and the death-rate somewhat high (31), but not so high as in European Russia. Only 9 per cent. of the population as a whole live in the towns. The number of males (1897) surpassed that of the females by 7 in 100. In 1891–92 there were 1,446 primary schools with 49,118 pupils, 55 middle schools with 7,401 pupils, 17 professional schools with 974 pupils (only 75 girls in the last), and a university at Tomsk, opened in 1887.

Means of Communication, etc.—A telegraph line extends from the Urals to Nikolaevsk at the mouth of the Amur. Besides the railway to Tiumen one from Orenburg to Vladivostok (4,950 miles) was begun in 1892. In 1899 the last section from Sryetensk to Lake Baikal (685 miles) was completed and opened Dec. 28, completing the line of communication from Vladivostok to European Russia. The trains are transported across Lake Baikal on ice-breaking ferry-boats. The chief towns are Tomsk (pop. 52,430 in 1897); Irkutsk (51,484); Omsk (37,470); Tiumen (29,588); Vladivostok (28,896). See Siberia in the Appendix.

Literature.—The encyclopædic and more complete works on Siberia are naturally in Russian, and the German literature is large. The following are the works available in English and the more classical of the German books: Middendorff, *Reise in dem äussersten Norden und Osten Sibiriens* (4 vols., 1851–60); Kennan, *Tent-life in Siberia* (1870), also magazine articles by this author; Seebohm, *A Visit to the Valley of the Yenisei* (1879); Mudge, *Fur-clad Adventures through Alaska, Kamtchatka, and Eastern Siberia* (1880); Nordenskiöld, *Voyage of the Vega* (1881); Iadrintzef, *Sibirien, geographische, ethnographische, und historische Studien* (trans. from Russian, 1886); Landsdell, *Through Siberia* (2 vols., 1882); Woeikof, *Die Klimate der Erde* (2 vols., 1887); De Long, *Voyage of the Jeanette* (2 vols., 1883); Melville, *The Lena Delta* (1885); *Lenamündung* of the Russian International Polar Expedition; Price, *From the Arctic Ocean to the Yellow Sea* (1892). Mark W. Harrington.

Sibilants [from Lat. *si'bilans*, partic. of *sibila're*, to hiss]: in phonetics, a group of fricatives or spirants characterized by a hissing sound. This hissing sound is produced by a current of breath directed by the blade of the tongue against the teeth. The commonest examples are *s* as in *sun*, *sh* (š) as in *shine*, *z* as in *zinc*, *zh* (ž) as in *azure*; *s* and *sh* are voiceless, *z* and *zh* are voiced; *s* and *z* are produced by a sharper or more concentrated current of breath than *z* and *zh*, in which the tongue is drawn back and the point slightly raised. See Spirants and Consonant.

Benj. Ide Wheeler.

Sibler, Wilhelm, Ph. D.: clergyman; b. at Breslau, Prussia, Nov. 12, 1801. After a gymnasium course he served for two years and a half in the Prussian army, rising to a lieutenancy; studied in the military school at Berlin; abandoning military life, studied philosophy and philology in Breslau and Berlin: gymnasium professor at Dresden 1830–37; tutor in Livonia, Russia, 1837–41. Having studied the-

ology privately, he answered an appeal for German missionaries for the U. S. and removed to North America in 1843. He became a member of the Joint Synod of Ohio, first for a brief time as pastor at Pomeroy, O., and then at Fort Wayne, Ind. He founded a seminary at Fort Wayne, Ind. (1846), of which he became professor, and was one of the founders and leaders of the Synod of Missouri. He was the author of *Sermons on the Gospels* and *Epistles of the Church Year*, and of various controversial treatises. D. Oct. 27, 1885. His biography (*Lebenslauf*) in two volumes was published at St. Louis, Mo., 1880. H. E. Jacobs.

Sibley, Henry Hopkins: soldier; b. at Nacogdoches, La., May 25, 1816; graduated at the U. S. Military Academy July 1, 1838; appointed second lieutenant of Second Dragoons; first lieutenant 1840, captain 1847, and major First Dragoons 1861; served in Florida war 1838–39 and 1840–41; adjutant of his regiment 1841–46. In the war with Mexico he participated in the siege of Vera Cruz, battles of Cerro Gordo, Contreras, Churubusco, Molino del Rey, and final capture of the city of Mexico, gaining the brevet of major for gallantry in the affair at Medellin, near Vera Cruz, Mar. 25, 1847. Before the civil war he was actively engaged on frontier duty and on numerous expeditions, notably the Utah expedition (1857–58, 1859–60), and that against the Navajoes (1860). The breaking out of civil war in 1861 found him in New Mexico, where he resigned from the U. S. army, in which he had just been promoted to the rank of major (May 13), and entered the Confederate service, in which he was soon a brigadier-general. Having organized a brigade in Northwest Texas, he left Fort Bliss in Jan., 1862, with between 2,000 and 2,500 men, to effect the conquest of New Mexico, and Feb. 16 appeared before Fort Craig, commanded by Col. E. R. S. Canby. The action of Valverde was fought Feb. 21, closing by the withdrawal of Col. Canby's troops to the fort. Albuquerque and Santa Fé were occupied by Sibley in March, but the following month he was compelled to evacuate the territory and return to Fort Bliss. After the close of the war he was in the service of the khedive in Egypt as brigadier-general 1869–73. He was the inventor of the tent known by his name. D. at Fredericksburg, Va., Aug. 23, 1886.

Revised by James Mercur.

Sibley, Hiram: financier; b. at North Adams, Mass., Feb. 6, 1807; was a shoemaker by trade; removed early to New York State, where he became a machinist, and also engaged in manufacturing machinery. When telegraphy came into practical use he associated a few gentlemen with himself, and bought or leased several unsuccessful lines, until finally over twenty corporations were merged into the Western Union Telegraph Company. Sibley subsequently conceived the idea of a line to California, and was mainly instrumental in carrying through Congress, in the face of the most intense skepticism, a bill which secured a line to the Pacific coast. He also completed negotiations with the British and Russian Governments for a European line across Bering Strait. The Atlantic cable proved a success and, consequently, the Asiatic line a failure. He engaged in railway-building, in manufacturing lumber and salt, seed-raising, and in farming, on a large scale. He expended $200,000 in founding Sibley College of Mechanical Engineering at Cornell University, and $100,000 on a fire-proof library building for the University of Rochester. D. at Rochester, N. Y., July 12, 1888.

Sibthorp, John, M. D., F. R. S.: botanist; b. at Oxford, England, Oct. 28, 1758; graduated at Oxford University about 1778; studied medicine at Oxford, Edinburgh, and on the Continent; made botanical researches in France, Switzerland, Southern Italy, Crete, Cyprus, Asia Minor, parts of European Turkey, and Greece; Professor of Botany at Oxford; one of the founders of the Linnean Society; made a second botanical exploration of Greece and the Ionian islands 1794–95; published the *Flora Oxoniensis* (1794); died at Bath, Feb. 8, 1796. He bequeathed to the university £1,200 per annum for the publication of his great work, *Flora Græca*, which was edited by J. E. Smith and John Lindley (20 vols., royal folio, with 1,000 colored plates, 1807, *seq.*).

Revised by Charles E. Bessey.

Sibyl [from Lat. *sibyl'la* = Gr. σίβυλλα, sibyl]: the name given to certain old women inspired by the god of prophecy. Plato knew of but one sibyl, Aristotle of several, and Varro of ten. Libyssa, the first sibyl, was the daughter of Zeus and Lamia, and prophesied at Delphi. The second and famous sibyl was Herophile, a sister or daughter or wife of Apollo, who is heard of even before the Trojan war. Troyland seems to have been her real home, though, from her wanderings in the interests of her god, she was known as the Sardinian, Trojan, Samian, Delphian, Cymæan, Cumæan, Erythræan sibyl. She lived for ages, and she it was who sold the books of prophecy to Tarquinius Superbus. The twelve extant books of sibylline oracles are of late (even Christian) origin, and have nothing in common with the old sibyls.

Sicard, Montgomery: See the Appendix.

Sicil'ian Vespers: the uprising of the Sicilian people against the French usurper, Charles of Anjou, at Palermo on Easter Day, Mar. 30, 1282. In 1264 Pope Urban IV. had granted the kingdom of the Two Sicilies to the bigoted Charles of Anjou, brother of King Louis IX. of France. Charles defeated Manfred at Benevento, took possession of the kingdom, and converted the government into an oppressive despotism. This was long borne without organized resistance, but the brutality of a French soldier toward a Sicilian woman produced an outburst of popular resentment which began with the instant massacre of the French soldiery, and ended with the slaughter of most of Charles's foreign and native adherents throughout the island, and the final overthrow of his domination in Sicily. See Amari, *La Guerra dei Vespri Siciliani* (2 vols., Palermo, 1842; many times reprinted).

Sic'ilies, The Two: the name given formerly to a kingdom composed of the island of Sicily and the southern part of the mainland of Italy. In 1130 the Norman Roger (*q. v.*), King of Sicily, having obtained the Italian territories of Apulia, Capua, Naples, and the Abruzzi, was crowned at Palermo as King of Sicily and Italy, a title afterward altered. Thus was formed a dominion whose two parts were frequently divided and united and transferred from one ruler to another, but always with hardly any change of boundary. Ferdinand the Catholic (1479–1515), King of Aragon and the island of Sicily, conquered the continental Sicily and called himself the king of the Two Sicilies, which then remained united up to 1706. (See Sicily.) From 1735 up to their annexation to the kingdom of Italy in 1860 the parts were again united, except during the period 1805–15, when the continental Sicily was ruled over by Joseph Bonaparte and Murat as Kings of Naples. The continental Sicily comprised what are now the five *compartimenti* of Abruzzi e Molise, Campania, Apulia, Potenza or Basilicata, and Calabria, and is divided into sixteen provinces. See Ferdinand IV. (King of Naples), Ferdinand II., Francis I., and Francis II. (Kings of the Two Sicilies).

R. A. Roberts.

Sicily, sis'i-le (Ital. *Sicilia*; Lat. *Sicilia, Sicania, Trinacria*; Gr. Σικελία, Σικανία, Τρινακρία): the largest and most important island in the Mediterranean, lying near the center of that sea, between 36° 41′ and 38° 18′ N. lat., 12° 30′ and 15° 40′ E. lon. It is separated from Italy by the narrow Faro or Strait of Messina. Its western extremity, Cape Boeo (anc. *Lilybæum Promontorium*), is 90 miles from Cape Bon in Africa. It forms a nearly isosceles triangle, its shortest side fronting the E. Area, 9,936 sq. miles. Together with the islands Pantellaria and Ustica and the Lipari or Æolian group on the N. and the Ægates group on the W., it constitutes a *compartimento* of the kingdom of Italy.

Physical Features, etc.—The coast is about 700 miles long, but has few natural harbors. The most important are those of Messina, Catania, Agosta, and Syracuse on the E. and of Palermo on the N.; also in the small harbors of Trapani and Marsala on the W. and in the roadstead of Licata on the S. a large trade is carried on. The most northeast point is Capo del Faro; most S. E., Capo Passero; N. W., Capo San Vito. Near the northeast corner of the island begins a mountain chain corresponding to the Calabrian range on the mainland. Its general direction is S. S. W. to Taormina, then westward, running parallel to and near the north coast with a general elevation of from 2,000 to 3,000 feet. Its highest summit, the Pizzo dell' Antenna or Pizzo di Case, S. W. of Cefalu, is 6,478 feet high. There the chain divides into three ridges, or rather series of detached mountains, diminishing in height, which run S. W., S., and S. E. The general surface of the island is an uneven plateau descending toward the S. E. Its most famous and important mountain is the isolated volcanic peak of Etna (*q. v.*). There are few lakes or ponds. Lago Pergusa, near Castro Giovanni (anc. *Enna*), and the Biviere di Lentini, or Lake of Lentini, are the largest. The forests, which were formerly extensive, have been largely destroyed in modern times, not only by volcanic eruptions, as along the slopes of Etna, but by im-

provident felling and abuse of pasturage. In consequence the water-supply is uncertain and limited. The heavy winter rains are of little benefit, being neither absorbed by the soil nor collected in natural or artificial storehouses for the dry season. Still, evaporation from the surrounding seas mitigates the heat, and its condensation on the summits of the northern coast range furnishes a supply of water which, though badly economized, somewhat protects the soil from droughts. The principal rivers are the Giaretta, formed by the union of the Simeto and Gurnalunga, the Cantara, Salso, Platani, and Belici. The numerous smaller streams are often obstacles to internal communication from the violence of their currents in winter and from the difficulty of constructing secure bridges over them. The larger number are dry in summer. The temperature is generally agreeable, except during the prevalence of the parching sirocco. The climate is not unhealthful, except in the many localities rendered almost uninhabitable by malaria.

Minerals.—The minerals correspond with the geologic formations of which the island is composed—Primitive at the N. E., Secondary along the N., and mainly Tertiary through the rest of Sicily. Sulphur and rock-salt are the most important mineral products. The marbles, jaspers, and agates are fine. Lignite and alum are found, and also at the eastern coast amber, usually of a transparent yellow, but sometimes blue or green.

Agriculture and other Industries.—The soil, almost nowhere alluvial, is exceedingly fertile wherever water can be secured for irrigation. Agriculture is carried on only in the rudest and most primitive way, and until recent years insecurity of life and property have prevented investment in rural improvements. Excellent wheat is raised in large quantities, but generally exported, the necessities of the inhabitants being supplied by the importation of a cheaper and inferior article. The vineyards produce delicious wines of various kinds. Hemp, saffron, and sumach are grown. The mulberry is cultivated for the silkworm. Almonds, figs, olives, lemons, oranges, and tobacco are raised extensively. The cultivation of cotton and the sugar-cane has greatly decreased. Manufactures are unimportant and hardly more than supply the wants of the working-classes. Fishing is prosecuted with energy. The tunny is taken and cured at different points along the coast, and sardines and anchovies are shipped to foreign ports in large quantities. Means of intercommunication are very defective. There are few highways, the roads are mostly bridle-paths, and the towns of the interior are generally not accessible by small carriages. In 1894 633 miles of railway had been opened up.

Language and Literature.—The Sicilian dialect resembles that of Calabria. It generally agrees with the Tuscan in vocabulary, but with the frequent substitution of *u* for *o* final, of *ll* by *dd*, and with the omission of the *u*-sound after *q*; but it possesses many words from the Arabic and others from unknown sources. Though not a literary language, it has ancient chronicles in the popular speech and some modern poems justly admired. Education, though making progress, is still in a backward state, and Sicily is far behind continental Italy.

History.—The earliest known inhabitants were the Sicani or Siculi, who crossed from Italy. At an early period the Phœnicians planted their factories along the coast and introduced the Phœnician worship. They were shortly followed by Greeks, who so thoroughly colonized the island in the eighth and seventh centuries before Christ that all its ancient culture and civilization were of Greek origin: but the colonists, being from many different states, were disinclined to unite in any common organization. The cities they founded were governed by oligarchies or tyrants, but though often at war with each other rose to great wealth and power. The Carthaginians in great force invaded Sicily, but received a crushing defeat at Himera (480 B. C.). Then followed the most brilliant half century of the Greek domination. Troubles among the cities furnished a pretext for the disastrous Athenian expedition (415 B. C.). After 409 B. C. the Carthaginians gradually mastered most of the island, but were sturdily resisted by Dionysius, tyrant of Syracuse. At the close of the first Punic war (241 B. C.) they were forced to cede their Sicilian possessions to the Romans, Syracuse still remaining independent; but all Sicily became a Roman province—the first Rome possessed—at the close of the second Punic war, and so continued until 395, when, on division of the Roman empire, it became part of the empire of the East. Christianity was early introduced, apparently from Rome. Overcome by the Goths, Sicily was delivered by Belisarius and continued a Byzantine possession until 827, when its subjugation was commenced by the Saracens and was completed in 878. Under the Mussulman sway agriculture, manufactures, and commerce steadily increased. In 1061 the wealthy island tempted the Normans under Roger Guiscard, but it was not wholly subdued until 1090. The Normans held it until 1194, when it passed to the Hohenstaufen emperors, who were replaced in 1268 by Charles of Anjou and the French. The massacre of the SICILIAN VESPERS (*q. v.*) ended the power of the latter (1282), and the island came into the hands of Peter III. of Aragon. The Aragonese dynasty reigned till 1504, after which until 1706 Sicily was under the Spanish crown. Then for brief periods it was held by Austria, Savoy, Austria, and Spain, till in 1735 it was reunited with Naples under Don Carlos as King of the Two Sicilies, and was ruled by his house until its liberation (1860) by Garibaldi and its incorporation into the kingdom of Italy. Its condition in the Middle Ages was deplorable. Its nominal independence was limited to control of its internal affairs, while its rulers constantly neglected to defend it against the Mussulmans; but great progress has been made since 1860.

All the ancient peoples who ruled Italy—the Siculi, Phœnicians, Greeks, Carthaginians, and Romans—have left monuments of their occupation. Those by the Greeks are stupendous, and include the vastest and most splendid existing remains of Greek temples. These are specially to be seen at Selinonte, Girgenti (*Agrigentum*), Segesta, Syracuse, and Himera. Even the reconstructed Roman theaters of Syracuse, Segesta, Taormina, and Palazzolo rest on Greek foundations. In Sicily are found very beautiful ancient pottery and unsurpassed medals. Some edifices date from the Byzantines and Saracens, but the most important memorials of the latter are the useful plants, such as sugar-cane and cotton, which they introduced.

Population.—Sicily is divided into the provinces of Caltanisetta, Catania, Girgenti, Messina, Palermo, Siracusa, and Trapani. Total population 1893 (official estimate), 3,404,665. Principal cities: Palermo, 276,000; Messina, 146,400; Catania, 121,000. See SICILY in the Appendix.

LITERATURE.—See Freeman, *History of Sicily* (4 vols., Oxford, 1891); also Freeman, *Story of Sicily* (New York, 1892); Amari, *Storia dei Musulmani di Sicilia* (3 vols., Florence, 1854–72); Lloyd, *History of Sicily to the Athenian War* (London, 1872); Chiesi, *La Sicilia illustrata nella Storia, nell' Arte, nei Paesi* (1892); Di Giovanni, *Filologia e Letteratura Siciliana* (2 vols., Palermo, 1871); Lo Faso, Duca di Serradifalco, *Antichità della Sicilia* (5 vols. folio); Evans, *The Classic and Connoisseur in Italy and Sicily* (3 vols., London, 1835); also the *Tours* of Brydone, Sir R. C. Hoare, and Simond. E. A. GROSVENOR.

Sic'kingen, FRANZ, von: champion of the Reformation; b. Mar. 2, 1481, in the castle of Ebernburg, near Kreuznach, in the present Rhenish Prussia; was one of the wealthiest and most powerful knights of his time, and was treated with much regard both by Charles V. and by the French king, Francis I. He spent all his time in feuds with his neighbors, and, having come into contact with the new religious ideas through his friend Ulrich von Hutten, he formed a plan of carrying through the Reformation by force. As the despoiling of the Roman Catholic Church of all its property and the distribution of its estates among the knights formed the principal points of his plan, he expected support from the nobility, and pamphlets were written and spread among the peasantry in order to arouse them, too, against their ecclesiastical lords; but the attempt entirely failed. One after another his castles were taken, and at last he was compelled to surrender himself, together with his last castle, Landstuhl, near Kaiserslautern. D. May 8, 1523.

Sickles, DANIEL EDGAR: soldier; b. in New York, Oct. 20, 1825; was educated at the University of New York, but left without graduating; learned the printer's trade, then studied law, and was admitted to the bar in 1846. He soon became identified with politics, and in 1847 was elected to the State Legislature as a Democrat. In 1853 he was appointed corporation attorney of New York city, and the same year accompanied Mr. Buchanan to England as secretary of legation. Returning in 1855, he was elected State Senator, and the following year was chosen member of Congress from New York city, and re-elected in 1858 and in 1860. On Feb. 27, 1859, he shot and killed Philip Barton

Key in Washington for improper intimacy with his wife, and was placed on trial for murder, but acquitted. On the outbreak of civil war he raised the Excelsior Brigade, and in June, 1861, was appointed colonel of one of its regiments, the Seventieth New York. In Sept., 1861, he was nominated a brigadier-general of volunteers. The appointment was at first negatived by the Senate, but subsequently confirmed to date from original appointment. In the Virginia Peninsular campaign his brigade was attached to Hooker's division of the Third Corps, to the command of which he succeeded in Sept., 1862, and having been commissioned major-general of volunteers Nov. 29, 1862, was assigned to the command of the Third Army-corps in Feb., 1863. He was distinguished at the battle of Chancellorsville May 3–4. At Gettysburg he lost a leg early in the second day's fight. In 1865–67 he commanded the military district comprising North and South Carolina. On July 28, 1866, he was appointed colonel of the Forty-second Infantry of the regular army, and in Apr., 1869, was retired from active service with the rank of major-general. In the latter year he was appointed U. S. minister to Spain, which position he resigned in 1873. Returning to New York he became president of the State board of civil service commissioners. He received the brevets of brigadier and major-general U. S. army for gallantry. In 1866 he was appointed minister to Holland and in 1869 minister to Mexico, but declined both positions. In 1890 he was appointed sheriff of New York by Gov. Hill, and in 1892 was elected to the Fifty-third Congress.

Sicyon, sis'ĕĕ-on (Gr. Σικυών): capital of the province of Sicyonia, in the Peloponnesus, which was bounded on the N. by the Corinthian Gulf, on the W. by Achaia and Arcadia, on the S. by Cleonæ and Phliasia, on the E. by Corinthia. Its site is occupied by the village of Vasilika. Sicyon was distinguished in earliest times as the original home of painting and bronze-casting. In history Sicyon played only a secondary *rôle*. Excavations have been made by the American School of Classical Studies at Athens. J. R. S. S.

Siddons, Sarah: actress; daughter of Roger Kemble; b. at Brecon, South Wales, July 5, 1755; played as a girl in her father's company; married Mr. Siddons, an actor, at the age of eighteen; made her first appearance at Drury Lane, with Garrick, as Portia in *The Merchant of Venice*, in 1775, but made no mark; retired in disappointment, but played in the provinces with success, and reappeared in London in 1782. This time she made a deep impression as Isabella in *The Fatal Marriage*, and began her career of extraordinary success. For thirty years, until her retirement June 29, 1812, she was the queen of the English stage. Her favorite and famous characters were Lady Macbeth, Queen Constance, Queen Catharine, Jane Shore, Isabella, Ophelia, Desdemona, Portia, and Imogen—impersonations of tragic pathos and majesty. To her contemporaries she was a prodigy of genius. Yet in the opinion of judges her ordinary recitation was imperfect. Her effects were produced by presence, mien, attitude, expression of voice and countenance, and by intense concentration of feeling, which lifted and dilated her form, transporting her audience as well as herself. The public readings she gave from Shakspeare after her withdrawal from the stage did not add to her fame. Her last appearance as an actress was in 1818, when she played for Charles Kemble's benefit. Thenceforth she lived in retirement, honored as a woman of stainless reputation, and respected in all the relations of life. D. in London, June 8, 1831. Her portrait was painted by Sir Joshua Reynolds, and is one of his best; her *Life* was written by Thomas Campbell (1834) and by Mrs. Kennard (London, 1886).

Revised by B. B. Vallentine.

Sidell, William Henry: soldier; b. in New York, Aug. 21, 1810; graduated at the U. S. Military Academy, sixth in his class, July, 1833, when assigned to the First Artillery as brevet second lieutenant; resigned the following October, and adopted the profession of civil engineering. For a time he was a city surveyor of New York, an assistant engineer on the Croton aqueduct, and division engineer of railways in Massachusetts and New York; was assistant engineer in the hydrographic survey of the delta of the Mississippi river; in 1851–52 was assistant in the exploration and survey of a railway route across the Isthmus of Tehuantepec. The work of construction was abandoned till 1858, when he became chief engineer. On the outbreak of civil war he was commissioned major of the Fifteenth U. S. Infantry, but without joining his regiment was at once assigned to duty as mustering officer in the department of the Cumberland. In July, 1862, he was detailed as acting assistant adjutant-general of that department, continuing as such until transferred to Louisville, Mar., 1863, as acting assistant provost-marshal-general of Kentucky, resuming soon after the duties of general superintendent of recruiting and chief mustering officer of the State. In 1867 he joined his regiment, the Tenth Infantry (to the lieutenant-colonelcy of which he had been promoted in 1864), with which he served in Dakota Territory until 1869, when placed in charge of the dépôt of the general recruiting service at Fort Leavenworth, Kan. He retired from active service Dec. 15, 1870. D. in New York, July 1, 1873. For meritorious and faithful services in the war he was breveted colonel and brigadier-general U. S. army.

Side'real System: See Astronomy, Galaxy, Nebulæ, and Stars.

Sidereal Time: See Time.

Sid'erite [from Gr. σίδηρος, iron]: the mineralogical name for spathic iron ore. See Iron.

Sidgwick, Henry, Litt. D., LL. D., D. C. L.: philosopher and economist; b. at Skipton, Yorkshire, England, May 31, 1838; educated at Rugby School and Trinity College, Cambridge; became fellow and lecturer at Trinity College 1859, reader in moral science in 1875, and Professor of Moral Philosophy in Cambridge University in 1883. He has published *Methods of Ethics* (1874; 4th ed. 1894); *Principles of Political Economy* (1883); *Outlines of the History of Ethics* (1886); *Elements of Politics* (1891); and many articles and special publications. J. M. B.

Sidmouth, Henry Addington, Viscount: statesman; b. at Reading, England, May 30, 1757; educated at Winchester School and at Brasenose College, Oxford; studied law; was admitted to the bar 1784; entered Parliament the same year through the influence of the younger Pitt, to whom he gave an efficient support during his administration; was Speaker of the House of Commons from 1789 until 1801, when, on the resignation of Pitt as Prime Minister, he formed a new ministry, accepting the posts of Chancellor of the Exchequer and First Lord of the Treasury; directed the negotiation of the Peace of Amiens 1802; supported a war policy 1803; resigned office 1804; was raised to the peerage and made president of the council Jan. 12, 1805; was Lord Privy Seal in the Grenville and Fox ministry 1806–07; was Home Secretary 1812–22, and a member of the cabinet without a portfolio 1822–24, when he became unpopular on account of his coercive measures, after which he retired from public life. D. at Richmond Park, Feb. 15, 1844.

Sidney: village; capital of Shelby co., O.; on the Miami river, the Miami and Erie Canal, and the Cin., Ham. and Dayton, and the Cleve., Cin., Chi. and St. L. railways; 31 miles S. of Lima, 40 miles N. of Dayton (for location, see map of Ohio, ref. 4–C). It is in an agricultural region, is principally engaged in manufacturing, and contains a public high school, public library (founded in 1886), 2 private banks, and a daily and 4 weekly newspapers. Pop. (1880) 3,823; (1890) 4,850; (1900) 5,688.

Sidney, or **Sydney**, Algernon: revolutionist; b. at Penshurst, Kent, England, in 1622, a son of the second Earl of Leicester; in 1632 accompanied his father, who was appointed ambassador to Denmark, and four years later to France. In 1641 he served as captain of a troop of horse in Ireland, of which his father had been made lord-lieutenant. When the great rebellion broke out, he took the side of the Parliament, and was made a captain of horse in the regiment of the Earl of Manchester. He was severely wounded at the battle of Marston Moor July 2, 1644; and in 1645 was made colonel of a regiment in Fairfax's army and governor of Chichester. In 1646 his brother, Lord Lisle, was appointed Lord-Lieutenant of Ireland, and he was made lieutenant-general of horse and governor of Dublin; in 1647 he received the thanks of the House for his services in Ireland, and was made governor of Dover. In 1648 he was one of the judges at the trial of Charles I., but was not present when sentence was passed, and did not sign the warrant for the execution, though he afterward characterized it as "the justest and bravest action that ever was done in England or anywhere else." Being opposed to the protectorate of Cromwell, he retired from Parliament in 1653, but when the Long Parliament was restored in 1659, he resumed his seat, and was named one of the council of state, and was sent as one of the

English commissioners to negotiate a peace between Sweden and Denmark. He was absent from England at the time of the Restoration, and, not acceding to this, he lived abroad in exile for nearly eighteen years. In 1677 he received a pardon from the king, with permission to return to his native country; twice unsuccessfully stood for a seat in Parliament, and was considered as being in league with Monmouth, Essex, William Lord Russell, and other popular leaders. The discovery of the Rye House plot in 1683 gave the court an opportunity of ridding itself of so dangerous an opponent. He and Russell were arrested and committed to the Tower on a charge of high treason. The only witness as to the main facts charged was Lord Howard, who by his own confession had been a party to the plot, and was ready to swear away the lives of his associates in order to save his own. The law required two witnesses to prove the alleged crime, and under the decision of the infamous Chief Justice Jeffreys the other witness was found in a manuscript on government which had been discovered among the papers of Sidney, in which it was maintained that a people had the right to depose an unworthy sovereign. The trial was opened Nov. 7, 1683; sentence was pronounced on the 26th; and on Dec. 7 he was beheaded on Tower Hill, London, and buried the next day at Penshurst. The reversal of the act of attainder was one of the earliest acts of the first Parliament of William and Mary. His *Discourses concerning Government* was published in 1698, and a 4th ed., with some miscellaneous writings, in 1772. *Lives* of Sidney have been written by Meadley (London, 1813), Van Santvoord (New York, 1851), and A. C. Ewald (London, 1873).

Sidney, or **Sydney**. Sir PHILIP: author and statesman; b. at Penshurst, Kent, England, Nov. 9, 1554; studied at Oxford and at Cambridge; traveled extensively, visiting Belgium, Germany, Hungary, and Italy, in all of which countries he was noted for his skill in knightly exercises as well as for his fondness for literature and art. He returned to England in 1575, and, aided by the influence of his uncle, the Earl of Leicester, rose to high favor at court. In 1576 he was sent on a mission to Vienna, but after his return he lost the queen's favor, probably in consequence of his bold remonstrance against the project of her marriage to the Duke of Anjou, and retired for a time to the seat of his brother-in-law, the Earl of Pembroke, where he devoted himself mainly to literary pursuits. Here he wrote, between 1579 and 1581, his pastoral romance *Arcadia*, which was never completed, and his *Defence of Poesie*, upon which his literary fame mainly rests. In the meantime the queen's favor for him revived, and he took a prominent part in all pageants of the court. He fell deeply in love with Lady Penelope Devereux, afterward Lady Rich and Lady Mountjoy, whom he celebrated under assumed names in his *Arcadia* and in the series of love sonnets entitled *Astrophel and Stella*, published soon after his death (1591). In 1583 he was knighted, and married the daughter of Sir Francis Walsingham. In 1585 he wished to join Sir Francis Drake in his second expedition against the Spaniards in the West Indies, but the queen forbade this, fearing, as she said, "lest she should lose the jewel of her dominions." It is said, probably without good grounds, that the crown of Poland was offered to him. The war was raging between Spain and the Netherlands, and Elizabeth made some show of assisting the Dutch. In 1585 Sidney was appointed governor of Flushing, and soon after was made general of horse under his uncle, the Earl of Leicester, in which capacity he gave promise of much military ability. On Sept. 22, 1586, he encountered a body of the Spaniards under the walls of the town of Zutphen. Sidney was severely wounded, and died at Arnheim, Oct. 7, 1586. The well-known story of his refusing the cup of wine, when fainting from loss of blood, in order to give it to a wounded soldier, has been questioned, but, whether true or false, well illustrates his chivalrous and generous character. His body was conveyed to England, where it lay in state for several days, and a general mourning, the first of the kind in English history, was observed. Sir Philip Sidney is perhaps the best English model of knightly virtues, and his character has always been a favorite theme with poets. His writings had great celebrity in their day, but they are marked by the strained and artificial style of the period. His *Arcadia* was first published soon after his death (1590) as *The Countess of Pembroke's Arcadia* (reprinted, London, 1868). His *Complete Works* appeared in London in 3 vols. in 1725; his *Miscellaneous Works*, with a memoir, were published at Oxford in 1826, reprinted at Boston in 1860; his *Complete Poems*, edited by Rev. A. B. Grosart, were published at London in 1873. See the *Life*, by J. A. Symonds (London, 1886; 2d ed. 1889). See ENGLISH LITERATURE.

Revised by H. A. BEERS.

Sidon, or **Zidon** [from Lat. *Si'don* = Gr. Σιδών, from Heb. *Tsīdhōn*, Sidon, liter., fishing-place]: an ancient city in Phœnicia, on the Mediterranean, in lat. 33° 34′ N. (see map of Palestine, ref. 3–E). Its origin, lost in antiquity, is due, according to Josephus, to Sidon, the oldest son of Canaan, and it is referred to even in the book of Genesis. Celebrated for its manufactures and commerce, its name was applied to the whole country and nation. Homer calls the Sidonians "skillful in all things." Sidon had trade-stations in Sicily, Sardinia, Spain, and Northern Africa; its fleets visited the British islands and the Baltic; and its purple, glass, linen, gold, silver, and ivory wares were famous a thousand years. Its most brilliant period began about 1600 B. C., but it was ultimately eclipsed by Tyre. Captured by Shalmaneser, King of Assyria, about 720 B. C., it was almost utterly destroyed during its revolt against the Persian Artaxerxes (351 B. C.). Rebuilt, it never regained its former splendor. Under the Greek, Syrian, and Roman dominion, it further declined. Alternately held during the crusades by the Christians and Mussulmans, it was razed by Malek Ashraf in 1291. In the vicinity were discovered (1887) sarcophagi of unsurpassed workmanship (now the chief treasure of the Museum of Constantinople), one of which is perhaps that of Alexander the Great.

E. A. GROSVENOR.

Sidonius Apollinaris: See APOLLINARIS SIDONIUS.

Sidra, Gulf of: See SYRTIS.

Siebold, zee'bōlt, PHILIPP FRANZ, Freiherr von: traveler, physician, zoölogist, and botanist; b. at Würzburg, Bavaria, Feb. 17, 1796; studied medicine and natural sciences; entered the service of the Dutch East India Company, and was appointed leader of a scientific mission which arrived at Nagasaki in 1823. He soon acquired an extraordinary influence over the Japanese, whose language he mastered, and in 1826, when he accompanied the Dutch embassy to Yedo, he was allowed to remain behind, the only foreigner in the hermit city. The sale of a map, however (see IXO), brought him into difficulties, and after a term of imprisonment he was finally banished from the country in 1830. On his arrival in Holland he was created a baron, and spent the next twenty-nine years of his life in writing and in arranging his scientific collections at Leyden, Munich, and Würzburg. European gardeners owe to him the introduction of Japanese lilies, peonies, camellias, chrysanthemums, and other attractive plants. At the close of his life he returned to Japan. His great work is a folio, magnificently illustrated, *Nippon, Archiv zur Beschreibung von Japan*. D. at Munich, Oct. 18, 1866. J. M. DIXON.

Siedlce, si-ed'l'tsă: town of Russia; the capital of the government of Siedlce (see map of Russia, ref. 8–A). It has a fine palace surrounded with beautiful gardens, distilleries, sugar-refineries, and manufactories of agricultural implements. Pop. (1890) 14,015, two-thirds Jews. The government of Siedlce, comprising an area of 5,535 sq. miles, with 774,139 inhabitants in 1897, is situated to the W. of the river Bug, between the governments of Lomza, Warsaw, Radom, Lublin, Volhynia, and Grodno, and occupies nearly the same territory as the old palatinate of Podlachia.

Revised by M. W. HARRINGTON.

Siege [from O. Fr. *siege*, Fr. *siège*, deriv. of *segier*, besiege: Span. *sitiar*: Provenç. *setjar* < Lat. **sedica're*, deriv. of *sede're*, sit]: the investing of a fortified place by an enemy for the purpose of compelling its surrender by continued offensive operations. Modern fortresses are of two general types—single fortresses, consisting of an enceinte and its outworks (see FORTIFICATION), and intrenched camps, consisting of the former combined with detached works. (See INTRENCHED CAMPS.) The latter may be defended simply by its garrison or by a large army in addition to the garrison. The methods of attack will vary with these different circumstances, and may be classified as (1) siege of a single fortress; (2) siege of an intrenched camp defended by its garrison simply; and (3) siege of an intrenched camp occupied by an army.

I. The method perfected by Vauban in the latter half of the seventeenth century applied to the first case, and under ordinary circumstances with the proper force—five or six

times the garrison—was almost certain of success. This method has been employed without essential change for 200 years, and it is only within a very brief period that military engineers have found it necessary to introduce some modifications in order to adapt it to modern instruments of war. It consists, in brief, in taking up a strong intrenched position in front of the work, beyond the range of its artillery, and clearing a path thence to the interior. To do the latter it is necessary to subdue the fire of the work, to batter down a portion of the scarp, and to excavate a path by which troops can advance under cover. The occupation of the ground is called the investment. The intrenchments on the side of the work are called lines of countervallation. Sometimes defenses are thrown up to guard against attack from the exterior; these are called lines of circumvallation. The covered roads constructed toward the work are called approaches, zigzags, or boyaux. To prevent their being enfiladed they are run in a zigzag direction, each branch being so placed that its prolongation shall fall outside the salients of the collateral works. Whenever it is practicable several zigzags are pushed forward simultaneously from different points and converge toward the point of attack. During the earlier portions of the siege these approaches are constructed by digging a trench and throwing the earth up on the side toward the enemy, thus forming a simple trench. When within easy range of artillery, cover is more quickly obtained by placing a row of gabions and filling them with earth. This is called a flying sap. During the latter portions the excavation is pushed forward by sappers, foot by foot, under the cover of a rolling shield called a sap-roller. It is revetted with gabions and is called a full sap. As the heads of these approaches offer an easy prey to sorties, they are united from distance to distance by lines of trench running nearly parallel to the front of attack. These are called parallels. They are arranged for infantry defense something like rifle-trenches (see FORTIFICATION), but their bottoms are made wider to afford means for the free circulation of troops. Each parallel should be nearer to the preceding one than it is to the work attacked, and must be within easy supporting distance from it. The number of parallels therefore depends upon the distance of the first one from the work, and that depends upon the range of the artillery. In Vauban's time there were usually three; at Sebastopol in 1854–55 there were seven. When the approaches have advanced within easy artillery range—about the second parallel—batteries are constructed to silence the artillery of the works. When practicable, they are placed on the prolongation of the faces of the work. The artillery fire having been subdued, the approaches are pushed forward toward the crest of the glacis. In the old method, when within a short distance from it, mounds of earth, called trench-cavaliers, were thrown up to command the covertway, and served to drive out the defenders. Their construction is now considered impracticable. The occupation of the crest of the covertway is called the crowning of the glacis. Here, in the old method, breaching batteries were constructed to batter down the scarp and a gallery was excavated to lead into the ditch, the advance through the ditch and breach being continued with the full sap or by assault. In these operations the miner goes hand in hand with the sapper. He searches out and destroys the countermines, creates large craters in which the sapper can make lodgments, and is frequently employed to make the breach.

The driving of a full sap, and the establishment of these breaching batteries, in the later stages of the siege, always difficult, may be said to have become of late years impracticable, assuming always that the defense is vigorous. At Sebastopol the fortifications were not strong, their profile being that of field-works. At the siege of this place, which lasted eleven months, during which the French executed 42 miles and the British 8 miles of trenches, the approaches never reached the ditch. At the final assault the ramparts were intact, and the troops had to advance without cover, at some points more than 200 yards. The assault failed at six points out of seven, and it was the opinion of Gen. Niel, commandant of the French engineers, that the place would have been impregnable if it had been provided with good revetted scarps. This opinion, however, assumes that the scarps remained unbreached, and it is qualified by the statement that the place possessed an armament such as is only found in a great maritime arsenal, and a garrison perpetually replenished by communication kept open with the interior of Russia. Since that date further great improvements have been made in the caliber, range, and accuracy of artillery fire, as well as in small-arms. It has become possible to effect the breach by indirect fire from a distance, while the difficulties of the assault have been proportionately increased. The introduction of machine-guns and of the breech-loading musket, by means of which a thin line of troops can keep up a steady sheet of fire, has rendered impracticable the open assault of even slight intrenchments if resolutely defended. It has fair chance of success, however, when made from a point close up to the works, and against a garrison worn out with the labors and anxieties of a long siege, or when following closely after the explosion of a mine.

The prompt capture of many of the single fortresses of France during the Franco-German war of 1870–71 has but little bearing on the subject, as many of them were of an ancient pattern, none was in a complete state of preparation, the artillery was inferior to that of the enemy, and the defense was often lukewarm or unintelligent, or both. The method of the Germans was to observe the places by detachments until operations in the field afforded leisure for a serious attack against them, and then to plant powerful batteries at distances varying from 1 to 2 miles, and bombard them until they capitulated. The bombardment of Schlettstadt lasted 5 days; of Neu-Brisach and Fort Mortier, 5 days; of Thionville, which had been blockaded three months, 2 days; of Montmédy, after four weeks' investment, 2 days; of Longwy, which had been invested seven weeks, 9 days; of Mezières, after being observed by detachments three months, and regularly invested ten days, 1½ days; of Rocroi, 7 hours with field artillery; of Toul, after being observed four weeks by a brigade and closely invested by a division eleven days, 8 hours; of Soissons, 4 days; of La Fère, after ten days' investment, 30 hours; of Péronne, after six days' investment, two of them employed in bombardment with field-guns, 7 days, etc. These facts do not militate against the value of these fortifications in themselves. Even defended as they were, they caused great annoyance and delay to the invaders, and they enabled the hastily organized armies of France to make a defense of which otherwise they would not have been capable. Phalsburg required a blockade of over four months for its reduction, and Bitche held out to the end of the war. Verdun resisted a *coup de main* Aug. 24, was observed by detachments until Sept. 23, when it was closely invested, resisted a bombardment of 54 hours from captured French guns Oct. 14–16, but surrendered Nov. 8 without standing a regular siege, after preparations had been made for carrying it on with German artillery. Strassburg, with a garrison of 17,000 men, resisted for 51 days a besieging army of about 60,000. The attack was by regular approaches, the outworks being breached by distant fire and by mining, and the main rampart by the fire of batteries in the second parallel. These batteries, called demolition batteries, were about 800 yards from the place, and effected their purpose by indirect firing, the masonry not being visible. The crowning of the glacis was successfully accomplished, followed by the descent into the ditch. The ditches, being filled with water, were crossed by dams, or, where the water was deep, by floating bridges of barrels floored over with planks. Everything having been prepared for the assault, the garrison capitulated without waiting to receive it.

In a vigorous defense of a single fortress the enemy will be kept at a distance as long as possible by the occupation of favorable points on the exterior. His approaches and other works will be harassed or destroyed by a concentrated artillery fire, with occasional sorties in large bodies. Counter-approaches will be run out to obtain favorable positions for enfilading his lines, and sharpshooters will be posted in rifle-pits well to the front to pick off his gunners. Countermines will be prepared, and sprung at the proper time. Damage to the works suffered during the day will be repaired at night. *Débris* will be removed from the foot of the breach, and when the latter has become practicable it will be obstructed by crows'-feet, chevaux-de-frise, or other obstacles, and intrenchments will be thrown up to command it. If the garrison has not been overworked the assault should be repulsed.

II. The siege of an intrenched camp, defended simply by its garrison, may take the form on an enlarged scale of the operations described above, or of a blockade. In the former case one or two of the detached works are selected for attack, and proceeded against until their capture, the difficulties being greatly magnified by the position of the artillery of the place. The siege of Belfort (Nov., 1870, to

Feb., 1871) is an illustration. The works planned for the defense of this place were not all completed at the breaking out of the war, and some of the points selected for the detached works were occupied by field-fortifications of the semi-permanent type. These were selected by the Germans as the point of attack. The investment was completed Nov. 3, the garrison consisting of 16,000 and the attacking force of 30,000 men, increased about the middle of January to 80,000. A bombardment was opened Dec. 3, and continued night and day until Feb. 13, during which time more than 500,000 projectiles were thrown into the place. In five days nearly every house in the city had been struck. The defense, under Col. Denfert-Rochereau, was gallant and skillful. For many weeks he kept the enemy at a distance by first occupying exterior positions, and then freely using his projectiles at long range. This kept the line of investment so attenuated that the attacking force was inadequate. Moreover, the latter was compelled to throw up lines of circumvallation against the threatening force under Gen. Bourbaki, and to use part of its artillery in defending them. The detached field-works were finally evacuated Feb. 3–8, the approaches having reached the ditch. Thus, after 98 days' investment and 68 of bombardment, the attack found itself just where it would have been on the first day of the siege had it not been for these field-works. Further operations were to be pushed against the main works, but the garrison was ordered out of the place by the French Government, and turned it over to the Germans Feb. 17 and 18, Paris having capitulated Jan. 28. That a well-managed assault may sometimes be successful against an intrenched camp was proved by the capture of Kars by the Russians on the night of Nov. 17–18, 1877. The defenses consisted of twelve detached permanent forts and a citadel, all built since the Crimean war. Some of the forts were connected by lines of trenches thrown up during the war of 1877. They were manned by a full garrison of about 23,000 Turks armed with the best modern breech-loaders. The attacking force was about 35,000 men. The Turks are considered the equals of any troops in the world when fighting in a fixed position, as behind fortifications, yet this assault resulted in the killing or capture of the entire garrison, with the exception of thirty or forty men. The most prominent features of its management were that no intimation had been given to the enemy that it was contemplated, the points of attack were skillfully selected, the various columns attacked simultaneously, and a moonlit night was selected for it, when the light was sufficient to prevent confusion among the columns, though not sufficient to expose them at a distance to the view of the enemy.

III. When the intrenched camp is occupied by an army, the difficulties of forcing an entrance are greatly magnified; and if the army is not very much inferior to the attacking force, they will probably be insuperable. The method of blockade may then be resorted to, with a view to exhausting the supplies of the besieged of ammunition and provisions. Here the attack and defense consist at first of a struggle for the possession of the communications with the place. These being once all secured by the attack, their further operations consist mainly in harassing the garrison by a distant bombardment while vigilantly guarding against the introduction of supplies or re-enforcements. The defense consists in keeping up a fire upon the enemy, with occasional sorties in large bodies, the object of which is to make a permanent break in the cordon, with a view to its destruction or to cover the introduction of re-enforcements. The sieges of Atlanta and Richmond during the civil war in the U. S., and of Metz and Paris in the Franco-German war, are illustrations. In the cases of Atlanta and Richmond the operations were confined to the preliminary struggles for the communications. Having lost these, the defenders withdrew at their last opportunity, preferring the immediate loss of the place to the sacrifice of both place and troops a few weeks later. At Metz, although the army of Bazaine was driven into the fortress and kept there against its will, and weakened the fortress for resistance to blockade, nevertheless it offered an immense obstacle to a forced entrance. The general method of occupying the ground by the Germans was about the same both around Metz and Paris. A first line of outposts was established from half a mile to a mile from the works. These were intrenched, and were strong enough to resist small parties of the enemy, but not a heavy force. Behind these was a carefully selected position, forming the main line. Its distance from the works depended upon the nature of the ground, and varied from 1 to 3 miles, the normal distance being 2¼ miles, or a little more than the effective range of the guns of the enemy. It was fortified by rifle-trenches and gun-emplacements of the strongest profile, strengthened by abattis or other obstacles, with occasionally an inclosed work capable of offering independent resistance. Farther to the rear central points were selected and fortified, at which the reserves were posted, and upon which the troops were to rally in case of the enemy's success in breaking through the cordon. The length of the line of investment of Metz was 24 miles, and of that at Paris 45 miles. In each case the besieging force was about 200,000 men. The holding of such lines by such numbers would have been utterly impracticable previously to the modern improvements in small-arms and the introduction of the free use of continuous lines of intrenchments. As it is, when the investment is once closed the besieging army has a great advantage over the defenders, since it can accomplish its purpose without leaving its works. The *rôles* are reversed, and the besieged are compelled to throw themselves against the intrenchments, where they are sure to meet with destruction. The army in Metz was 173,000 strong and that in Paris 500,000, many of the latter, however, worthless as soldiers. The former capitulated after 70 days' blockade, and the latter after 129 days'. The operations about these cities, especially Metz, give rise to the curious but essential question, Can one army invest and besiege another of equal magnitude? The object of the sorties from Metz was to break through the cordon and get away with the active army, leaving the place to be held by its garrison. The fortifications aided such attempts; and if they had been mere field-intrenchments which were being evacuated, the beleaguered army would have had still less chance of success. The answer, then, seems to be, Let an army somewhat demoralized by defeat simply lie dormant for a while, and it may be invested by equal numbers and taken by siege. The so-called siege of Plevna, July to Dec., 1877, was one of the most prominent features of the Russo-Turkish war of 1877–78. Upon its occupation by the Turkish army, about the middle of July, Plevna was without defenses. The construction of field-fortifications was continued, almost under the fire of the enemy, during the five months which followed, until there was an intrenched camp, having 47 detached works, supplemented by numerous lines of trenches, and occupying a perimeter of about 22 miles. The Russians attacked the place on July 20 with a small force—about 7,000 men—and were repulsed with a loss of more than one-third their number. They assaulted again on July 30 with 30,000 men, and were repulsed with a loss of over 7,000. They again assaulted Sept. 11, with 90,000 men, after a four days' bombardment, and were repulsed with a loss of 18,500 men. They then concluded to resort to a blockade. The investment of the place was completed Oct. 24, after a hot contest for the last communications, the Turks committing the error of allowing themselves to be shut in, instead of abandoning the place before it was too late. The line occupied by the Russians was 46 miles long, the force employed being about 110,000 men. The Turks at this time had about 40,000. Subsequent operations were limited to strengthening the defenses on both sides, with the exception of the partial assaults of Oct. 19 and Nov. 8, the object of which was to gain certain points by which the line of investment could be shortened. By Dec. 10 the Turkish commander, Osman Pasha, having consumed all of his provisions, found himself compelled to surrender or to leave his works and throw himself against the fortifications which surrounded him, in a desperate attempt to cut his way out. He chose the latter alternative, lost in the attempt 6,000 men, killed and wounded, while inflicting a loss of but 1,800 upon the enemy, and then surrendered.

The blockade may be applied to a single fortress, but its chances of success will then be less favorable, for the reason that the number of mouths in the place being comparatively small, the stock of provisions may be such as to enable it to hold out longer than the requirements of the besieger will permit.

IV. For a long period in the early history of war, when the arms employed were slings and arrows, the high and thick walls of fortresses offered insuperable obstacles to a forced entrance. Sieges then were simple blockades. At a later date mining was resorted to; ramps of earth and wood were thrown up, beginning beyond the range of an arrow, and sloping upward to the top of the wall; or the battering-ram was employed to effect a breach. The method of carrying on the operation among the Greeks and Romans

was as follows: The place was surrounded by a strong continuous intrenched line. In front of the point of attack a covered gallery was established parallel to the work, composed of vines. A vine was a sort of hut on wheels, about 8 feet wide, 20 feet long, and 7 feet high, with a double-sloped roof strong enough to resist anything the besieged could throw upon it, and covered with raw hides or clay to protect it from fire. It was closed in front with wickerwork (from which its name) provided with loopholes. From this parallel gallery several similar galleries were run forward, the head of each being occupied by a special vine, having an overhanging roof projecting about 10 feet to the front, under cover of which workmen leveled the ground or built up the ramp. Through these galleries the material was carried forward to fill up the ditch. When the wall was reached, the battering-ram was brought up, covered by a long hut of a construction similar to that of the vines. In great sieges these attacks were supported by square wooden towers, which were either moved up to the walls on wheels or put together on the spot; in their lower stories they contained rams; in the middle, drawbridges, which could be lowered upon the walls; and in the upper stories, parapets of hides, wickerwork, or cordage to protect slingers and archers. They were sometimes as much as 150 feet high, and had from ten to twenty stories. Towers of these dimensions, however, could not be moved. The besieged endeavored to retain a commanding position. When the ramp rose, they raised the wall opposite to it; and when the towers were constructed, they increased the height of those on the ramparts. They opposed the enemy's works by mining and inundations and by fire.

The invention of gunpowder rendered the wooden approaches and the towers useless, and the vines were at once replaced by trenches. The change in the character of fortifications (see FORTIFICATION) rendered the defense a more active one. The garrison could sally and easily envelop the head of the approach. If an outwork were taken, it was difficult to hold it, for the reason that the supports were at a distance. (At the siege of Candia an outwork was taken and retaken thirty-six times.) During the youth of Vauban the approaches were generally pushed forward to the glacis when the covered way was assaulted. A covered descent was then made into the ditch, and a breach was made by the miner. This also was assaulted. After the capture of the outworks the main work was breached and assaulted, and then the interior retrenchments. These operations were bloody and precarious. Vauban rendered them sure and comparatively safe. He secured his approaches from being enveloped by the introduction of parallels, and, avoiding assaults, accomplished his purpose by well-directed manual labor, establishing the method sketched at the beginning of this paper.

The principal sieges during the civil war in the U. S. were the following: At Yorktown, Va. (Apr. and May, 1862), a parallel was constructed about a mile from the works, and heavy batteries were established, but the enemy evacuated before the latter opened fire. This siege is interesting from the fact that it was the first struggle of earthwork against earthwork in that war. At Vicksburg the investment was closed May 19, 1863, and an assault was made and repulsed in the afternoon of the same day. A vigorous assault on the 22d having failed, it was determined to make gradual approaches. There were no engineer troops in the command, and only four regular engineer officers. Every graduate of the Military Academy below the grade of general was detailed for engineer service; practical miners were selected from the different regiments for mining; and the sapping, fabrication of gabions, fascines, etc., were executed by some pioneer companies and by details from the line. The artillery was simply the field-artillery of the army and a heavy battery borrowed from the navy. There being no light mortars, wooden mortars were made by shrinking iron bands upon cylinders of tough wood and boring them out for 6 or 12 lb. shells. The broken nature of the ground gave ample protection to the attack up to within 600 yards, and often to within 400 yards of the works. By June 30 there were 220 guns in position. A line of circumvallation was thrown up to oppose the efforts of Gen. Johnston to relieve the place. On June 25 a heavy mine was sprung under one of the salients. The crater was assaulted and occupied, but the besieged, having been warned, had prepared an inner line, to which they retired. Another mine was at once begun, which was sprung July 1, blowing up an entire redan, with its defenders; but the interior line was not destroyed, and no assault was made. The besieged attempted to obstruct the advance by countermines, but obtained only slight success. Occasional sorties were also made, and at one point 90 yards of trench were run out as a counter-approach. By July the approaches had in many places reached the ditch. Orders were given to prepare the heads of approaches for the easy debouch of troops, to widen the main approaches so that men could easily move by fours, and to prepare planks and sandbags for crossing the ditches. On July 4 the place capitulated, with over 30,000 men. In the operations against Richmond in 1864 it was found necessary to occupy Petersburg. Desperate assaults were made June 15, 16, 17, and 18, but only an outer line of intrenchments could be taken. A mining-gallery was begun June 25, and a regular siege was determined upon July 9, and work begun July 11. Gradual approaches were attempted, but the difficulties of pushing them against a long line of strong works, which could not be enveloped and were defended by forces nearly equal to the attack, were found to be so great as to offer small chance of success. The mine was sprung July 30, the main gallery being 510 feet long, and its two branches 37 and 38 feet respectively, and the charge 8,000 lb. of powder. It was followed by a badly managed assault, which failed. Gradual approaches were abandoned, and steps were taken to prepare the lines of investment to be held by a small force, with a view to moving the main body upon the communications which were still held by the enemy. The latter operations gradually extended the lines until in October their length was 32 miles, comprising thirty-six forts and fifty batteries. The system consisted of inclosed fieldworks placed in commanding positions at intervals of about 600 yards, connected by strong rifle-trenches, well protected by obstacles in front. Many of the inclosed works were provided with bombproofs in addition to the magazines, etc. In some parts small redoubts were placed 300 or 400 yards in advance of the main line, to insure time for manning the latter in case of assault, the ordinary pickets not being deemed sufficient. The line extended from the Appomattox southerly and westerly, embracing two sides of Petersburg, and thence back as a line of circumvallation to the James river, thus inclosing the Army of the Potomac in a loop. The movements of the forces operating upon the communications finally rendered an assault practicable by drawing a large part of the defenders away from their works. It was given Apr. 2, 1865, and a large part of the works were captured, the defenders evacuating the city during the night which followed. The fall of Petersburg necessitated the evacuation of Richmond. In the pursuit which followed, the whole Confederate army of Northern Virginia was captured. Mention may be made of the sieges of FORT PULASKI (*q. v.*); Corinth, Miss., May, 1862; Port Hudson, La., May, 1863; Forts Gaines and Morgan, Mobile, Ala., Aug., 1864; and Fort Blakely and Spanish Fort, Mobile, Ala., Apr., 1865. See BOMBARDMENT. O. H. ERNST.

Siegfried: See NIBELUNGENLIED.

Siemens, ERNST WERNER, von: electrician; b. at Lenthe, near Hanover, Dec. 13, 1816; was educated in the gymnasium of Lubeck and in the school of artillery and engineering at Berlin; entered the Prussian army as an officer of artillery in 1838; studied chemistry and electro-magnetism; took out a patent for electro-plating and gilding in 1841, and laid in 1848 the first submarine mines exploded by electricity; left the army in 1849, and founded, in connection with Halske, a telegraph-building establishment in Berlin, which built the telegraph lines of Russia, Spain, Brazil, Northern Germany, etc. Among the many inventions and improvements which are due to him, and of which he gave an account in *Proceedings* of the Berlin Academy, *Poggendorfs Annalen*, etc., are the methods of determining the position of injuries in subterranean and submarine lines, of examining insulated wires, of charging subterranean and submarine conductors in order to lessen the disturbing influences of induced currents in the cables. D. in Berlin, Dec. 6, 1892.—His brother, Sir WILLIAM (Karl Wilhelm) SIEMENS, physicist, b. at Lenthe, Apr. 4, 1823, was educated at Göttingen; settled in 1843 in London as a civil engineer, and founded there in 1853 a branch of the Berlin house, with immense telegraph-building establishments at Woolwich and extensive steel-works at Landore in Wales. He invented the regenerative furnace (see FURNACE), in which he utilized the heat which would otherwise escape, the bathometer, an instrument for measuring ocean-depths,

a pyrometer, etc.; and published *On a Regenerative Condenser* (1850); *On the Conversion of Heat into Mechanical Effects* (1853); *On a Regenerative Steam-engine* (1856); and *On the Increase of Electrical Resistance in Conductors, with Rise of Temperature, and its Application to the Measure of Ordinary and Furnace Temperatures* (1871). He was knighted Apr., 1883, and died Nov. 20 the same year. See his *Life* by W. Pole (London, 1889).

Siemens's Armature: See ELECTRIC MOTOR.

Siemens's Regulator: See ELECTRIC LIGHTING.

Sienkiewicz, syen-kye'vich, HENRYK: Polish novelist; b. in the government of Siedlee, Polish Russia, in 1846. He was educated in Warsaw, which has long been his home, and he has traveled much. Many of his works have been translated into English (by Jeremiah Curtin) and other languages. Among them are: *With Fire and Sword* (1884); *The Deluge*; *Pan Michael*; *Without Dogma* (1890); *Children of the Soil* (1894): and *Quo Vadis* (1895), a story of Roman and Christian life at the time of Nero.

Sien'na [It. *terra di Siena*, earth of Sienna]: an ocherous earth which when ground forms an excellent pigment called raw sienna, and when burnt assumes a still richer orange-red tint. It is brought from Italy.

Sienna (Ital. *Siena*, anc. *Sena Julia*): city of Tuscany, Italy; chief town of the province of Sienna; covering a beautiful hill 1,100 feet above the sea, a spur of the Chianti chain; in lat. 43° 22′ N., lon. 11° 11′ E.; 60 miles by rail S. of Florence (see map of Italy, ref. 4–D). The walls are about 4 miles in circumference; the citadel occupies the northwest corner of the town, which is entered by nine gates; and the principal streets radiate in irregular lines from the Piazza Vittorio Emanuele, a fine large open space nearly in the heart of the city. The Duomo, or Chiesa Metropolitana, one of the finest specimens of Gothic architecture in Italy, stands on an elevation not far from the center of the town. Its length is about 300 feet, its mean width 120 feet. The western façade is magnificent in color and in the richness of its sculptures. The effect of the interior is peculiarly picturesque, partly from the horizontal layers of black and white marble of which not only the walls but even the columns are composed, and partly from the roofing, which is a vault of blue studded with stars. The pavement is of marble inlaid in various styles, the work of different artists from the fourteenth to the sixteenth century, the most distinguished of these being Beccafumi (1517). The marble pulpit is adorned with some of the finest reliefs of Nicola Pisano and his school. The bronze tabernacle, the pictures by Duccio (1300), several early works of Michelangelo, the celebrated frescoes of Pinturicchio (1502) representing scenes from the life of Pius II., the fonts, the vases for holy water, the large collection of old choir-books exquisitely adorned with miniatures, are among the countless other objects of the highest interest to the student of art. In the Church of S. Agostino and in several others, in the ex-convent of S. Domenico, and in many private palaces are choice pictures by early painters, above all by Sodoma. The Academy of Fine Arts is very rich, especially in pictures of the Siennese school. The university, founded in 1321, was formerly very celebrated. There are cloth and furniture factories, but the industries are small.

As early as the reign of Charlemagne Sienna was governed by a count. In the disputes between the papacy and the German emperors it at first took the side of the former, and like its neighbors, Florence and Pisa, developed into an independent commonwealth. In 1186 Sienna joined the other large Tuscan commonwealths in their resistance to Henry, son of Frederic Barbarossa, but after some successes was reconciled to the emperor, and thenceforward it continued, for the most part, steadfastly Ghibelline. In 1260 the Siennese inflicted a crushing defeat on the Florentines at Montaperto, but hostilities were frequently renewed afterward. An awful plague, known as the black death, broke out in 1348, and continued to appear until toward the close of the century. During the first year of this frightful malady 80,000 persons are said to have perished in the city and territory of Sienna. In 1480 the government of the commonwealth fell into the hands of Pandolfo Petrucci, who continued to direct public affairs successfully until 1512. After his death the Medici, with Spanish help, annexed Sienna to the territory of Florence. From this time its history is almost one with that of the rest of Tuscany. Pop. (1893) 29,000.

Revised by M. W. HARRINGTON.

Sierra: See MOUNTAIN.

Sierra Leone, si-ăr'raă-lēĕ-ō'nēĕ: a British colony on the northern end of the Guinea coast, Africa, from 7° to 9° N. lat., including about 150 miles of coast and extending 100 miles inland. Area about 15,000 sq. miles. The soil is fertile, especially in the low coast-land, but the climate is extremely hot and unhealthful, especially in the wet season. The rainfall at Freetown is about 110 inches, of which two-thirds fall in July, August, and September. All tropical plants and fruits grow luxuriantly, and palm oil, pepper, ginger, gum-copal, ground-nuts, etc., are exported. Sugar, coffee, indigo, and cotton have been introduced, and succeed well. The settlement was made in 1787 with a philanthropic purpose, the idea being to form a home, or at least a place of refuge, for free Negroes, and in spite of its climate, which is very unhealthful for Europeans, the colony is steadily growing. The chief products and exports are palm oil, palm-kernels, benni-seeds, ground-nuts, kola-nuts, India-rubber, coal, and hides. The capital and chief port of the coast is Freetown, which is fortified and is a naval coaling-station. Pop. (1893) 180,000, with 224 whites. Administration is actually effective over only about 75,000 of the population. See SIERRA LEONE in the Appendix.

Sierra Madre, -măă-drā', or **Sierra Madre del Pacífico**: the irregular chain of mountains which borders and frames the western side of the Mexican plateau. (See MEXICO.) It may be regarded as a continuation of the mountains on the western border of the Great Salt Lake basin, and the name Sierra Madre is applied to it also in Southern Arizona. Entering Mexico near lon. 109° W. it separates Chihuahua from Sonora, occupies the western part of Durango, and is continued through Jalisco. On the eastern or plateau side the declivity is gentle, but the Pacific side is marked by steep slopes, numerous precipices, and magnificent scenery. Few of the peaks exceed 10,000 feet. The chain is much broken, and often there are several parallel ranges. In Jalisco, especially, the mountains are cut by deep cañons where rivers break through them. The higher slopes are covered with pine-forests. The Sierra Madre del Sur, in Southern Mexico (Guerrero, Oajaca), is an E. and W. range, parallel to and near the Pacific, and rising in parts to 10,000 feet; apparently it has no structural connection with the Sierra Madre del Pacífico. The mountains forming the eastern border of the plateau are sometimes called, collectively, the Sierra Madre del Oriente or Eastern Sierra Madre.

HERBERT H. SMITH.

Sierra Morena, -mō-rā'năă: a mountain range of Spain, separating the basin of the Guadiana from that of the Guadalquivir, and extending between lon. 3° and 4° W. Its aspect is generally rugged and somber; its highest peak is Aracena, about 5,500 feet high.

Sierra Neva'da [Span., snowy mountains; *sierra*, saw, mountain range < Lat. *serra* + *neva'do*, snowy, deriv. of *nieve*, snow < Lat. *nix*, *nivis*]: a mountain range of Southern Spain, 75 miles long and 25 broad, between the Guadalquivir and the Mediterranean. Its highest peaks are Mulahacen, 11,658 feet, and Veleta, 11,387 feet, and it has received its name from its being covered on many of its peaks with perpetual snow and ice. Its southern slopes are clad with chestnut forests, olive and orange groves, and vineyards.

Sierra Nevada: a mountain range of Eastern California, separating the great valley of California from the interior basin of Nevada. The general trend is N. N. W. The range is continued at the N. by the Cascade Mountains, and at the S. turns S. W., uniting with the Coast Ranges. It is essentially a broad plateau inclined toward the W., except at the extreme N., where it divides into several ridges. The crest-line and highest peaks are along the eastern margin, and the eastern slope is steep. The long western slope is broken by deep cañons. Among its highest peaks are Dana (12,992), Lyell (13,042), Brewer (13,886), Tyndall (14,386), and Whitney (14,898), the loftiest point of the U. S. south of Alaska. The principal passes are Tehachapi (3,830), crossed by the Southern Pacific Railroad, Walker (5,320), Truckee (7,200), crossed by the Central Pacific Railroad, and Beckworth (5,190). The snowfall on the western slope is heavy, and the rivers nourished by its melting irrigate the Californian valley. The eastern slope is characterized by the arid climate of the interior basin. Among the higher peaks are a few small glaciers.

G. K. GILBERT.

Sierra Nevada de Santa Marta: See SANTA MARTA.

Siete Corrientes: See CORRIENTES.

Sievers, EDUARD: philologist; b. at Lippoldsberg, Prussia, Nov. 25, 1850; studied at the Universities of Leipzig and Berlin; Professor of Germanic Philology at Jena 1871–83 (ordinarius since 1876), at Tübingen 1883–87, at Halle 1887–92, and since 1892 at Leipzig; distinguished by quickness of scholarly insight and soundness of judgment; author of *Tatian, lateinisch und altdeutsch, mit Glossar herausgegeben* (1872; 2d ed. 1893); *Das Hildebrandslied, die Merseburger Zaubersprüche und das fränkische Taufgelöbniss* (1872); *Die Murbacher Hymnen* (1874); *Paradigmen zur deutschen Grammatik* (1874); *Der Heliand und die angelsächsische Genesis* (1875); *Grundzüge der Lautphysiologie* (1876; 2d ed. as *Grundzüge der Phonetik* (1881; 3d ed. 1885; 4th ed. 1893); *Zur Accent- und Lautlehre der german. Sprachen* (1878); *Heliand* (1878); *Angelsächsische Grammatik* (1881; 2d ed. 1886, Eng. transl.); *Proben einer metrischen Herstellung des Eddaliedes* (1885); *Tübinger Bruchstücke der älteren Frostuthingslög* (1886); *Oxforder Benedictinerregel* (1887); *Althochdeutsche Glossen* (with E. Steinmeyer, 1879–82); *Altgermanische Metrik* (1892). He has been joint editor since 1891 of *Beiträge zur Geschichte der deutschen Sprache und Literatur*. BENJ. IDE WHEELER.

Sieyès, sĕĕ-es', EMMANUEL JOSEPH (commonly known as the ABBÉ SIEYÈS): publicist and statesman; b. at Fréjus, department of Var, France, May 3, 1748; was educated for the Church at the seminary of St. Sulpice, Paris; took orders and became vicar-general and chancellor to the Bishop of Chartres in 1784. He had attained some reputation as an acute thinker when suddenly, in Jan., 1789, he attracted the attention of the French people by his celebrated pamphlet, *Qu'est-ce que le Tiers État?* and having been elected a member of the States-General by Paris, he became for some time the actual leader of the Assembly and originated some of the first and most decisive steps toward the Revolution. He proposed that the three estates should examine their credentials in common, that the third estate should constitute itself as a national assembly, etc.; and his pamphlet, *Reconnaissance et Exposition des Droits de l'Homme et du Citoyen* (July, 1789), was the precursor and immediate occasion of the declaration of the rights of man. The new administrative division of France into departments and the abolition of the old provincial system, with its many feudal remnants and artificial barriers, were also due to him. Nevertheless, as the Revolution ceased to be a philosophy and became a passion, Abbé Sieyès lost his influence. In the Convention he sat silent, though he voted for the death of Louis XVI. without any appeal to the people, and during the Reign of Terror he entirely disappeared from public life. After the fall of Robespierre he returned, was successfully employed in several diplomatic negotiations, and became a member of the Directory May 16, 1799; and it was he, as much as if not more than Gen. Bonaparte, who prepared and carried through the *coup d'état* of the 18th Brumaire (Nov. 9, 1799), by which the Directory was overthrown and the consular government instituted, he himself being chosen one of the three consuls. Very soon, however, finding that this, the best beloved of the various constitutions which he had framed, was disregarded, and that he had in effect brought in a military despotism with Napoleon as First Consul in complete control, he retired from his consulship and took part very little in politics. Napoleon enriched him and made him a count of the empire. After the Restoration, Sieyès was banished from France as a regicide, and went to Brussels. After the Revolution of 1830 he returned to Paris, and died there June 20, 1836. Boulay published, in 1836, *Théorie constitutionelle de Sieyès*, drawn from his *Mémoires inédits*. There are also *Études Sieyès*, by Mignet (1836) and Beauverger (1851). Revised by F. M. COLBY.

Sigel, zee'gel, FRANZ: soldier; b. at Sinsheim, Baden, Nov. 18, 1824; graduated in the military school at Carlsruhe; became a lieutenant of infantry in the army of the Grand Duke of Baden; resigned in 1847 from political reasons. He took part in the revolutionary movement of 1848; led a corps of 4,000 men through the Black Forest to the attack of Freiburg, and, narrowly escaping capture, he fled to Switzerland. At the beginning of the insurrection of 1849 he was appointed Minister of War by the revolutionary authorities; took part in the unsuccessful campaign against the Prussians, and after fighting several battles, including Rastadt, he successfully conducted the demoralized remnants of his forces into Switzerland on the dissolution of the provisional government, but, being expelled by the Swiss Government, he went to England, and after remaining there two years he embarked for the U. S.; was for some years teacher of mathematics in an academy in New York, and became major of the Fifth Regiment of New York militia; settled in St. Louis, Mo., 1858, as professor in a college; was commissioned early in 1861 colonel of the Third Missouri volunteers; took part in the capture of Camp Jackson; fought the desperate battle of Carthage July 5; was second in command under Lyon at Wilson's Creek Aug. 10; conducted the retreat from Springfield to Rolla; was thereupon commissioned brigadier-general to date from May 17; commanded a division under Fremont in his campaign in Southern Missouri; took an active part in the battle of Pea Ridge Mar. 6–8, 1862; tendered his resignation in May, in consequence of unpleasant relations with Gen. Halleck, in command of the district; was summoned to Washington and made major-general, dating from Mar. 21; was placed in command of Harper's Ferry June 2; succeeded to the command of Gen. Fremont's army-corps June 26; served under Pope in his Virginia campaign, taking a prominent part in the second battle of Bull Run Aug. 29–30; was placed in command of the Eleventh Army-corps Sept. 14, 1862; became commander of the department of West Virginia Mar., 1864; was defeated by Breckenridge at Newmarket May 15; relieved from command shortly afterward by Gen. Hunter; resigned May 4, 1865, and became editor of the Baltimore *Wecker*; removed in 1867 to New York, where he was chosen register Nov., 1871. He was U. S. pension agent for New York 1885–89. Revised by JAMES MERCUR.

Sighing: an act consisting of a full, long, and slow inspiration, which is immediately followed by a more rapid expiration unusually prolonged, and characterized by the presence of a sound as air passes out of the mouth. Although usually a reflex act, presumably excited by an almost imperceptible sensation due to imperfect aëration of the blood, sighing is often voluntarily performed, although it is in some respects not a perfect counterpart of that which is produced reflexly. It ordinarily takes place about once in every six respirations, but when the attention is concentrated upon some subject of great interest, the reflex excitability is diminished for the time being, and then, when the mind becomes disengaged, the act of sighing is so prominent as to attract at once not only the notice of the individual, but of those around him. The apparent object of sighing is to aërate the blood more perfectly than ordinary respiration, and through it the lungs are more effectually filled and emptied than would be the case were the breathing uniformly regular. Sighing is also a means of expressing certain emotions, particularly those of a sorrowful and tender character. In this relation it is to a certain extent under the operation of the will, and may be assumed, like smiles and tears, for purposes of deception. Figuratively, the act of sighing is often associated in our minds with desires, and we are said to sigh for the objects of our wishes; but the connection is in reality not primary. We sigh not because we desire anything, but because during the concentration of the mind upon a subject or object of engrossing interest we are for the time incapable of appreciating the sensation which prompts us to inspire air until it becomes overwhelming, and then the long-drawn sigh takes place. Sighing is not peculiar to the human species, but is a normal phenomena of respiration in all mammals, and perhaps in other classes of animals. Revised by E. T. REICHERT.

Sight: See VISION, EYE, and HISTOLOGY (*Organs of Special Sense*).

Sigilla'ria [Mod. Lat., from Lat. *sigil'lum*, seal. Named in reference to the scars left by the leaf-stalks]: a genus of fossil trees of the Carboniferous period. Trunks have been found 5 feet in diameter and 70 feet long. The roots called *Stigmaria* belong, at least in some instances, to this genus. See PLANTS, FOSSIL (*Lycopodineæ*).

Sigillum Confessionis: See CONFESSION.

Sig'ismund: Emperor of Germany 1411–37; the last of the house of Luxemburg; b. Feb. 14, 1362; a son of the Emperor Charles IV.; received after his father's death (1378) the margraviate of Brandenburg, while his elder brother, Wenceslaus, King of Bohemia, succeeded as emperor. Having been betrothed to Maria, the eldest daughter of Louis the Great, King of Hungary and Poland, he became heir-apparent to these two crowns. But on the death of

Louis (1383) the Poles chose his younger daughter, Hedvig, queen, Charles Durazzo seized the regency in Hungary, and Maria was kept in captivity by John Horvath, ban of Croatia. Sigismund rescued and married her, and was crowned King of Hungary in 1387. He then undertook a war against the Turks, supported by the German and Freneh chivalry, but was completely routed at Nieopolis (1396) by Bajazet, fled to Greeee, and found, when in 1401 he returned to Hungary, his queen dead, his throne occupied by Ladislaus of Naples, and his brother deposed in Germany, and vindicating himself only with diffieulty in Bohemia. In 1403 he expelled Ladislaus, and again took possession of the throne of Hungary, and in 1410 was even eleeted Emperor of Germany. In 1414 an œcumenical council was convoked at Constanee in order to put an end to the schisms in the Church, and reeoncile the Hussite party. He gave his assent to the deeree of the council eondemning Huss to be burned at the stake; and the Hussite war began. D. at Znaim, Moravia, Dec. 9, 1437. He was succeeded by his son-in-law, Albert II. of Hapsburg.

Sigismund: the name of three kings of Poland of the Jagellonian dynasty: SIGISMUND I., THE GREAT, b. in 1466, a son of Casimir IV., suceeeded his brother Alexander on the Polish throne in 1507. His was probably the most sueeessful reign in the history of Poland. A treaty with the Turks gave Poland the free navigation of the Blaek Sea, the sovereignty of Moldavia, and secured her against the invasions of the Mongols. He knew how to curb the arrogant nobility; was prudent in his expenses, and a patron of literature, which flourished highly under him and his son; and he favored the Reformation, which from Germany spread rapidly among the Poles. After the death of his first wife, Barbara Zapolska, he married Bona Sforza of Milan, an intriguing, avaricious, and licentious woman, who exercised great influence over him, and alienated to some extent the love of his subjeets from him. D. Apr. 1, 1548, and was suceeeded by his son, SIGISMUND II., AUGUSTUS, b. Aug. 1, 1520, who, although educated purposely by his mother in effeminacy and dissoluteness, opposed the ambitious schemes of the queen-dowager with great decision. At the Diet of Lublin (1569) Sigismund sueeeeded in uniting Lithuania firmly to Poland, and at the Diet of Warsaw (1572) he granted religious liberty, but the intolerance of the nobles prevented anything like freedom of worship to the serfs. Volhynia, the Ukraine, and Livonia were also incorporated, and his reign was, in both external and internal respeets, a period of great prosperity. D. July 14, 1572, and with him the male line of the Jagellonian dynasty became extinet. His sister Catharine, however, who was married to John III., King of Sweden, had a son, Sigismund, who was eleeted King of Poland as SIGISMUND III. after the death of Stephen Báthori (1587), and was crowned at Cracow; but his only aim was to unite Sweden and Poland, in order to reestablish Roman Catholicism in the former and suppress the Reformation in the latter. In 1592 John III. died, and Sigismund suceeeded him as King of Sweden, but in 1604 he was formally deposed by the Swedish estates, and his unele, Charles IX., raised to the throne. Unwilling to give up his claims, he then began a long series of wars with Sweden which contributed much to the final ruin of Poland. D. at Warsaw, Apr. 30, 1632.

Sigmaringen: See HOHENZOLLERN.

Sign [viâ O. Fr. from Lat. *sig'num*, mark, sign, token; cf. SEAL]: in astronomy, a portion of the eeliptie, containing a twelfth part of the eomplete cirele, or thirty degrees. The first sign begins at the point of the equator through which the sun passes at the time of the vernal equinox in the upper hemisphere; and the signs are counted onward, proceeding from W. to E., aeeording to the annual course of the sun around the cirele. The signs and their characters are as follows:

♈, Aries, *Ram.*	Spring.	♎, Libra, *Balance.*	Autumn.
♉, Taurus, *Bull.*		♏, Scorpio, *Scorpion.*	
♊, Gemini, *Twins.*		♐, Sagittarius, *Archer.*	
♋, Cancer, *Crab.*	Summer.	♑, Capricornus, *Goat.*	Winter.
♌, Leo, *Lion.*		♒, Aquarius. *Waterman.*	
♍, Virgo, *Virgin.*		♓, Pisces, *Fishes.*	

The first eharaeter, ♈, indicates the horns of a ram; ♉, the head and horns of a bull; ♊, the aneient statues of Castor and Pollux; ♋, the claws of a erab; ♌, a corruption of the Greek letter Λ, initial of Λέων, lion; ♍, eorruption of παρ for παρθένος, virgin; ♎, seales; ♏, the tail of a scorpion, or the legs and tail; ♐, an arrow; ♑, for τρ, initials of τράγος, goat; ♒, running water; ♓, two fishes joined. See ZODIAC.

Sign: in algebra, a symbol indieating a relation subsisting between two quantities, or an operation to be performed. Of the latter, those most commonly used are +, denoting addition; −, subtraetion; ×, multiplication; ÷, division; $\sqrt{}$, square root; $\sqrt[3]{}$, cube root; and $\sqrt[n]{}$, *n*th root. The signs denoting relations are =, equal to; >, greater than; <, less than, etc.

Signaling: a means of transmitting intelligence to a distance by means of signals appealing to the sense of sight or of hearing. For army signaling, espeeially in the U. S., see SIGNAL SERVICE and HELIOTROPE, and for signaling at sea see the former artiele and FOG-SIGNALS, NAVAL SIGNALS, and ROAD, LAW OR RULE OF THE. Signaling is of great importance on railways, for whieh see RAILWAYS (*Signals and Interlocking*). Signals are also used to make annouueements of weather predietions. (See WEATHER SIGNALS.) For the signals used before the invention of the electric telegraph to transmit messages to a great distanee, see TELEGRAPH.

Signal Service: that branch of the public serviee of a country which is concerned with transmitting intelligenee by means of signals, espeeially in the army and navy. Few persons without experience have any idea of the remarkable ranges at which signals made by motions are visible to the naked eye, or the wonderful gain had by the use of a simple poeket-telescope. Signaling at 5 miles is held by experienced signalists to be at very short range. Messages have been sent 10 miles by means of a pocket-handkerehief attaehed to a 12-foot rod. With the flags and staffs in use in the Signal Corps of the U. S. army communieation is said to have been had at 25 miles' distance, and detached words are reported to have been read at a distance of 40 miles.

It is well known that the suceess of modern military operations depends very largely upon celerity of movement and the eoneentration of the largest force at a given point. The greatly increased aeeuracy and range of small-arms and artillery have made it imperatively necessary that there should be rapid and sure means of intercommunication between the various component parts of an army, and that there must be prompt transmission of information both on the march and on the field of battle. The conditions neeessary to meet these requirements are well provided for by the Signal Corps of the U. S. army as at present organized. The system of military signals of which Maj. Albert J. Myer was the originator proved to be a great advance over the crude and unwieldy methods previously in use. Its value was speedily demonstrated by actual test almost immediately after the apointment of Myer as first signal officer of the army in 1860, and at the close of the civil war its usefulness as an auxiliary arm on the field of battle and on the march was not only recognized by giving it a plaee in the permanent military establishment, but the record whieh the corps made during the war has been utilized by the military powers, and the Myer system serves as a basis upon which rests modern military signaling. In Aug., 1861, a eamp was formed at Georgetown, D. C., where signal-parties were instructed and equipped to attend eaeh army that took the field; but it was not until Mar. 3, 1863, that the Signal Corps was given a separate and systematic organization. It was to consist of 1 colonel, 1 lieutenant-colonel, 2 majors, 1 captain, and 8 lieutenants for each army-corps, and for each officer there was allowed a sergeant and 6 privates. The corps was authorized for the duration of the civil war, and appointments were to be made on the reeommendation of examining boards.

The Signal Corps served with the greatest efficiency on all fields during the civil war, and even on naval vessels, notably with Farragut in the fight at Mobile Bay. At the close of the war it was again reorganized. The aet of July 28, 1866, provides that there should be one chief signal officer, with the rank of colonel, but it made no provision for a corps other than by a limited detail of six officers and not to exeeed 100 men from the Engineer battalion. The school of instruetion was established at Fort Whipple, now Fort Myer, Virginia, and here for many years signal instruction was given to offieers of the army and the navy and to the enlisted men of the Signal Corps. In 1870 a meteorologieal division was added to the signal servicc, to provide for taking meteorological observations, with a view to giving notiee by telegraph and signals of the approaeh and force of storms, and for twenty-one years this work formed a most important part of the duties of the serviee, gaining for it a worldwide reputation by the skill with which its weather forecasts were produced and their great reliability.

On July 1, 1891, however, that branch of the service was constituted the weather bureau and transferred to the Department of Agriculture. See WEATHER SIGNALS.

The Signal Corps of the U. S. army is constituted under a law which took effect July 1, 1891, and which provides that in addition to the chief signal officer (who has the rank of brigadier-general), the commissioned force shall consist of 1 major, 4 captains, and 4 first lieutenants, who shall receive the pay and allowances of mounted officers of like grades in the army. The enlisted force of the Signal Corps of the army shall consist of 50 sergeants, of which ten shall be of the first class, with the pay of hospital stewards. In time of war the ten officers and fifty enlisted men would have to be largely supplemented from the army, in order to man the various appliances that constitute its equipment, its present number having already been found too small. At present a number of the sergeants are employed as operators on the military telegraph lines throughout the republic and at the various department headquarters, and the rest are at the School of Instruction for Military Signaling at Fort Riley, Kansas.

This course of instruction extends over six months, and consists of both theoretical and practical instruction in the general principles of signaling, and requires a thorough knowledge of all the codes likely to be used in active service, including the international and nautical codes used by the U. S. navy, thus assuring, when necessary, signal communication between the land and naval forces and merchant marine. Instruction is also given in cryptography, and the class is required to devise plans of cipher and by practice to become skilled in enciphering and deciphering messages. Theoretical and practical instruction is also given in electricity, topography, photography, and the operation of the field telegraph and captive balloon trains. Practice in signaling extends over various ranges up to 12 miles with the flag, torch, and flash-lantern, and with the field-telegraph kit, both insulated cable and the bare-wire system being used. The course of instruction to operators consists largely in practice with the Morse system until each of the sergeants can send and receive thirty-five words a minute, and transcribe twenty-five words a minute on the typewriter, together with the regulations for transmission of messages and keeping the accounts of the various military lines, on which a considerable amount of commercial work is done.

The means of communication by day used by the corps are flags, heliograph, and the field telegraph and telephone trains; and by night the torch, flash-lantern, rockets, bombs, and searchlight. The method of visual signaling by flags consists in waving a flag to the right for a dot, to the left for a dash, and to the front for the space in the American Morse code. Thus the motions

Right, right, front, right represent C.
Right, front, right represent O.
Right, front, right, right represent R.
Right, right, front, right, right represent Y.
Right, right, right, front, right represent Z.
Right, front, right, right, right represent &.

Each motion embraces an arc of ninety degrees, starting from and returning to the vertical. The long dash (letter

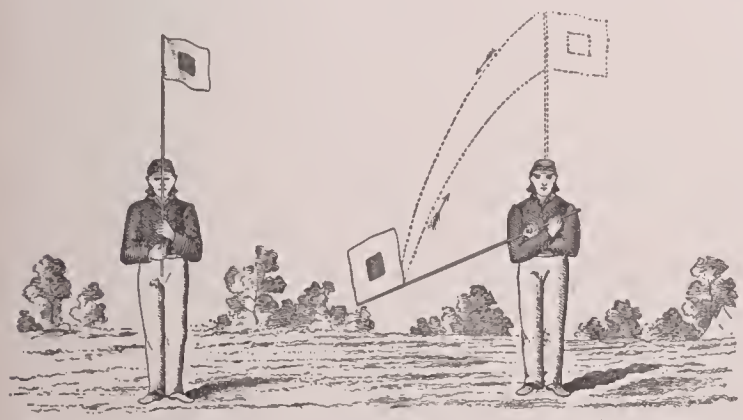


FIG. 1.—First position. First motion—"one"—"1" or dot (-).

"L" and numeral "naught") is distinguished from the "T" dash by a slight pause at the lowest point of dip, and with this exception there is no pause whatever between the motions required for any single letter. A slight pause is made between letters. At the end of each word, abbreviation, or conventional signal the space signal, or "front" motion, is made, preceded and followed by a pause equivalent to that made between letters.

The U. S. naval code for visual and telegraphic signaling uses three signals, numbered 1, 2, and 3, by combinations of which all the letters and numerals are expressed. In flag-signaling 1 is made by a motion to the right, 2 by one to the left, and 3 by one to the front (see figures); with a whistle or flash-light 1 is one toot or short flash, 2 two toots or short flashes, and 3 a blast or long flash. The alphabet and numerals are as follows:

A 22, B 2112, C 121, D 222, E 12, F 2221, G 2211, H 122, I 1, J 1122, K 2121, L 221, M 1221, N 11, O 21, P 1212, Q 1211, R 211, S 212, T 2, U 112, V 1222, W 1121, X 2122, Y 111, Z 2222. 1–1111, 2–2222, 3–1112, 4–2221, 5–1122, 6–2211, 7–1222, 8–2111, 9–1221, 0–2112.

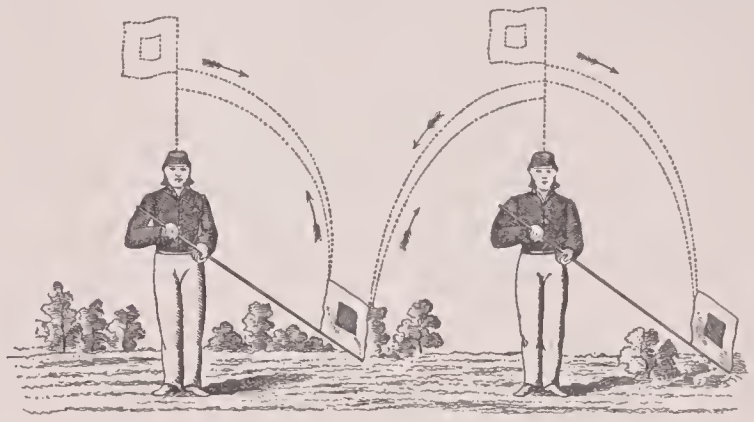


FIG. 2.—Second motion—"two" "Two—one"—"21" (— -). —"2" or dash (—).

When signals are communicated in the presence of the enemy they must be transmitted in cipher. The composition of cipher codes is facilitated by the use of a simple device called the cipher disk (see Fig. 4). This consists of several concentric disks, each carrying letters of the alphabet or numbers arranged in irregular sequence. To encipher a message the disk is clamped in any desired position, and the letters or symbols on one of the outer disks are used, each standing for the letter opposite it on the inner disk.

The field-telegraph train used in the U. S. army consists of a battery wagon and three sections, each of which includes a lance-truck and a wire-wagon.

The Japanese Signal and Telegraph Corps, the day following the battle at Ping Yang, in Korea, 1894, ran into that city a flying telegraph line extending from Seoul, the distance being 70 miles. This shows what modern war requires, and the necessity of a specially trained corps for these purposes.

The balloon-train is another factor of the utmost value in modern war tactics. The ability to discover the movements and position of an enemy is an absolute necessity, and these can be accurately ascertained by an operator in a balloon about 2,500 or 3,000 feet above the surface of the earth, who can scan the country for miles around with a good telescope, and telephone at once whatever he may see to the surface of the earth. The balloon-train at Fort Riley consists of three wagons for the carriage of tubes of compressed hydrogen and one wagon for the balloon and appliances.

When the balloon is inflated the manœuvering-bar is at-

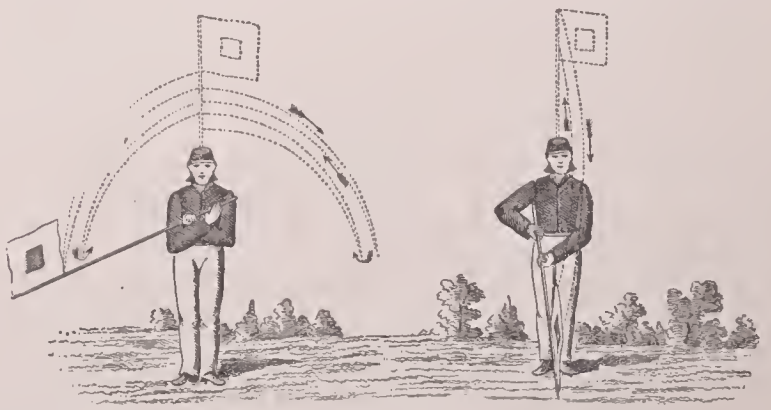


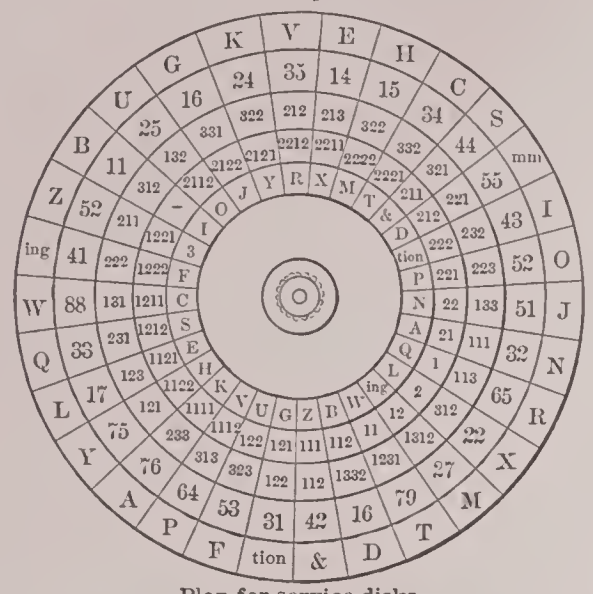
FIG. 3.—"One—two—one—two." "Three"—"3"—or "front." —"12 12" (- — - —).

tached to the end of the cable on the drum of the balloon-wagon, and the necessary amount of cable is paid out. The height of the balloon above the ground is of course regulated by the length of cable paid out, and the observer in the car, having a field telephone kit, can direct the manipulation of the balloon itself as occasion may require.

The equipment of the car consists of an aneroid barometer, prismatic compass, telescope, field-glasses, note-book and pencil, telephone, maps of the country, and a camera. The operator is thus fully prepared for photographic work and observation. It may be thought that a balloon would present a good target to the enemy, but the experiments at Shoeburyness with an old captive balloon showed that it is almost impossible to hit such an object with long-range musketry fire or by artillery fire, especially if it be kept moving, which it always would be.

The advantage that a force possessing a balloon-train has over a less-favored enemy is manifest. All the great nations have equipped their armies with captive balloon-trains,

Fig. 4.—Cipher disk.



Plan for service disks.

Vertical section exhibiting plan for four disks.

and the individual processes of manipulation are regarded as military secrets. The French claim to possess a dirigible balloon, and if its practicability be established the machine should prove a most powerful engine of war.

It will be seen from the foregoing that the system of signaling used in the U. S. army—which is practically the invention of one man, Gen. A. J. Myer—has developed into a military science. In most of the foreign armies the signal service has been dignified by a separate corps organization, and where not separately organized they form a distinct division of some corps already in existence, such as the engineer, and the practical exigencies of war have in war served to make them independent in all but name. In Great Britain the signaling operations are entirely under the jurisdiction of the Royal Engineers Telegraph Corps, which consists of 6 officers and 245 men. In the Austrian army this duty is performed by a regiment having charge of railways and telegraph. In the Russian army there are 7 field-telegraph boards, each board consisting of 3 divisions, with the strength of 1 officer and 38 men. In the German army there are 7 field and 4 semi-permanent telegraph divisions, each field division being composed of 4 officers and 148 men. Belgium, Holland, Spain, and Italy have all given special attention to the organization of telegraph and signal trains in connection with their military establishments.

In addition to the military telegraph lines under charge of the chief signal officer of the U. S. army, there are thirty-three military posts and stations whose telegraphic connections with the great commercial systems of the U. S. are over prominent lines, constructed and operated by the Signal Corps of the army. There is at present hardly a military post which has not a telegraph station either within its limits or at some convenient point speedy of access. In addition to the regular telegraph service attention is being given to suitable equipment of its flying telegraph-trains in all phases, from the connection, by means of such lines, of army headquarters with the permanent lines of the U. S., to the provision for temporary telegraphic or telephonic communication between army, division, or even brigade headquarters, with all essential points, whether in camp or on battle-line.

H. H. C. Dunwoody.

Signature: in the old system of medicine, some physical peculiarity of a drug which was supposed to indicate its use. Thus, because the euphrasy or eye-bright has a flower with an eye-like mark, it is good for the vision; the rock-liverwort was thought to be shaped like the liver, hence it is good for diseases of that organ. This belief prevailed not only among herbalists and pretenders, but among the best-trained physicians of the time.

Sign-language: See Deaf-mutes.

Signorelli, seĕn-yō-rel'leĕ, Luca: painter; b. at Cortona, Italy, about 1441; pupil of Piero della Francesca. In 1472 he was painting at Arezzo, in 1474 in Città di Castello. He afterward went to Rome, and in the Sistine chapel painted two frescoes representing incidents in the history of Moses. These were completed by 1484, when he returned to Cortona, and painted an altarpiece for the chapel of Sant' Onofrio in the Cathedral of Perugia. In 1490 he painted the *Circumcision* in the Church of San Francesco at Volterra and an altarpiece in the Duomo, and the next year returned to Cortona and took office as a councilor. The eight frescoes in Mont' Oliveto, near Sienna, were commissioned in 1497, but the greatest works of this master are the frescoes of the chapel of the Madonna di San Brizio in the Cathedral of Orvieto. These were undertaken after Signorelli's sixtieth year. The four great compositions with life-size figures represent *Antichrist*, *Hell*, *The Resurrection*, and *Paradise*. These, with the decorative designs around them, were all executed by Signorelli and his assistant Girolamo Genga within three years and three months. Signorelli painted innumerable altarpieces and frescoes besides the works mentioned. He signed his name in several manners: Lucas Signorellius Corthonensis, also in a Greek form, Λουκᾶς ὁ Κορτιός, also Lucas Coritius, also Lucas Ægidii Signorelli Cortonensis. He was the first of the whole cycle of Italian painters in his mastery of drawing the human figure, and of his use of it in his compositions for its own sake. His frescoes at Orvieto greatly impressed Michelangelo, whose *Last Judgment* testifies to the influence Signorelli had over him. Signorelli died at Cortona in 1523. He had lived there in splendor and luxury, more like a nobleman than a painter, according to Vasari. His son Antonio and his nephew Francesco Signorelli were painters also. Luca Signorelli is well represented in European galleries. For further information, see Vasari; Crowe and Cavalcaselle's *History of Painting in Italy* (1864–71); Robert Vischer, *Luca Signorelli* (Leipzig, 1879); and Kugler's *Handbook*, edited by Sir H. A. Layard (1887). W. J. Stillman.

Sig'ourney: city; capital of Keokuk co., Ia.; on the Skunk river, and the Chi., Mil. and St. P. and the Chi., Rock Is. and Pac. railways; 25 miles E. of Oskaloosa, 28 miles W. of Washington (for location, see map of Iowa, ref. 6–I). It is in a coal-mining region, has important manufactories, and contains a public high school, a national bank with capital of $50,000, 2 State banks with combined capital of $100,000, and a monthly and 3 weekly periodicals. Pop. (1880) 1,735; (1890) 1,523; (1900) 1,952.

Sigourney, Lydia Howard (*Huntley*): poet; b. at Norwich, Conn., Sept. 1, 1791; established a select school for young ladies at Norwich 1809, and at Hartford 1814; published a volume of *Moral Pieces in Prose and Verse* (1815), and was thenceforth through a long life one of the most popular of American poets. She published fifty-nine volumes of poems, essays, and letters, chiefly on moral or religious themes. She married Charles Sigourney, a merchant at Hartford, in 1819; visited Europe 1840; d. at Hartford, June 10, 1865. Among her works were *Letters to Young Ladies* (1833); *Zinzendorff, and other Poems* (1835); *Pocahontas, and other Poems* (1841); *Pleasant Memories of Foreign Lands* (1842): *Past Meridian* (1854); and a posthumous autobiography, *Letters of Life* (1866). Two volumes of her selected poems appeared in London 1841, and a choice edition, illustrated by Darley, was published at New York 1848. Revised by H. A. Beers.

Sigwart, Christoph, von, Ph. D., Dr. Theol., LL. D.: b. at Tübingen, Würtemberg, Mar. 28, 1830; educated there and became professor in a seminary 1859 and Professor of Philosophy in the University of Tübingen 1863. He is a corresponding member of the Academy of Sciences of Berlin. His principal works are *Spinozas neuentdeckter Tractat von Gott, etc., erläutert* (1866); *Logic* (vol. i., 1873; vol. ii., 1878; 2d ed. vol. i., 1889: vol. ii., 1893; English translation 1894); *Vorfragen der Ethik* (1886); *Die Impersonalien, Eine logische Untersuchung* (1888). J. M. B.

Sihon, or **Sihun**: See Syr-Darya.

Sikes, Olive (*Logan*): actress and author; daughter of a theatrical manager; b. at Elmira, N. Y., in 1841; made her *début* on the stage in Philadelphia 1854; went to England 1857, in which year she was married to Henry Delille, from whom she obtained a divorce in 1865; became a contributor to English and French papers; published two novelettes (1860); reappeared on the stage at Wallack's, New York, in 1864, in *Eveleen*, a play written by herself; retired in 1868, and devoted herself principally to lecturing on woman's rights and on other social topics, magazine-writing, and newspaper correspondence. In 1871 she became the wife of William Wirt Sikes. Among her publications are *Photographs of Paris Life* (1861); *Château Frissac* (1865); *John Morris's Money* (1866); *Apropos of Women and Theatres* (1869); *Before the Foot-lights* (1870); *The Mimic World* (1871); *Get thee behind me, Satan* (1872); and *They Met by Chance*, a novel (1873). Revised by H. A. Beers.

Sikes, William Wirt: journalist and author; b. at Watertown, N. Y., in 1836. He learned type-setting in his boyhood, and wrote for the newspapers. He was afterward editorially connected with the Utica *Herald*, *The Chicago Times* and *Evening Journal*, and the New York *Sun*. While in Illinois he was appointed State inspector of canals. He removed to New York in 1867, and in 1871 was married to Olive Logan. From 1876 to 1883 he was U. S. consul at Cardiff, Wales. He published *One Poor Girl: the Story of Thousands* (1869); *British Goblins: Welsh Fairy Mythology* (1879); *Rambles and Studies in Old South Wales* (1881); and *Studies of Assassination* (1881). D. in London, England, Aug. 19, 1883. H. A. Beers.

Sikhs, seeks [from the Punjaubi word *sikha*, or *sikh*, a disciple]: the disciples or followers of Nanak, a religious reformer, who was born in the village of Talwandi, now called Nankana, on the bank of the river Ravi, near Lahore, in A. D. 1469. They form the principal native element of the province of the Punjaub.

The history of Nanak is recorded in what are known as the *Janam Sakhis*, or biographical sketches. According to these ancient records Nanak was a Hindu by birth, of the Khattri càste, and the son of a village official. In his early years he sought the society of ascetic monks. At the age of fifteen he misappropriated the money which his father had given him for trade, and gave it to religious mendicants. This induced his father to send him to a relative at Sultanpur, in order that he might be weaned from his affection for a monkish life; but he still continued to give all his earnings to poor mendicants, and reserved but a bare pittance for himself. While in the service of a Mohammedan in Sultanpur, Nanak believed that he received ecstatic visions and divine inspirations. When engaged in religious exercises he was translated bodily, so he said, to the gates of paradise, and received a golden goblet of *amrita*, or the "water of life." Then God said to him, "Nanak, I am with thee, and whosoever shall follow thee shall be happy indeed." Nanak recovered from the trance, and when he awoke he uttered those words which have become the keynote of his religious system: "In religion there is no Hindu, and there is no Moslem." He soon began to show evidences of supernatural power, and many miracles are credited to him. He was accepted by the people as a religious guide. His employer was among his first converts, and the eclectic character of his system made Nanak acceptable to Hindus and Moslems alike.

He next proceeded to Benares, the sacred city of the Hindus, in order to be brought in contact with the teachings of the Brahmans. Here he succeeded in converting to his views a large number of Hindus, and not a few Moslems. Among those who joined him from the ranks of Islam was the Sheik Farīd, who afterward became a valuable assistant in enabling Nanak to combine in his religious system the ideas of the Hindu and of the Moslem. Nanak was, upon his return from Benares, captured among the prisoners taken by the Emperor Baber, and it is said the Mogul ruler was much attracted by the teacher's piety. After his release Nanak renewed his missionary work, and many people joined him. He is said to have visited Mecca, and to have acknowledged Mohammed as a God-sent messenger. He returned to his native river to die (1538 A. D.), after having named Angad as his successor, the *guru* or teacher of the Sikhs.

Nanak was an uneducated man, but a book was compiled by one of his successors (by Arjun, the fifth *guru*, it is said), which claims to record the opinions and teachings of Nanak. This sacred book, known as the *Adi Granth*, which is written in the Punjaubi language, is kept in the Golden Temple of Amritsar, and is guarded and preserved with great honor by a corps of priests and choristers. It is called by the people the *Granth Sahib*. An English translation by Dr. Ernest Trumpp has been published in London.

Sikhism may be generally characterized as a pantheistic system, similar to Hinduism, but rejecting caste distinctions and the practice of idolatry. It contains in itself the mystic elements of ancient Hinduism, and the more modern teachings of the Moslem Sufis. The line of teachers who succeeded Nanak is as follows: Angad, who died in A. D. 1552; Amar-Das, 1574; Ram-Das, 1581; Arjun, 1603; Har-Govind, 1638; Har-Raie, 1660; Har-Kisan, 1664; Tegh-Bahadur, 1675; Govind Singh, 1708. Govind Singh welded the Sikhs into a great military power. He established the Khālsa, or brotherhood, by which he enrolled the followers of Nanak into an army of fighting men, and conferred upon each member the title of Singh, or lion. After a turbulent reign he was slain by an Afghan follower, and in his dying moments refused to name a successor. He said the *Granth Sahib* was enough to guide them for all time. The Sikhs were little heard of after Govind's death, but the falling power of the moguls, and the repeated invasion of India, first by Nadir Shah and then by Ahmad Shah, the Afghan, favored the revival of the followers of Govind Singh as a military power. In 1763 40,000 Sikhs defeated the Afghan governor of Delhi. In 1785 the Sikhs formed a confederacy, with annual durbars at Amritsar, and are said to have numbered more than 70,000 horsemen. Under the vigorous rule of Runjeet Singh (*q. v.*) they became an important nation. After his death the Punjaub was ruled by a durbar, or council, of Sikh nobles, during the minority of Runjeet Singh's son, Maharajah Dhuleep Singh. Eventually Dhuleep Singh abdicated in favor of the British, and embraced Christianity. He died in Paris in 1894. The Sikhs are considered admirable soldiers, and there are about 14,000 serving under British colors. Among the leading Sikh princes are the maharajahs of the semi-independent states of Patiala, Kashmir, and Kapurthala.

Thomas P. Hughes.

Si-kiang, sĕē'kyaang': a river of China (*q. v.*).

Sik'kim: feudatory state of British India, occupying the upper part of the Tista river basin on the southern slope of the Himalaya Mountains, with Tibet on the E. and N., Nepal on the W., and the British district of Darjiling on the S. It is about 70 miles long N. and S., and 50 miles broad. Area, 2,600 sq. miles. It is governed by a maharajah, aided by a British political resident who has entire charge of the foreign affairs. It is a mountainous, elevated, and healthful territory, producing rice, maize, millet, tea, oranges, cloths, and copper. Pop. (1891) 30,458. The people are Buddhist. The principal towns are Tumlong and Gamtak. See Edgar, *Report on a Visit to Sikkim* (1874); Strahan, *Report on Explorations in Sikkim* (1889). M. W. H.

Silao, sĕē-laa'ō: town of the state of Guanajuato, Mexico; on the Mexican Central Railway, and 237 miles by this route from Mexico city; head of a branch road to Guanajuato, 14 miles (see map of Mexico, ref. 6–F). It is on the plateau, 5,910 feet above the sea; is the center of a rich wheat and maize district; and has factories of cottons and woolens. Silao is the ancient Indian town of Cillan. Pop. about 15,000. H. H. S.

Sile'nus [= Lat. = Gr. Σειληνός]: in mythology, son of Hermes or Pan, and the childhood instructor and constant companion of Dionysus. In Asia Minor he was originally the god of flowing water, and so he always carried a skin of water; but in Greece he was degraded to a mere δαίμων, and was represented as a drunken, jolly, fat old fellow with bald head, flat nose, and abundant hair all over his body, and carrying always a skin filled with wine. J. R. S. S.

Sile'sia: province of Prussia, S. of the provinces of Brandenburg and Posen, bounded E. by Poland, S. by Moravia and Bohemia, and W. by Saxony. Area, 15,557 sq. miles. Along the southern and western boundaries the province is mountainous and rugged, but the whole central part is flat, traversed by the Oder and its tributaries. The soil is generally fertile and well cultivated. Grain, flax, hemp, oil-plants, tobacco, beets, and hops are extensively cultivated. An excellent breed of sheep yields a very fine wool, and important manufactures of linen and woolen fabrics are carried on. The mineral wealth is considerable,

lead, copper, and coal being abundant. Pop. (1895) 4,415,309. Capital, Breslau.

Silesia was from the sixth century inhabited partly by German, partly by Slavonic tribes, and formed a fief or—as it was divided between several dukes—several fiefs, first of the Polish, then of the Bohemian crown. In 1537 the Duke of Liegnitz and the Elector of Brandenburg made an agreement that if either of the two reigning lines became extinct its possessions should fall to the other. In 1675 the ducal family died out, but the German emperor refused to acknowledge the validity of the agreement of 1537, and incorporated Liegnitz and the other ducal possessions as a lapsed fief of Bohemia into the Austrian empire. In 1740 the duchies were seized by Prussia. (See FREDERICK II. of Prussia and SEVEN YEARS' WAR.) Under the Prussian Government the province has developed greatly, and forms one of the richest provinces of the kingdom.

Revised by M. W. HARRINGTON.

Silesia, Austrian: province of Austria, between Prussia, Moravia, and Galicia. Area, 1,987 sq. miles. The northern part is covered by the Sudetic Mountains; the rest is flat, though high. The climate is somewhat rigorous, but healthful. Good crops of rye, barley, and oats are raised, cattle, sheep, and bees are extensively reared, and copper, lead, iron, and coal are mined. Pop. (1891) 605,649, of whom four-fifths are Roman Catholics. Capital, Troppau. M. W. H.

Silhouette [from Étienne de Silhouette, French Minister of Finance in 1759, either because of his excessive public economy, causing his name to be applied to things cheap, or because of his making such figures as a diversion]: a figure drawn in outline and filled in solid, usually with black, without other details than those of the outline; much like a shadow. By extension the term is used when there is some slight delineation of the parts within the bounding line.

Sil'ica or **Silicic Acid** [*silica* is Mod. Lat., from Lat. *si'lex, si'licis*, flint]: a compound (SiO_2) of SILICON (*q. v.*) with oxygen. It was first pointed out by Smithson in 1811 that this substance is a weak acid, and shortly afterward Berzelius showed that it is one of the most important and widely distributed acids of the mineral kingdom. It occurs in nature partly free, partly in combination in the silicates. Free silica is either crystallized or amorphous. The crystallized varieties contain no water, have the specific gravity 2·66 or 2·3 according to the form, and are insoluble or difficultly soluble in alkalies. The amorphous varieties contain water, have the specific gravity 2·1 to 2·2, and are dissolved by alkalies. The principal form in which silica occurs is QUARTZ (*q. v.*).

Tridymite crystallizes in the same system as quartz, but has a lower specific gravity, 2·3, and constitutes an undoubted allotropic form of silica. It was discovered by von Rath.

Amorphous Forms of Silica.—Silica when precipitated from solution, and when fused, as with the oxyhydrogen flame, assumes the density 2·225, and in this form is highly soluble in caustic alkalies—to a small extent in many saline solutions, and even in pure water. This is the form in which silica is left in the decomposition of many natural silicates by alkaline waters, and it is therefore present in most soils. All amorphous varieties of mineral silica are called opal. Among these are OPAL and HYALITE (*qq. v.*). Mixtures of the crystallized and amorphous varieties of silica also occur in nature. Among these are AGATE, CHALCEDONY, CHERT, FLINT, and CARNELIAN (*qq. v.*). An analysis of a very pure opal by von Rath gives the formula $3SiO_2.H_2O$, with the density 1·99, corresponding to 9·84 per cent. of water. Some of these hydrates, however, contain as much as 13, 16, and even 21 per cent. of water, and some opals as low as 5 or 6 per cent. only. This indefinite character of opal is probably due sometimes to admixture with quartz or other forms of silica, a variable insoluble residue being generally left on boiling with an alkali.

The relations of silica to life upon the land are very important. Of the animal kingdom it is but a very trifling constituent, but to many plants silica has the same relation that tricalcic phosphate has to most animals—that is, silica is the main material of the plant-skeleton. Of the ashes of plant-stems, particularly, silica is often found to be a large constituent; thus in ash of rye-straw is found 65 per cent., of potato-stems 36 per cent., and of wheat-straw as much as 73 per cent. Hence the importance of the existence in soils of silica in such form that it may pass in solution into the roots—namely, in the form of soluble silica, or more probably that of hydrated silica.

Silicic hydrates may be obtained artificially by several methods. If solutions of soluble glass (see GLASS) are treated with acids, hydrate of silica precipitates in gelatinous form. This, if well washed and dried over oil of vitriol, gives, according to Doveri, a product of the composition $3SiO_2.2H_2O$, which was converted at 212° F. into $3SiO_2.H_2O$, the same as von Rath's native opal, referred to above. Hydrates may also be obtained by the action of the gaseous fluoride of silicon on water. Fuchs obtained thus the above trisilicic monohydrate, and another, a tetrasilicic monohydrate ($4SiO_2H_2O$). Ebelman also obtained a definite hydrate ($2SiO_3.3H_2O$) as a transparent solid glass by the action of air upon silicic ether. By DIALYSIS (*q. v.*) Graham obtained a solution of 5 per cent. of silica in pure water, which may be boiled rapidly down to 14 per cent. if no gelatinization is allowed on the edges. This solution is tasteless, with a feeble acid reaction. In the course of a few days it passes spontaneously into a transparent jelly. Addition of a little muriatic acid or an alkali tends to preserve it. Carbonic acid coagulates it, also alkaline and earthy carbonates in minute proportion. Added to a solution of gelatin, this precipitates, together with the silica, about in equal parts. This solution evaporates to a lustrous transparent glass of composition $SiO_2.H_2O$, containing 22 per cent. H_2O.

Revised by IRA REMSEN.

Silicate Cotton: See MINERAL WOOL.

Silicide of Carbon: a very hard crystalline substance first obtained about the year 1890 by E. G. Acheson, of Chicago, while experimenting for the production of diamonds in the electric furnace. Under the supposition that he had formed a compound of carbon and corundum, he gave it the name "carborundum," by which it is commercially known. Chemical analysis, however, shows that it has the following composition: Silicon, 69·10; carbon, 30·20; with about seven-tenths of 1 per cent. of oxide of iron, alumina, and lime, which may be regarded as impurities and as imparting color, which varies from nearly white to a deep emerald green and blue. The composition may thus be expressed by SiC, the elements being united atom to atom.

The crystallization is rhombohedral, usually with a broad development of the basal plane, forming hexagonal plates confusedly aggregated and very small, but with brilliant surfaces, an adamantine luster, and transparent. Specific gravity about 3. It is a good conductor of heat, is not fusible before the blowpipe, and is insoluble in acids.

The most important physical characteristic, industrially, is its extreme hardness, which appears to be between that of the sapphire, which it scratches, and the diamond. It is used as a substitute for emery or corundum, and is made into wheels, whetstones, and polishing-cloths. It is manufactured by exposing a mixture of sand and carbon to the heat of a powerful electric current for eight hours. The result is a mass of crystals of small size, which is crushed and the powder digested with dilute sulphuric acid to remove soluble impurities.

See Acheson, *Carborundum, its History, Manufacture, and Uses*, in *Jour. Frank. Inst.* (Philadelphia, Sept., 1893); Schützenberger, *Contribution to the History of Carbosiliceous Compounds* (*Comptes Rendus*, May, 1892); *Carborundum*, etc., *The Electrical Engineer*, xv., p. 227 (Mar., 1893); *Science*, xxii., 141 (Sept. 15, 1893).

W. P. BLAKE.

Sil'icon [Mod. Lat., from Lat. *si'lex, si'licis*, flint]: an element which, next to oxygen, is the most abundant one in the solid part of the earth's crust. Quartz, sandstones, and other forms of SILICA (*q. v.*) contain over 45 per cent. of their weight of silicon. Granite and gneiss-rocks average 35 per cent. of silicon, slates 30 per cent., and trap-rocks 23 per cent. Silicon was first obtained by Berzelius in 1823 from the silicofluoride of potassium by the action of fused potassium thereon. It appears, when thus obtained, as an amorphous powder of a dull-brown color, which smears the fingers like lampblack. It does not conduct electricity; is not acted on by mineral acids, except hydrofluoric, but dissolved by potash solution. Heated in air or oxygen, it burns brilliantly, forming silica, SiO_2. Silicon may be obtained in this form also by the action of potassium or sodium on gaseous fluoride or vaporous chloride of silicon; also by the electrolysis of fused silicofluorides, and by heating sand (silica) with metallic magnesium. A second allotropic form of silicon is obtained by exposure of the above to strong heat, which causes it to become denser and pass into graphitoid silicon. This form was obtained in hexagonal tabular crystals by Wöhler by fusing silicofluoride

of potassium with an excess of metallic aluminium, and, after the action, dissolving out the aluminium from the metallic button obtained, with acids. Molten zinc dissolves silicon, and, on cooling, the latter crystallizes out in needles. The preparation of needle-formed silicon is accomplished by heating to a high temperature a mixture of silicofluoride of potassium, metallic sodium, and granulated zinc. After the silicon has crystallized out, the zinc is dissolved by hydrochloric acid, and the crystals of silicon left behind. This form of silicon is also obtained by passing vapor of chloride of silicon over fused aluminium. Another form is fused silicon, which was obtained by Deville by heating above the melting-point of steel. This is dark steel-gray, and hexagonal in crystallization. Deville and Caron obtained cast ingots weighing nearly a pound. In this modification it will not burn, even in oxygen gas at a white heat.

The allotropic forms of silicon offer a remarkable parallelism with those of carbon; and, indeed, there are no elements, of such widely different functions in nature, which present so many analogies as carbon and silicon, the first being a characteristic element of the organic kingdom, and the last of the inorganic. Silicon is more electro-positive or basylic than carbon, at least at high temperatures, and will even decompose potassium carbonate when fused with it, setting carbon free, with vivid incandescence, potassium silicate being formed. It is therefore a more powerful agent in smelting reduction than carbon, and if it were cheaply procurable would have valuable practical applications in this way. Silicon combines with iron at high temperatures, and pig irons often contain it. Revised by Ira Remsen.

Silis'tria (anc. *Durostorum*): town; in Bulgaria; on the Danube; about 70 miles N. W. of Varna (see map of Turkey, ref. 3–E); carries on a large trade in wheat and lumber. It is specially important as one of the strongest fortresses on the Danube. Until the conclusion of the Russo-Turkish war (1878) it was for almost 500 years the main bulwark of the Ottoman empire on its northeast European frontier. The Russians besieged it in vain in 1773, 1810, and 1854. In 1828–29 12,000 Ottomans withstood for months the whole army of Marshal Diebitch, but July 1 the town was forced to surrender, and the fortifications were demolished. Though not captured by the Russians in 1877–78, the demolition of its principal redoubt, Arab Tabia, was one of the stipulations of the Congress of Berlin (1878). Pop. (1893) 11,710. At a village 6 miles S. E. from Silistria the treaty of Kaĭnardji was signed (July 21, 1774), the conditions of which were the most disastrous up to that time imposed on the Ottoman empire. E. A. Grosvenor.

Sil'ius Ital'icus: poet: full name Tiberius Catius Silius Italicus, which is found only in one inscription (*Corpus VI.*, 1984). Born in 25 A. D., at what place it is not known, he acquired some reputation as a pleader at the bar, was consul in 68, and was proconsul in Asia, probably under Vespasian. Possessed of ample means, he purchased numerous villas, including one that had been Cicero's, filled them with books and works of art, and devoted himself to literature and philosophy. The latter part of his life was spent in retirement on the Campanian shore, near the tomb of Vergil, of whom, as well as of Cicero, he was an ardent admirer. Among his friends were the Stoics Epictetus and Cornutus, and he ended his life in true Stoic fashion by voluntary starvation in 101, being afflicted with an incurable disease. His epic poem, entitled *Punica*, in seventeen books, is the longest of the Roman epics, and also the dullest, evincing, as the younger Pliny says, more industry than talent. The subject is the second Punic war, and the two great heroes are Scipio and Hannibal. Livy is his principal source for the facts and Vergil for the phraseology, while various incidents are imitated also from Homer. Of late Silius has found few readers, and has been seldom edited. The best text is given by L. Bauer (2 vols., Leipzig, 1890–92). Of earlier editions may be mentioned that of Ruperti (2 vols., Göttingen, 1795–98). Another work, entitled *Homerus Latinus*, a Latin version or epitome of the *Iliad*, in 1,070 hexameters, is generally ascribed to Silius, and was probably composed at a much earlier period than the *Punica*, and not later than the time of Nero. At the beginning and end are found acrostica, Italicvs scripsit. This has been edited by F. Plessis (Paris, 1885). See also R. Döring, *Ueber den Homerus Latinus* (Strassburg, 1884) and *De Silii Italici epitomes re metrica et genere dicendi* (Strassburg, 1886). M. Warren.

Silk [O. Eng. *seolc*; akin to Russ. *shelkŭ*, Mongol. *sirgek*, and obtained from a different source from Germ. *seide*]: a fine, soft, strong, elastic, and lustrous filament or fiber produced by the larvæ of certain bombycid moths which feed on the leaves of the mulberry (*Morus alba*) and other trees, and are known as silkworms. (See Silkworm.) The name silk is also applied to the textile fabrics woven from these filaments or threads. The finest silk is the product of the *Bombyx mori* or silkworm proper, which feeds on the mulberry. Some of the other varieties of silkworms, which are found in a wild state, produce what is commonly known as wild silk, a rather coarse filament possessing few of the properties of the mulberry-fed silk. Tussah silk, produced by the oak-feeding worm, is woven by the natives of India and China into a cloth of primitive make; and of late years, owing to the improvements made in the mode of treating it and depriving it of its gum, it has found a more extended consumption in Europe. The extreme fineness of silk adapts it for articles in which appearance has to be combined with lightness and durability. So great is the fineness of the thread formed in the cocoon that several of them have to be reeled together into one single thread. This fineness varies, even in the same cocoon, and reaches as low as $\frac{1}{400}$th of an inch in diameter, while the length of the worm's secretion is very great compared with its weight, exceeding 1,000,000 yards to the pound.

Preparation of Silk.—The secretion which the full-grown silkworm emits comes out through two separate seric tubes which combine in the worm's "spinner" under its lower lip. The cocoon is formed in six or eight days, and in about three weeks the worm undergoes all the transformations into chrysalis and butterfly. The best cocoons are carefully selected and retained for seed—i. e. for the hatching of the moths which are to lay the eggs for the following year. The chrysalides in the other cocoons have to be killed in order to prevent the piercing of the cocoon by the moth, which would make it unfit for reeling. The smothering of the chrysalis can be accomplished in hot-air ovens, with damp air or with dry air, by steam, and by exposure to the hot sun. It has also been attempted with carbonic acid, sulphur fumes, etc. The cocoons are then ready for reeling, and have to be separated in groups in order to obtain as much uniformity as possible in color and quality of the silk to be reeled. Stained cocoons and others having imperfections are grouped separately. Before reeling the cocoons are cleaned by removing the frame which the worm builds before lining it with the valuable fiber, and which is the floss or loose silk. The reeling has to be done very carefully, and female labor is mostly employed in doing it. The value of the product, its fineness, its uniformity, are all dependent on good reeling. While the filament in the cocoon is a continuous and independent thread, the glutinous or gummy substance which makes the cocoon a kind of homogeneous mass has to be softened or dissolved in order to permit of the free unwinding of the cocoon thread. The reeling of the silk is done while the cocoons float in a pan of hot water, the temperature of which is between 194° F. and the boiling-point, the spinner touching them lightly with a small broom in order to find the end of the threads that have to be spun together. According to the thickness of the silk to be obtained, from two to six cocoons or more are reeled together into a single thread. Attached to these threads is still sufficient of the gum to cause them to be glued together with a slight pressure of the fingers and a light twist. The combined thread is then carried on to the reel. New cocoons have to be taken and their ends joined to the continuous thread when the first cocoons give out or cease to spin. The thread produced by reeling is known as *raw silk*, and comes in commerce in large skeins or hanks.

Principal Countries producing Raw Silk.—These are Italy and France in Europe; China, Japan, India, and Asiatic Turkey in Asia. Silk is also produced in Spain, Austria-Hungary, Greece, European Turkey, Russia, Persia, Central Asia, etc., but on a smaller scale than in the countries first named. Notwithstanding all the efforts made to introduce sericulture in the U. S., very little raw silk is produced there at a profit. The opening up to commerce of the ports of the far East greatly increased the supply of raw silk available for Europe and America, and as this supply has been increasing at a steady rate, there has been a tendency toward a lower level of prices. The production of raw silk of the world in 1893 and 1894 may be estimated to have averaged about 30,000,000 lb. per annum. Of this China and Japan supplied more than half. Italy produces

about one-sixth of the entire world's supply, France much less. Raw silk is graded in regard to its commercial value; French and Italian is the higher priced, that produced in Asiatic Turkey, Japan, and that part of China known as the Canton district follows, and common China silk shipped through Shanghai represents the inferior grade.

Conditioning.—The raw silk reeled in Japan and China on the European system is classified as filature. Native-reeled silk can be rereeled; these are known as rereels. The fineness of raw silk is expressed by a number, which indicates the weight for a certain number of yards. This weight is expressed in *deniers* (old style *pennyweight*), and is called its title (French, *titre*; Italian, *titolo*). Of this there are several standards, the most used being the Milan legal standard and the Lyons standard, the first numbering 1 for each unity of weight of ½ decigram for 450 meters, while the Lyons standard, which is also known as the international, numbers the same unity of weight for every 500 meters. As, however, uniformity in fineness is not obtainable, the "number" of raw silk is usually expressed between limits. Thus if raw silk is numbered 9/11 deniers, it means that for every unity of length it weighs between 9 and 11 times the unity of weight, averaging 10 deniers. A scientific method of assaying silk has been found necessary, in order to establish its title, the amount of moisture it contains, etc. This is commonly called conditioning. Nearly every European city in the industries of which silk plays any part has a conditioning establishment. A certificate is given for each separate parcel, which gives it a sort of legal status, and is sufficient for commercial purposes. Nearly all the silk exported to the U. S. from Europe is accompanied by a certificate of conditioning, while much of the Asiatic silk imported is conditioned in the U. S.

Waste Silk.—Under this general name may be included everything that in the course of the manufacture, from the cocoon to the finished fabric, is eliminated through one reason or another. This includes the pierced cocoons which have been used for seed, and all others that are unadapted for reeling. In reeling the raw silk only about 70 per cent. of the silk in the cocoon is utilized, the rest going as waste. Waste is also made at every subsequent process of manufacture. All this waste is the raw material for a subsidiary but important industry, that of making the yarn that is commonly called spun silk, which can be used for many purposes, as it possesses all the luster of silk. Spun silk is used as filling in silk fabrics; it can be used in combination with wool, cotton, and other fibers, in mixed goods. Spun silk is also much used in the manufacture of velvets and plushes.

Treatment of Raw Silk.—Raw silk has to be thrown before it becomes fit for further process of manufacture. Only for a few special tissues can it be woven as it is. The throwing consists in twisting several threads into one thicker thread. It includes various operations, such as rereeling, doubling, cleaning, spinning, doubling again, twisting, and, if the silk has to be dyed, reeling again into skeins. Thrown silk is known as *tram* if to be used for the filling and as *organzine* if to be used for the warp. The tram, being less exposed to friction and to rough handling during the weaving, is less strong than the organzine; it has a smaller number of raw silk threads, and is given less twist in the throwing than is the case with organzine.

Boiling and Dyeing.—Combined with the silk is always present a certain amount of gum, which to some extent impairs its brilliancy. This can be eliminated by boiling the silk with soap, the operation being called "boiling off." Boiled silk is as near as possible the purest silk obtainable for commercial purposes. The loss in weight caused by the boiling may be as high as 25 per cent., but there is a proportionate gain in the brilliancy of the fiber. Boiled silk is used in the richer tissues, in which great luster has to be combined with strength and softness of the fiber. For some tissues only a partial boiling is necessary, while for others all the original stiffness of the fiber is required. The operation of boiling usually precedes the dyeing. The dyeing of silk is a very delicate operation, and while the desired shade has to be produced on the fiber, this must not lose its brilliancy. Silk takes the dye as easily as wool, and more readily than any of the vegetable fibers. Silk can also be bleached by being exposed to the action of sulphur fumes. The loss in weight which silk sustains through the boiling can be regained in the operation of dyeing. The dyer can even increase the weight of the silk by what is called loading, but the increase in weight is often obtained at the expense of the strength of the fiber. This operation is based on the property possessed by silk of absorbing and retaining other substances. The substances available are white sugar, tannic acid, compounds of tin, lead, iron, and other metals. The excessive loading of silk is intended to deceive the consumer, and such addition is extensively made to black silks, the *charge* sometimes more than doubling the weight. Silk that is not loaded is commonly known as pure dye. The silk is usually dyed in the skeins before being woven. The tissues can be dyed after they have been woven, but usually only the lower-priced and lighter tissues are so treated. The operation is called piece-dyeing, as distinguished from skein or yarn dyeing.

Fabrics of Silk.—The natural qualities of silk make it possible to obtain with this fiber greater diversification in the tissues that can be woven with it than is the case with any other fiber. The weaving is preceded by the operations of winding, spooling, warping, etc., which make the yarn ready for the loom. Improvements in machinery have made it possible to weave almost any fabrics on power-looms, and the greater proportion of the silk tissues now produced are so woven, although some of the richer fabrics require so much care that they can be produced only on hand-looms. In the U. S. the looms are nearly all driven by power, but in Europe there are still many hand-looms. Tissues can be classified into two distinct families. Plain tissues are in one color only, and show no elaborate pattern, the variety in them being obtained by the different arrangement of the warp and filling threads as regards each other. Fancy tissues include all those in the making of which enter more than one color, all figured tissues that show a design. When one color is used for the warp and another for the filling in a plain tissue, the two colors combine, producing a peculiar effect of reflex, known as changeable (French, *glacé*). Plain silk cloth can be embossed, producing figures in relief; for this purpose only the lighter silk tissues are used. Another peculiar effect that can be produced on silk fabrics, and which is commonly called *moiré*, is obtained by exerting strong pressure on the surface of a grained silk fabric (gros-grain) which becomes flattened at certain spots, producing a design. In the weaving of tissues various kinds of raw silk are employed, according to the cloth that has to be woven. The sort of warp that is used for some fabrics is not suitable for others, and the number of twists per yard of length which have to be given to the organzine also varies. In the tissues produced the weave varies according to the position of the single warp and filling threads relatively to each other. Satin has a smooth surface, formed by well-twisted warp threads. Taffeta is relatively light tissue, plainly woven. Pongee is still lighter, and was first imported from China; it is woven in the U. S. and Europe in several varieties, known under different names. The Japanese export large quantities of light silk fabrics, which are known as habutai and kaiki. Grained surfaces are represented by gros-grain and other tissues. A good gros-grain has to be carefully woven to insure the regularity of the grain. Surah represents the twilled weaves. Ribbed fabrics are also plentiful in silk goods, and are known under various names, according to the thickness of the ribs. Tulle, gauze, grenadine, and veil are transparent fabrics, the weaving of which requires special care, and the threads for which have to be specially thrown, as some of these require thread more twisted than is the case with other goods. Under the name of armures are known fancy weaves, which show a special effect or design, usually very small, and formed by the threads themselves without the aid of a change in color. Damask, brocade, and damassé are figured fabrics in which a design is produced while they are being woven. Silk can be woven alone and in combination with other fibers. Good wearable tissues are obtained by weaving together silk and wool. Some dress fabrics are made with silk warp and wool filling. Others have wool warp and silk filling. The principal representative of these is bengaline, which is a silk and wool poplin. To the bengaline family also belong crystal weaves, being large fancy ribbed goods in silk and wool mixtures. Other silk and wool mixtures, known under the names of Ottoman and others, show more or less large ribs, and are principally used for cloaking purposes. Silk is also much used in combination with cotton for making cheaper goods, which are used for linings, for umbrellas, and other purposes. The cheaper satins are made of silk and cotton, and are known as cotton-back satins (the silk showing on the satin face, the cotton on the back) to distinguish them from the all-silk satins.

After the tissues have been woven they have to be "finished." This is usually done in separate establishments, and is the final operation of manufacture. The finisher passes the tissues over rollers. Some tissues have to be "sized," a pasty or starchy substance being added in the finishing process, which is sprinkled over or otherwise transferred on the tissues while they travel on the rollers.

Silk-printing.—Silks are printed—a colored design is produced on them—by means of engraved rollers. The cloth travels in a continuous strand, and as it passes under each engraved roller it receives the impression for one color of which the design is composed. There are two different systems of printing. In the chemical process the pieces are treated as if they were to be dyed in one color, except that care is taken to prevent the fixation of the color on certain points; on these portions, either at once or in the later handling, other colors appear, thus forming the design. The other process, which may be called the mechanical, consists in transferring every color, ready prepared, and in the form in which the fiber will take it, on the surface of the cloth by means of the rollers. The printing is done on a machine which can give as many different colors as it has engraved rollers, some machines having as many as twelve rollers. In Europe some printing is done by hand with the old-fashioned blocks, but hand-printing is, as a rule, only resorted to for the more delicate and elaborate designs. Lyons, France, has been for a long time the center of the silk-printing industry. Since about 1880 silk-printing has become an important branch of the silk industry of the U. S.

Sewing-silk and Machine Twist.—The invention of the sewing-machine called for the manufacture of a special kind of sewing-silk. This is called machine twist. The making of sewing-silk may be called a continuation of the process of throwing. This branch of the industry was the first to be established in the U. S., where it has reached its full development, importations being very small and insignificant.

The *principal silk-manufacturing countries* are France, with a product having a value of about $100,000,000 per annum, and the U. S., with a product valued at about $80,000,000 per annum. Switzerland and Germany follow with products exceeding $20,000,000 per annum. Great Britain has an important silk-manufacturing industry, which, however, has made little progress since 1860. It is the largest importer of silk-manufactures, purchasing over $50,000,000 worth yearly, and exporting only a comparatively small amount. The U. S. imports over $30,000,000 worth per annum, and exports very little. With its large home production, the U. S. is now the largest consumer of manufactured silks. France, Switzerland, and Germany, on the other hand, export more than they import. Italy has made good progress since 1870, but has more importance as a producer of raw silk than of silk-manufactures. Japan has made great progress since 1880 as a silk-manufacturing country, and in 1899 exported over 21,000,000 yens' worth of goods.

History.—After wool and linen, silk seems to have been, in the remote East, one of the earliest of textile industries. The Chinese records agree that Hwang-Ti, Emperor of China, charged his first or principal wife or queen, Si-Ling-Chi, to examine some silkworms and test the practicability of using the thread from the cocoons. In her zeal she collected large numbers of the worms, fed them herself, and discovered not only the means of rearing them, but also the method of reeling the silk and of employing it to make garments. The period when this beneficent discovery was made is left as vague as the rest of the Chinese chronology, and European writers have differed in regard to the date all the way between 2700 B. C. and 1700 B. C. Other particulars in the long and useful reign of Hwang-Ti render it probable that he ruled over China during the greater part of the century 1800 to 1700 B. C. The Chinese say that Si-Ling-Chi was deified for this meritorious act, and that she has ever since received divine honors under the name of "the goddess of silkworms." The wild silkworms—or at least some of the numerous genera and species of the *Bombycidæ*—were found in great numbers in other countries of Southern or Eastern Asia; they inhabited the jungles of India, Pegu, Siam, and Cochin-China; but for many centuries the only use made of their cocoons was by carding and spinning the silk, very much as spun silk is now produced. Meanwhile the Chinese kept their methods of rearing silkworms and reeling silk a profound secret for nearly 2,000 years. During this period silk-culture had made a little progress westward; some of the nations of Central Asia who were under the sway of the Chinese were rearing silkworms under rather rigid restrictions; and Persia was for nearly 1,000 years the common carrier of silk between China and the West, without knowing how silk was made. Aristotle was the first European to learn the true origin of the wrought silk brought to him from Persia on the return of the victorious army of Alexander. He described the silkworm as a horned insect, passing through successive transformations, and producing *bombykia*, the name he gave to the silk. The prevalent theory of the origin of silk among the Greeks and Romans for at least 500 years after this time is given with all seriousness by Ammianus Marcellinus, in the first century after the Christian era, in the passage in which he represents the *Seres*, or silk-growers, as "a sedate and gentle people, passing their happy days in the most perfect tranquillity and delightful leisure, amid shady groves, fanned by gentle breezes; these groves produce fleeces of downy wool which, after being sprinkled with water, is combed off in the finest threads and woven into *sericum*" (the Latin name of silk). Vergil also says in reference to silk, "Velleraque ut foliis depectant tenuia Seres" (The Seres comb the delicate fleeces from the leaves). Probably both writers had confounded the gathering of the silk-cotton from the silk-cotton tree (*Bombax*) of the East with the production of silk.

Silk-culture in Europe.—In Aristotle's time Pamphila and her associates in the island of Cos (or possibly Ceos, the modern *Zea* in the Ægean Sea) had imported silk goods, or possibly raw silk, from Persia, and, unraveling it, had woven from the single and delicate threads a silken gauze, which from its transparency received the name of "woven wind." Her example was followed somewhat later by the Roman ladies, who used the silk only for the warp of these delicate tissues, while the weft or filling was of fine threads of linen or cotton. The Phœnicians of Tyre, Sidon, and Berytus also procured raw silk from the Persians, and wove silk goods for Corinth and Rome. The latter city under the emperors indulged freely in the costly luxury of silk attire. It became the favorite dress of both sexes, and sumptuary laws were passed to restrict its use to women, and to the wealthy among these, under the reigns of Tiberius, Vespasian, and Diocletian. Silk in its raw state was still imported through the Persians, and continued to be till the time of Justinian in the sixth century of the Christian era. That emperor, having engaged in war with Persia, found his supply of silk cut off and the manufacturers in great distress. Two Nestorian monks then arrived at Byzantium from China, bringing with them the seeds of the mulberry, and communicated to him their discovery of the mode of rearing silkworms. The exportation of the eggs of the silkworm or of the unreeled cocoons from China was at this time forbidden under the pain of death; but, stimulated by the persuasions and liberal promises of Justinian, the two monks returned to China, and in 555 came back, by way of Persia and Bokhara, to Byzantium, bringing with them a quantity of silkworm eggs concealed in the hollows of their pilgrims' staves. From this small beginning the culture of silk spread rapidly over Greece and Syria. It was introduced into Spain and Portugal in 711 by the Saracens, into Sicily and Naples in the twelfth century, and probably in the thirteenth into Genoa and Venice. It was not generally extended throughout Italy and Piedmont till the sixteenth century. It did not take root in France till the latter part of the sixteenth century and the beginning of the seventeenth, but during the latter century it made great progress there, as well as in Belgium and Switzerland. The manufacture of silk had begun earlier in France and Germany, and to some extent in England. It is worthy of notice that from the sixth to the seventeenth century the choicest silks, under the names of *samite* (*examitum*, or six-threaded), *cendal*, *siglatoun* or *cyclatoun*, *dysaspres* or *diaper*, *escaraments*, *bauderquin* or *baldaquin*, and cloth of gold, were woven first for the churches and cathedrals and for the hierarchy of the Church, next for kings and emperors, and finally for the higher nobility and the wealthier knights of the age of chivalry. Up to the close of the twelfth century silks—some of them with raised woven figures of Oriental patterns, but the best embroidered by hand with years of labor—were brought first from the East, from Persia and China, and later from Greece, where the art of weaving and embroidering these rich textiles was kept secret; still later from Spain, where the Saracens had introduced these arts; and from about the middle of the twelfth century from Sicily, where the Saracens had at first transported their skill

from Spain, but were superseded by Greek silk-weavers whom Roger, King of Sicily, had brought as captives from Corinth, Thebes, and Athens to his own island. Some of these early silks surpass in beauty any of the productions of the manufacturers of modern times. In another hundred years the manufacture of silk had extended to Lucca, and thence, about sixty years later, to Venice, Florence, Milan, Genoa, and Bologna. The manufacture of silk goods was brought from Lucca to Lyons probably as early as the fifteenth century, but it made little progress until silk-culture and the production of the cocoons and raw silk were established at the beginning of the seventeenth century. In England the manufacture had made a little progress in the fifteenth and sixteenth centuries, but all attempts at silk-culture had failed. In Austria, Germany, Switzerland, and the Netherlands there were manufactories of silk, but very little silk was grown.

In America.—The first attempts to introduce silk-culture into America were made very early. James I. having been foiled in his efforts to establish the rearing of silkworms in England, and having learned that the climate of Virginia was favorable for silk-culture, sent over, in 1622, silkworm eggs, white mulberry-trees, and some printed instructions. Large bounties were offered for the production of raw silk, and fines were imposed on every planter who failed to plant a certain number of mulberry-trees, but the enterprise was neglected by the company and thrown upon the planters before it was fully established, and hence failed. Some silk was exported to England for several years, but after a time the attention of the planters was turned wholly to tobacco. At the time when the colonies of Georgia and the Carolinas were founded, the effort was made to revive the culture of silk there, and under vigorous protection and encouragement from England it was for a period of perhaps twenty-five or thirty years very successful. The first shipment of silk from Georgia consisted of 8 lb., and was made in 1735. From this small beginning there was a steady increase to 1759 or 1760. After 1760 the culture of silk declined; probably the next year's yield was not more than $80,000.

The culture was not attempted in Connecticut till about 1760, but it was carried on there more persistently and extensively than anywhere else in North America. For many years the silk produced in Connecticut amounted to $100,000 or $200,000 per annum, but was seldom exported, being mostly made up into sewing-silk and into woven fabrics by home manufacture. The rearing of silkworms was also attempted with some success from 1869 to 1875 in Pennsylvania, New Jersey, New York, Rhode Island, and Massachusetts. In most of these States it had been given up during the Revolutionary war, and was not revived again till about 1825 or 1826. New machinery for reeling, throwing, and weaving silk was invented and put into operation; and as the supply of American-grown silk was not sufficient to meet the demand, a moderate quantity was imported. But the imports of manufactured silks continued to increase. The history of silk-culture in the U. S. has been one of ceaseless efforts toward a goal that has not yet been reached. Silk-manufacture, however, has developed into a staple industry. In 1830 an effort was made to introduce the so-called Chinese mulberry (*Morus multicaulis*) in the place of the white mulberry (*Morus alba*) on which the silkworms had been fed hitherto. Speculation came in and in 1839 twigs of the *Morus multicaulis* less than 2 feet in length and of the size of a pipe-stem were sold for $2, $3, or $5. In the autumn of 1839 the bubble burst, ruining thousands. In 1844 a severe winter destroyed most of the trees, and blighted in the Northern States generally the white mulberry; and for the second time the rearing of silkworms was practically abandoned in the U. S.

Yet great good resulted, in the end, from this apparent disaster. The men who had devoted so much attention to silk-culture, finding the rearing of silkworms unprofitable, turned their energies to the manufacture of silk. From the beginning of the nineteenth century there had been some importation of raw silk, mostly for the fringe and dress-trimming manufacturers, and to some extent also for exportation; in some years it had amounted to $100,000, $200,000, and in one year to $600,000. As yet there was little done save in sewing-silks, dress-trimmings, and a few styles of ribbons; but in the next decade (1850–60) the demand for sewing-machine silk and twist began to increase, and by this time it was found that the best brands of American sewing-silks fulfilled all requirements in quality, evenness, strength, and color. Pongees, Japanese silks, and other mixed goods were made of as good quality as the imported; handkerchiefs, ribbons, and a few pieces of broad goods were put upon the markets, and were creating a demand for more. After years of experiment the spun silks made from silk waste, pierced cocoons, etc., were coming into use, and greatly reducing the cost of those goods of which they could form a part. As yet (in 1860) American silk-manufacturers had received no protection or aid from the Government; but in 1861 the exigencies required the raising of a large revenue, and a duty of 40 per cent. *ad valorem*, which was afterward raised to 60 per cent., was imposed on manufactured silk, while raw silk was admitted free. In 1840 some machinery was taken from Connecticut to Paterson, and gave rise to an industry that has been steadily growing and has caused Paterson to be called the Lyons of America, since it is the principal silk-manufacturing center in the U. S.

In the U. S. nearly everything that is known in the line of silk-manufactures can be produced, although foreign goods find a market either on account of their novelty, as Europe retains the supremacy in designing and in fashion, or because the lower wages paid in other countries enable foreign manufacturers to sell some lines of goods cheaper than they can be produced in the U. S., notwithstanding the import duty.

SILK INDUSTRY IN THE U. S., CENSUS OF 1890.

STATES.	Establishments.	Capital.	Average number of hands employed.	Wages paid during the year.	Net value of finished goods.
California	9	$112,283	214	$83,566	$266,312
Connecticut	35	9,037,042	5,081	2,006,804	8,123,561
Illinois	10	422,096	805	295,636	785,845
Maryland	4	50,400	75	24,233	100,361
Massachusetts	20	3,353,296	3,216	1,296,399	4,611,959
New Jersey	132	16,809,927	17,917	7,176,180	25,405,982
New York	185	11,165,918	13,151	5,584,399	17,736,315
Ohio	3	37,830	40	13,685	33,927
Pennsylvania	66	9,362,063	9,522	2,981,334	11,404,223
Rhode Island	3	122,256	194	61,978	135,000
All other States	5	534,426	698	156,104	551,114
Totals	472	$51,007,537	50,913	$19,680,318	$69,154,599

The values of the principal items in the production, as given in the census of 1890, are: Ribbons, $17,081,447; dress goods, figured and plain, $15,183,134; machine twist and sewing-silk, $7,068,213; upholstery goods, $7,630,536; dress and cloak trimmings, $4,403,757; tailors' linings, $3,011,437; other broad goods, $1,928,036; handkerchiefs, $1,913,224; fringe, knitting, embroidery, and floss silk, $1,849,631; hosiery and knit goods. $1,150,172; velvets and plushes, $3,141,026; braids and bindings, $2,771,382; tie silks and scarfs, $919,919; laces, $261,750; military trimmings, $232,600; other goods, $602,330.

To meet the requirements of the increasing production of silk-manufactures the imports of raw silk in the U. S. have been increasing steadily. This progression is shown by the following table, giving the imports of raw silk in fiscal years:

YEAR.	Pounds.	Value.
1843	17,898	$53,350
1850	* 120,010	401,385
1860	* 297,877	1,340,676
1870	583,589	3,017,958
1880	2,562,236	12,024,699
1885	3,424,076	12,421,739
1890	5,943,366	23,285,099

* Estimated from current prices.

Artificial Silk.—In 1888 public attention was called to a chemically prepared substance called artificial silk. This is a pure cellulose obtained by treating wood-pulp, cotton, or other fibers with acids; run through a fine funnel it can be formed into a filament that is almost as fine as silk, possesses all its brilliancy, and can be dyed very readily; it is, however, easily set on fire. F. Sansone.

Silk-cotton: the cottony down of many malvaceous trees of Africa, India, and South America, of the genera *Bombax*, *Eriodendron*, *Chorisia*, etc. *Eriodendron anfractuosum* is the common silk-cotton tree of the West Indies. The trees are mostly very large, with very soft wood.

Silk, Vegetable: See Fiber.

Silkweed, or Milkweed: a plant of the genus Asclepias (*q. v.*).

Silkworm: the silk-producing larva of a bombycid moth. The silkworm proper, *Bombyx mori*, feeds upon the mulberry, and was originally derived from the northern or mountainous provinces of China, though the wild worm has not been rediscovered. The moth is white, with the fore wings falcate, and the hinder pair not reaching the tip of the abdomen, and antennæ well pectinated. The caterpillar is hairy when hatched, with a large head. When fully fed it is naked, not very thick-bodied, cylindrical, with a tubercle on the second thoracic ring and a long horn on the tail. It is 3½ inches long, and of an ashy or cream color. In almost every batch of worms raised in India there will be seen, after the first moult has occurred, some dark-colored worms, which at first glance appear to be a distinct species, but they are actually types of the original species. The silkworm is an annual, though some allied species yield two or three broods in the warmer parts of India. It moults four times, but occasionally only three times. The eggs are about the size of mustard-seeds, and the larvæ of the first age are one or two lines long, and of a dark color. In five days begins the second stage. In the third stage the worm is naked, whitish, and lives six days before attaining the fourth. The fifth stage is the longest, lasting nine days; and at this time the worm is very voracious. It then ceases to eat, and in about thirty-six days after hatching it begins to make its cocoon, which is spun from the large silk-glands opening in the under lip (labium). See SILK.

In the rearing of the silkworm the work-room should be well ventilated and warmed, with racks containing frames from 1 to 1¾ yards in breadth, with a border to prevent the worms from falling, and lined with paper on the bottom. The eggs laid before the end of winter are hung up in woolen cloths in a cool, dry place exposed to the N. As soon as the buds of the mulberry-tree begin to unfold the eggs are spread out on sheets of paper in very thin layers, placed for three or four days on a table in a room having a southern aspect, but out of the direct rays of the sun. The temperature of the room is gradually raised to 25° C., and maintained till all the eggs are hatched. The larvæ are fed six to eight times a day on chopped leaves. The worms are removed to new food by nets placed upon the old food, the worms ascending through the meshes to the fresh leaves placed above. When fully fed the worms ascend into sprigs of heather placed at intervals on the tables. Here they spin their cocoons, some of which are white, producing the best silk, while most of them are yellow. See the illustration given in the article ENTOMOLOGY.

Of the diseases which affect the silkworm, muscardine was until lately the most prevalent, the losses in France being estimated at one-sixth of the profits. When affected, the worm changes to a duller white, its movements are slower, it becomes soft, and soon dies. Seven or eight days after death it turns hard and reddish, and in a day after the whole body becomes floury. The disease was found by Bassi, an Italian, to be due to the attacks of a fungus, *Botrytis bassiana*. But still more destructive is the disease called *pebrine*, in allusion to the dark spots peppering (whence the term *poivrine*, *pebrine*) the skin of the worm. This disease was probably unknown before 1842. Quatrefages believes that the disease is not a new one, but was confounded with muscardine; he compares it with the Asiatic cholera, and states that it is an hereditary epidemic, and that it may become accidentally contagious and infectious. It originates from the presence of exceedingly minute corpuscles, probably a parasitic fungus, which multiply by self-division and infest the tissues and viscera of the larva, pupa, and adult, as well as the scales of the latter. The disease first showed itself in France, and spread eastward until it reached China, and, in 1865, Japan. It was also a little later introduced into the establishment of Prof. Trouvelot, at East Medford, Mass., and carried off from $5,000 to $10,000 worth of worms of *Telea polyphemus*, the silkworm which he then had under domestication. Pebrine differs from muscardine in being hereditary. Another disease is called *flacherie*, where the worms become enfeebled by the fermentation of the food in the stomach, resulting in the development of vibrios or fermentation-fungi. This disease is also hereditary, but, like muscardine, more or less accidental, and not an epizoötic, as pebrine is, and does not affect the eggs.

Alarmed by the fearful ravages of pebrine, silk-raisers turned their attention to the importation of other silkworms. Of these the tussah and arrinda moths are the most manageable and promising. The tussah moth (*Antheræa mylitta*) has a closed cocoon, spun from an unbroken thread. It is semi-domesticated in India, and the silk is an article of commerce. It spins a hard, most durable silk of a dark-brownish color. While the tussah moth can not be reared in Europe, the related yama-mai (*Antheræa yama-mai*) of Japan, does well in France in the open air.

The AILANTUS SILKWORM (*q. v.*) can be reared in Europe and the U. S., and is double-brooded. Though the cocoon is open at one end, the thread with care can be unwound; in one case an unbroken thread 800 yards long was unreeled. The silk, however, like that of the tussah moth, is coarse, ill-colored, and can not be placed in competition with the most inferior mulberry silk.

A similar article is furnished by the American silkworm (*Telea polyphemus*). The thread is coarser than that of the *Bombyx mori*, but has a rich gloss, and can be used very extensively in commerce. The thread of which the closed cocoon is spun is unbroken, and can be readily unwound. Its larva feeds on the oak, and is thick, fleshy, striped obliquely with white on the sides, with angulated segments, on which are tubercles giving rise to a few short hairs. The pupa is very thick, and the cocoon is regularly oval-cylindrical. The moths leave the cocoons late in May, appearing until the middle of June. They then lay their eggs, generally singly, on the under side of the leaves. In ten or twelve days the caterpillars hatch. The worm moults five times, the first four moults occurring at intervals of ten days, while about twenty days elapse between the fourth and fifth moults. It spins its cocoon late in September, and in six or eight days after beginning it assumes the pupa state, and in this condition passes the winter. A. S. PACKARD, Jr.

Sill, EDWARD ROWLAND: poet and scholar; b. at Windsor, Conn., Apr. 29, 1841. He graduated at Yale in 1861; taught school in Ohio; was principal of the high school at Oakland, Cal., 1871–74; Professor of English Literature in the University of California 1874–82, when he returned to Ohio. He was the author of *The Hermitage and Other Poems* (New York, 1867) and *The Venus of Milo and Other Poems* (1883). D. at Cleveland, O., Feb. 27, 1887. A selection of his *Poems* was published in 1888. H. A. B.

Sill, JOSHUA WOODROW: soldier; b. at Chillicothe, O., Dec. 6, 1831; graduated at the U. S. Military Academy July 1, 1853, and was appointed a second lieutenant in the ordnance corps. After a brief service at the Watervliet arsenal he was recalled to West Point, where he served until 1857 as Assistant Professor of Geography, History, and Ethics; subsequently in command of Vancouver ordnance dépôt, Washington, and Leavenworth dépôt, Kansas. In Jan., 1861, he resigned from the army, and became Professor of Mathematics and Civil Engineering in the Brooklyn Polytechnic Institute. On the outbreak of the civil war he was tendered the colonelcy of a New York regiment, and proceeded to Ohio, where he served as assistant adjutant-general of the State in organizing volunteers, and in the field at the battle of Rich Mountain. In Aug., 1861, he accepted the colonelcy of the Thirty-third Ohio Volunteers, and was engaged in the occupation of Bowling Green, Ky., and Nashville, Tenn., Feb., 1862, and in Gen. Mitchel's expedition to Huntsville, Ala., and seizure of the railroad from Stevenson to Decatur, thus regaining control of Northern Alabama; most of this time he was in command of a brigade. In July, 1862, he was commissioned brigadier-general of volunteers, and commanded a division in the Army of the Ohio at the battle of Perryville, Oct. 8, and subsequent pursuit of the Confederate army. In the battle of Murfreesboro, Dec. 31, 1862, he was killed at the head of his brigade.

Revised by JAMES MERCUR.

Silliman, BENJAMIN, M. D., LL. D.: chemist; b. at North Stratford (now Trumbull), Conn., Aug. 8, 1779; son of Gold Selleck Silliman (1730–90), a lawyer and colonel of Connecticut cavalry during the Revolution; graduated at Yale College 1796; was a tutor there 1799–1802, studying law in the meantime; was admitted to the bar 1802, and in the same year chosen Professor of Chemistry in Yale College; spent a part of the years 1802–04 at Philadelphia, preparing for his professorship under the guidance of Dr. James Woodhouse, of the University of Pennsylvania; gave his first full course of lectures on chemistry at Yale in the winter of 1804–05; spent fourteen months in England, Scotland, and Holland 1805–06, engaged in the prosecution of his studies; made a geological survey of a part of Connecticut, the first exploration of the kind in America; published a memoir, with an analysis, of the fragments of the celebrated Weston meteorite of Dec. 14, 1807; aided Dr. Robert Hare in his ex-

periments with the compound blowpipe, with which instrument he demonstrated the fusibility of several bodies never before fused; secured for Yale College the valuable mineralogical and geological cabinet of Col. George Gibbs 1812; founded in 1818 *The American Journal of Science and Arts*, of which he was sole editor until 1838, and senior editor, along with his son, 1838–46; was the first to notice and record the effect of a powerful battery in volatilizing carbon and transferring it from the positive to the negative pole in the state of vapor; was an eloquent lecturer in scientific topics before popular audiences, having been perhaps the first to give such courses in the principal cities of the U. S.; made a second visit to Europe 1851; resigned his professorship 1853, and was made professor emeritus, but at the request of his colleagues continued to lecture on geology until June, 1855, when he retired from active labors. D. at New Haven, Nov. 24, 1864. He was the author of *Journal of Travels in England* (New York, 2 vols., 1810; 2d ed. New Haven, 3 vols., 1820); *Elements of Chemistry* (1830); *A Narrative of a Visit to Europe* (2 vols., 1853); and several minor publications; he also edited Henry's *Chemistry* (1814) and Bakewell's *Introduction to Geology* (1829). An interesting *Life* was prepared from his MS. reminiscences, diaries, and correspondence, by Prof. G. P. Fisher (2 vols., New York, 1866).

Silliman, Benjamin, M. D., LL. D.: scientist; son of Benjamin Silliman, chemist; b. at New Haven, Conn., Dec. 4, 1816; graduated at Yale College 1837; became associate editor of Silliman's *Journal of Science* 1838, and associate proprietor (with Prof. James D. Dana) 1846; was an instructor in chemistry, mineralogy, and geology in Yale College 1838–46; became Professor of Applied Chemistry 1846, and successor to his father in the chair of Chemistry 1854, which position he held in the medical department till his death. In 1847, in connection with Prof. John P. Norton, he established the Yale Scientific School, which has since grown into the Sheffield Scientific School. He was also Professor of Medical Chemistry and Toxicology in the University of Louisville, Ky., 1849–54; visited Europe with his father in 1851; was a director in the departments of chemistry, mineralogy, and geology in the Crystal Palace world's fair at New York 1853, and prepared (with Charles R. Goodrich) *World of Science, Art, and Industry* (New York, 1853) and *Progress of Science and Mechanism* (1854), in which the results of the exhibition were recorded; was for many years secretary of the American Association for the Advancement of Science, in which capacity he edited the volumes of *Proceedings*: wrote *First Principles of Chemistry* (1846: revised ed. 1856); *Principles of Physics* (1858; revised ed. 1868); and *American Contributions to Chemistry* (1875); contributed many papers to scientific societies, besides the large number published in his own *Journal*; was a popular lecturer on scientific subjects. D. at New Haven, Jan. 14, 1885.

Silo: See Ensilage.

Silo'am [= Lat. = Gr. Σιλωάμ, from Heb. *Shilo'ah*, liter., a sending (of water), aqueduct: Arab. *Silwan*]: (1) a fountain and pool in Jerusalem, on the southern edge of Ophel, 1,708 feet S. S. W. of the Fountain of the Virgin, with which it is connected by a winding tunnel. The fountain proper, hewn out of solid rock, is about 6 feet wide. Like the Fountain of the Virgin, it is intermittent. The lower basin is 52 feet long, 18 broad, and 19 deep, but now holding only 3 or 4 feet of water. It was once arched over. Jewish writers say it furnished the water used in sacrifice on the last great day of the Feast of Tabernacles. Jesus alludes to the practice of sending a Levite with a golden pitcher to get it (John vii. 37–39). This most famous of all the pools in or about Jerusalem is mentioned only three times in the Bible (Isa. viii. 6; Neh. iii. 15; John ix. 7), but frequently by Josephus. In the tunnel alluded to, cut in the solid rock, there was discovered in the summer of 1880 a Hebrew inscription. Prof. A. H. Sayce made the first intelligible copy (Feb., 1881). It is thus translated by Canon S. R. Driver: "Behold the piercing through! And this was the manner of the piercing through: Whilst yet the miners were lifting up the pick, each towards his fellow, and whilst yet there were 3 cubits to be cut through, there was heard the voice of each calling to his fellow, for there was a fissure in the rock on the right hand. And on the day of the piercing thus the miners smote each so as to meet his fellow, pick against pick; and there flowed the water from the source to the pool, 1,200 cubits, and 100 cubits was the height of the rock over the head of the miners." (*Heb. Text of the Books of Samuel*, p. xvi.) This inscription is proof that the excavation was begun at each end, probably simultaneously. The inscription is undated, but the shape of the letters apparently shows that it dates from at least Hezekiah's time; and it is certainly one of the oldest known Hebrew inscriptions. 2 Kings xx. 20, 2 Chron. xxxii. 30 may allude to the excavation. See the discussion by A. H. Sayce in *Records of the Past*, new series. i., 168, *seq.*, and S. R. Driver, *l. c.*, pp. xiv., *seq.* In 1889 a second conduit, some 20 feet below the ground, was discovered leading from the Pool of Siloam to another reservoir which once existed below. To it Isa. viii. 6 is supposed to refer. It was to Siloam that Jesus once sent a blind man to wash (Luke iv. 18). (2) The name of a little straggling, dirty village occupying an old quarry on the east side of the Kedron, overlooking the Pool of Siloam.

Samuel Macauley Jackson.

Sil'phium [Mod. Lat., from Lat. *sil'phium* = Gr. σίλφιον, an umbelliferous resin-bearing plant, perhaps the asafœtida]: a genus of perennial plants of the family *Compositæ*, comprising twenty species, many of which are found in abundance in the U. S. on the prairies and in the Southern States, also in other parts of North America. They are very hardy and coarse, bear large flower-heads, and exude a plentiful resin-like juice, whence the commonest species (*S. laciniatum*) has received the name of rosin-weed. The stem sometimes exceeds 10 feet in height. Both the resin and the leaves are much employed by farriers for asthma in horses, and a tincture has sometimes been found useful as a tonic and diaphoretic. This species is known by the names of Compass-plant (*q. v.*), pilot-weed, and polar-plant, from the fact that its leaves have a tendency to stand with one surface facing the E. and the other the W.; the plane of the leaf, which is usually vertical, is thus N. and S. The prairie burdock (*S. terebinthinaceum*) and the singular cup-plant (*S. perfoliatum*) belong to this genus. Revised by Charles E. Bessey.

Compass-plant (much reduced).

Silu'rian Period [*Silurian* is from Lat. *Si'lures*, name of a people in ancient Britain]: the division of geologic time preceded by the Cambrian period and followed by the Devonian. The name was first applied by Murchison to a rock series occurring in England and Wales in a district formerly occupied by the Silures. In the original description of Silurian and Cambrian rocks a large series was included under both designations, and a long dispute followed. Partly as a means of settling this dispute, but also on paleontologic grounds, the name Ordovician was proposed by Lapworth as the name of a period between the Silurian and Cambrian, and this proposition has received much favor; but the prevailing usage in Great Britain and North America refers the disputed series to the Silurian period, constituting it a minor division under the title Lower Silurian. The Silurian rocks of the U. S. are well developed in the basin of Lake Ontario and in the Champlain-Hudson valley, extending thence southwestward along the Appalachian chain through Pennsylvania, Maryland, Virginia, Tennessee, and Georgia into Alabama. In New England are several outlying areas, in which the rocks are metamorphic. In Ohio, Indiana, Kentucky, and Tennessee are broad areas laid bare by the erosion of the crest of the Cincinnati arch, and a still greater area follows the western coast of Lake Michigan and sends an arm up the Mississippi valley into Minnesota. Other areas are found in Missouri and Texas. The hydraulic cement and salt of New York and the fossil iron ores of the Appalachian chain from New York to Alabama, besides sandstones and limestones of architectural importance, are derived from formations of this period. See Cambrian Period and Geology, and for the flora of this period see Plants, Fossil, and consult Murchison's *Siluria* (1854); Lapworth's *Tripartite Classification of the Lower Paleozoic Rocks* (*Geol. Mag.*, vol. vi., 1879); Sedgwick's *Synopsis of the English Series of Stratified Rocks Inferior to the Old Red Sandstone* (*Proc. Geol. Soc.*, London, vol. ii., 1838).

G. K. Gilbert.

Silu'ridæ [Mod. Lat., named from *Silu'rus*, the typical genus, from Lat. *silu'rus* = Gr. *σίλουρος*, a kind of river-fish, perhaps the sheat]: an extensive family of fishes of the order *Nematognathi*, comprising the catfishes of Europe and North America. The skin is naked; the operculum developed; barbels, especially maxillary ones, well developed; gill-openings confluent below, the membrane being free at its posterior margin; the anterior vertebræ co-ossified and much modified; the inferior pharyngeal bones distinct. Most of the species live in fresh water, but some are found in warm seas. *Silurus glanis* is the sheat-fish found in the rivers of Central and Northern Europe. Among the North American species are the common catfishes or bullheads of the genus *Amiurus*, the stonecats of the genus *Noturus*, and the channel-cats of the genus *Ictalurus*.

Silva, Antonio José, da: dramatist; b. in Rio de Janeiro, Brazil, May 8, 1705. He went to Portugal when a child; was educated at Coimbra, and became a lawyer in Lisbon. He soon became known as the author of numerous comedies, which won great applause and are still regarded as among the finest in the Portuguese language. Silva's mother, who was of Jewish descent, was accused of Judaism, and was imprisoned by the Inquisition; later, suspicion fell on the poet and his wife, they were twice incarcerated, and finally all three were burned at Lisbon, Oct. 13, 1739. H. H. S.

Silva Lisbo'a, Balthazar, da: historian; b. in Bahia, Brazil, Jan. 6, 1761. He studied law at Coimbra, Portugal; held various judicial positions at Bahia and Rio de Janeiro, and in 1823 was imprisoned for a short time on account of his political utterances. His principal published work is *Annaes do Rio de Janeiro* (7 vols., 1834). D. in Rio de Janeiro, Aug. 14, 1840.—His brother, José da Silva Lisboa (b. in Bahia, July 16, 1756; d. in Rio de Janeiro, Aug. 20, 1835), was a well-known statesman, leader of the imperialists in the Brazilian parliament, senator from 1826, and the author of numerous works on history and political economy. He was created viscount of Cayrú in 1830. H. H. S.

Silver [O. Eng. *seolfor*, *seolubr*: Germ. *silber* < O. H. Germ. *silbar*: Goth. *silubr*; source obscure. Lat. *argentum*, Gr. *ἄργυρος*, Sanskr. *rajata-* is another widespread name of the same metal]: one of the precious metals, known from remote ages, and much used for ornaments, household vessels, and for money. Among the alchemists it was known as *luna*. Its chemical symbol, Ag, is derived from the Latin name. It is the whitest of the metals, and takes a brilliant mirror-like polish. In hardness it is intermediate between gold and copper, and it is very malleable and ductile. It may be beaten into foil or leaves 0·00001 of an inch in thickness. A grain of the metal may be drawn out into a wire 400 feet in length. If repeatedly heated it becomes brittle. The specific gravity of silver ranges from 10·1 to 11·1, according to its condition and purity. Karsten found the gravity of fused silver to be 10·4382; G. Rose gives 10·57 for hammered silver, and 10·92 for precipitated silver. The metal fuses readily on charcoal before the blow-pipe or in a crucible in a forge or furnace. It expands forcibly upon cooling, and thus solid pieces will float in molten silver as ice floats in water. It may be vaporized by the burning lens or by the oxyhydrogen blowpipe or strong electrical currents. The vapors are white. When pure the molten metal absorbs from twenty to twenty-two times its bulk of oxygen, according to various authorities, but the presence of a small percentage of copper or lead greatly diminishes or prevents this absorption. The absorbed gas is given off at the moment of solidification, and with considerable force. If the surface of a globule or bar of silver has cooled while the interior is fluid, the expansion breaks the crust and more or less of the fused metal is projected through the cracks, and forms an arborescent growth generally known as sprouting, and, when it is projected with violence, as spitting. This mechanical projection of a portion of a globule of silver cooling upon a cupel is a frequent source of loss in assaying. The absorption of oxygen and the subsequent spitting may be prevented to a great extent by the use of charcoal powder upon the melted metal. Absorption of oxygen is also prevented by fusing it under a layer of salt. The use of niter in the crucible causes a large absorption of the gas. The vapor of water is decomposed by silver at a white heat, oxygen being absorbed and hydrogen liberated. Silver is a good conductor of heat and of electricity. It is capable of being welded, alloys freely with gold, copper, and several other metals, and crystallizes in forms of the monometric system, generally in octahedra.

Silver is abundantly distributed in nature, particularly among the metallic minerals. Malaguti and Durocher give a table of 122 assays, chiefly of metalliferous minerals exclusive of silver ores proper in most of which silver was found in traces or appreciable quantities. It exists in sea-water in the ratio of 1 milligramme to 100 kilogrammes. Assuming that there is 1 centigramme of silver per cubic meter of water, it has been calculated that the oceans contain not less than 2,000,000 tons of silver. The metal has been found in small quantity also in rock-salt in the mines of the department of Meurthe-et-Moselle, France. All native gold contains from ·016 to 16 per cent. of silver, but generally from 5 to 13 per cent.; California gold averages about 12 per cent. of silver. It occurs also nearly pure in masses and irregular grains, but it is not so generally distributed in this form as gold, and is seldom found in placers or alluvial deposits, being confined rather to the vicinity of the outcrops of veins. It is usually in irregular, ragged masses, or in thin sheets coating surfaces of the veinstone, or filiform, as if drawn out into wire. This wire-like form of silver is of frequent occurrence in the cavities of veins. The filaments sometimes reach the length of a foot or more, but are generally much curled up and interwoven or matted together, looking like bunches of hair or wool. Specimens of this description occur in the ore of the Rainbow lode, Walkerville, Montana, and in the Silver King mine, Pinal, Arizona. At Kongsberg, in Norway, the metal has been found massive and in large and perfect crystals, which retain their whiteness without tarnishing in a remarkable degree. One mass taken from these mines and preserved in the Royal Museum at Copenhagen weighs upward of 500 lb. Large amounts of native silver have been obtained in Mexico and South America. One mass in Peru is said to have weighed 800 lb. Large masses have been reported from the northern portion of the Mexican state of Sonora. It is not uncommon, though not in large masses, in the upper portions of the silver-bearing veins of the Western States and Territories of the U. S. It is found also in a vein upon Silver islet in Lake Superior, and associated with the native copper of the Keweenaw Point mines. Some of these specimens are remarkable for being completely joined to the copper, without any intermingling of the metals; half of a mass may be silver and the other half copper.

Specimens of silver when taken from mines are usually tarnished a dull brown, or even black, this color being caused generally by the presence of sulphurous vapors either from the constituents of the vein or the combustion of powder. Such vapors rapidly tarnish silver. Silverware and silver-plate are rapidly tarnished and turned black by the gases of bilge-water, and also by the tainted atmosphere about drains and vaults, and the sulphurous gases from burning coal. The peculiar whiteness of the Norwegian native specimens is supposed to be due to the presence of a portion of mercury. Native silver is rarely pure. The cupriferous variety sometimes contains 10 per cent. of copper. With gold the proportions are variable. (See Gold.) The *electrum* of Pliny contains one-fifth of silver. The pale gold of Transylvania contains from 35 to 38 per cent. of silver. The native alloy in the great Comstock lode of Nevada contains about 43 per cent. of silver, as shown by Attwood, the rest being gold. It is usual to estimate that of the $550,000,000 in value, in round numbers, produced from the lode $250,000,000, or a little less than half, was gold. Gold predominated at the surface, particularly at Gold Hill and Cedar Hill, at the two ends of the lode. Native amalgams have been found in Chili, containing from 52 to 64 per cent. of silver. The metal is also found combined with sulphur, antimony, arsenic, tellurium, etc., and with chlorine, bromine, and iodine, giving a great variety of interesting species. The chief ores are the sulphide, containing 86 per cent. of silver; the brittle or antimonial sulphide, with 68·5 per cent. of silver; gray silver ore, with 23 per cent. of silver; dark-red silver ore, with 60 per cent.; and the light-red silver ore, with 64 per cent. This last is generally known as ruby silver, from the brilliant ruby red of the crystals by transmitted light. In the upper portions of silver-bearing veins, where air and moisture have had access, a certain amount of decomposition has taken place among the minerals, especially if they consist of the above-mentioned species, and new combinations have been formed, which may be called secondary ores. These are generally oxides, chlorides, bromides, and iodides, and are more earthy and highly colored than those in the deeper parts of the vein, being intermingled with oxides of copper, lead, and iron. They are also softer than the un-

changed ores below, and are more easy to work. Such ores are known in Mexico as *colorados*, especially if red, and in Peru as *pacos*. The ores from a greater depth in the mine, which have not been acted upon by the air, are more compact, brilliant, and darker in color, and are called *negros*. The green bromide ores are known in Zacatecas, Mexico, as *plata verde*. Chloride of silver is common in the upper portions of rich silver-bearing veins, and usually forms thin dark-colored crusts or films upon the gangue. It is easily identified by its wax-like hardness, and by giving a globule of silver when fused in the flame of a candle.

A large class of the metallic minerals contain silver in varying proportions, especially galena and blende, which are rarely free from a portion of silver. The greater portion of the silver produced in Europe is extracted from argentiferous galena. The galenas of England and of the Hartz Mountains carry from ·03 to ·05 per cent., and those of Tuscany from ·03 to ·07 per cent. The galena ores of the U. S., with the exception of those of the Mississippi valley, nearly all contain silver in larger quantities, the percentage ranging from ·10 to 1·85 and 3·0, but the quantity of these rich ores is seldom large in the Eastern States. Some of the Wood river and Kootenay lead ores carry 100 oz. to the ton, but 30 to 60 oz. to the ton of lead ore is a very fair yield. Formerly lead ores containing less than 10 oz. could not be profitably worked for silver, but since the discovery by Pattinson, of England, in 1829 of the process which bears his name, the cost of separating silver from lead has been greatly cheapened. Lead containing only 3 oz. of silver to the ton can now be worked with profit, and in smelting operations on a large scale where lead ores are used as a flux even a small amount of contained silver is incidentally important.

The antiquity of silver coinage is very great. The most ancient coins known were struck in silver by Phidon, King of Ægina, B. C. 869. After the conquest of Egypt by Cambyses, about 540 years before Christ, a great improvement appears to have been made in the purification of silver, for that which was produced under Aryandes was celebrated for its purity and fineness. The alloy in the Greek silver coinage generally appears to have been lead, which had not been removed for want of the requisite skill in refining. The Athenian currency was noted for its purity, and Xenophon mentions the profit with which it could be exported. Silver currency was adopted by the Roman republic about 269 B. C., and its standard was as high as the Greek, but it rapidly fell. Under Vespasian the alloy was one-eighth, under the Antonines one-fourth, under Severus about one-half, after which there does not appear to have been a fixed standard. (*King.*) After the loss of Spain, from which the chief supply of silver was drawn, the silver currency vanished, and was replaced by *billon* denarii, having only one-fourth part of silver. According to Pliny, Antony alloyed denarii with iron, apparently to harden the coin. The denarii of Justinian and the Italian Goths weigh about 15 grains troy, and are the reputed direct antecedents of the Anglo-Saxon silver penny.

Silver was largely used by the Romans for household plate and table decoration. It was elegantly chased and embossed in the *repoussé* style by Grecian artists. The wealthy Romans vied with each other in possessing the most massive dishes. Of such dishes, weighing 100 lb. or more, there were 150 in Rome before the first civil war. Pliny cites the existence of one dish weighing 500 lb., with eight plates to match, weighing together 250 lb. The old chased plate of the Grecian artists was valued as a curiosity in Pliny's time. The ornamentation of silver, known as niello-work, originated in Egypt, and was revived and carried to great perfection by the Florentine silversmiths. Cellini gives a recipe for the fusible argentiferous compound used to fill the engraved design. This art was applied to the decoration of armor as early as the days of Homer. Agamemnon's breastplate was thus inlaid. In mediæval times massive plate was in great favor, and the chief form of investment for the noble-born and wealthy. Its extensive use for ecclesiastical decoration is also to be noted. In 1899 7,657,770 oz. of silver were sent out from the mints of the U. S. in the form of bars for industrial uses. The total annual consumption of silver in the industrial arts approximates $53,000,000 coining value, and is increasing.

In modern times solid silverware has been to a great extent replaced by nickeliferous alloys and britannia ware, covered with a layer of pure silver by the galvanoplastic method. Silver may, by this method, be deposited to any desired thickness, thus giving all the appearance of solid silver, and its utility for most purposes. The annual consumption of the metal for this purpose alone is very large. Silver thus deposited is pure, but solid silverware and silver coin contain a portion of alloy, generally copper. In the U. S. and in France the standard fineness is one-tenth of alloy, or 900 parts of silver and 100 of copper, the mixture being denominated ·900 fine. In Great Britain the standard is higher, being 925 of silver and 75 of copper, or ·925 fine. This is the fineness of "sterling silverware."

The value of silver relatively to other objects obviously depends upon two chief conditions—the demand and the supply. The demand is seriously affected by legislation, as, for example, by the demonetization of silver. The variations in the demand are sufficiently indicated by the preceding references to its use in historic times. The supply is also variable, and at times excessive. The production of silver in the large way, owing to its mode of occurrence and mineralization, is more dependent upon the use of mechanical power (steam or water) than upon the labor of men, and generally it requires a heavy plant and large capital. There may therefore be a large production of silver in sparsely populated regions and within a short period of time. With gold, however, the bulk of the product is derived from placers. It is so much more generally distributed in the earth that an unlimited number of men may be engaged together in its production. No expensive preparations or chemical operations are required to obtain gold in a merchantable form.

The value of silver relatively to gold has greatly changed within historic times, and it has been different in various countries. Commerce has tended to equalize this difference. King justly observes that in the ancient world silver was to the same extent the peculiar production of Europe that gold was of Asia. It follows naturally that the estimation of silver relatively to gold was higher in Asia than in Europe—a condition prevailing until within a recent period. Sir Isaac Newton in 1717 showed that the ratio in weight of equal values of the two metals, silver and gold, in China and Japan was as 9 : 1, while it was as 15 : 1 in Europe. Perhaps the earliest recorded ratio is found inscribed at Karnak, the tribute-lists of Thutmosis (1600 B. C.) giving 13·33 : 1. The same ratio is shown by cuneiform inscriptions on plates found in the foundations of Khorsabad and on ancient Persian coins. It was reported by Xenophon (400 B. C.) as the ratio in Asia. Toward the Christian era gold fell in value relatively to silver. As early as about 189 B. C. the Romans coincided with the Greeks in estimating the value of gold compared with silver as 10 : 1. Upon Cæsar's return to Rome gold became so abundant that the ratio for a time was as $7\frac{1}{2}$: 1. A century later the ratio was as $12\frac{1}{2}$: 1, where it remained for 150 years or more. When guineas were first coined in 1663 the value of fine gold compared with that of fine silver was rated in the English mint at about 14 : 1. In 1805 the ratio was nearly as 15 : 1, and in other countries gold was rated higher. In the Middle Ages the ratio varied from 9 : 1 to 12·8 : 1. At the date of the discovery of America the ratio was about 11·30 : 1, since which, up to the discovery of gold in California and Australia, it gradually rose to 15·83 : 1 in the year 1850. In 1870 and 1871 the average commercial ratio was 15·57 : 1, and in 1873 as 15·92 : 1, with a gradual increase to 26·49 : 1 in 1893, 32·56 : 1 in 1894, and 34·36 : 1 in 1899.

The annual production of gold and silver in the world, stated in kilogrammes, with the ratio of silver to gold by weight, is shown in the following table:

YEARS.	ANNUAL PRODUCT, KILOG.		Ratio of silver to gold, by weight.
	Gold.	Silver.	
1871 to 1875, mean	173,904	1,969,425	11·3
1876	165,956	2,323,779	14·0
1877	179,445	2,388,612	13·3
1878	185,847	2,551,364	13·7
1879	167,307	2,507,507	15·0
1880	163,515	2,479,998	15·2
1881	158,864	2,592,639	16·3
1882	148,475	2,769,065	18·6
1883	144,727	2,746,123	19·0
1884	153,193	2,788,727	18·2
1885	159,289	2,993,805	18·8
1886	159,741	2,902,471	18·2
1887	159,155	2,990,398	18·8
1888	159,809	3,385,606	21·2
1889	185,809	3,901,809	21·0
1890	181,256	4,180,532	23·1
1891	189,824	4,479,649	23·6
1892	196,234	4,945,237	25·1
1893	236,570	5,031,488	21·3

The lowest, highest, and average price of bar-silver in London per ounce, British standard, 0·925 fine, since the year 1871, and the equivalent value in U. S. gold coin taken at the average price are shown in the following table:

YEARS.	Lowest (pence).	Highest (pence).	Average (pence).	Average.
1871	60·188	61·000	60·500	$1·326
1872	59·250	61·125	60·313	1·322
1873	57·875	59·138	59·250	1·298
1874	57·250	59·500	58·313	1·278
1875	55·500	57·625	56·875	1·246
1876	46·750	58·500	52·750	1·156
1877	53·250	58·250	54·813	1·201
1878	49·500	55·250	52·563	1·152
1879	48·875	53·750	51·250	1·123
1880	51·625	52·875	52·250	1·145
1881	50·875	52·875	51·938	1·138
1882	50·000	53·375	51·813	1·136
1883	50·000	51·188	50·625	1·110
1884	49·500	51·375	50·750	1·113
1885	46·875	50·000	48·563	1·065
1886	42·000	47·000	45·375	0·995
1887	43·250	47·125	44·625	0·978
1888	41·625	44·563	42·875	0·940
1889	42·000	44·375	42·688	0·936
1890	43·625	54·625	47·750	1·046
1891	43·500	48·750	45·063	0·988
1892	37·875	43·750	39·813	0·876
1893	30·500	38·750	35·625	0·782
1894	27·000	29·916	28·875	0·635

The world's production has increased from 41,260,000 oz. in 1870 to 167,224,243 oz. in 1899. The production in the U. S. was approximately 12,375,360 oz. in 1870 and 54,764,500 oz. in 1899. The production for 1893 was more than 60,000,000 oz., the maximum for the U. S. See the reports of the director of the U. S. mint; Soetbeer's tables; *The Mineral Industry*, vol. ii.; and the annual circulars by W. J. Valentine, San Francisco, and by Pixley & Abell of London.

WILLIAM P. BLAKE.

Chemistry of Silver Compounds.—Silver forms a number of compounds of practical importance and scientific and technical interest.

Silver chloride, or *chloride of silver*, AgCl, is an important substance, which is found native as horn-silver. The insolubility of silver chloride causes its production, by adding a solution of a chloride, to be an excessively delicate test of the presence of silver in a solution. Gay-Lussac's volumetric method of silver-assay, in use in all U. S. mints, depends on the use of a standard solution of common salt to precipitate the silver as chloride. Silver chloride melts at about 500° F. to a clear liquid. On exposure to light and moisture it becomes darker. When any organic matter is present, as when the chloride is applied to paper, this action of light is far more powerful. Photographic methods are chiefly founded upon these kinds of changes of the halogen compounds of silver by light, the dark compound formed under the influence of the light being insoluble in hyposulphite of soda and other fixing agents, while the unchanged chloride, iodide, or bromide of silver remains soluble, and is therefore easily removed from the paper, leaving the picture, composed of the changed dark-colored compound, attached thereto. *Silver bromide*, or *bromide of silver*, AgBr, constitutes the mineral bromyrite or bromargyrite. It is found as an ore in Mexico and Chili, and at Huelgoat in Brittany. At some of the Chilian mines, as in Chanarcillo and in Copiapo, another silver mineral is much more abundant than either the chloride or bromide, which is a combination of the two in varying proportions, called embolite. *Silver iodide*, or *iodide of silver*, AgI, forms the mineral iodyrite, found in Mexico, Chili, Spain, and Arizona. It is sulphur-yellow when pure, and very soft and sectile. Bromide and iodide of silver, when precipitated, are much more sensitive to light than the chloride.

Silver nitrate, or *nitrate of silver*, $AgNO_3$, known also by its ancient name of *lunar caustic*, is manufactured on a large scale, owing to its important applications in medicine and in the arts of photography and electro-plating. It crystallizes very easily, and is largely introduced into commerce in crystalline form, though the lunar caustic for medicinal use is generally fused and cast into sticks or pencils. It is soluble in its own weight of cold water.

Silver sulphide, or *sulphide of silver*, Ag_2S, in pure state, constitutes the mineral argentite or silver-glance. This is, with lead-gray, a regular crystallization, but is often cryptocrystalline or amorphous. The hardness is about that of gypsum, and it has a high degree of sectility, the mineral often cutting almost like metallic lead. It contains, when pure, 87 per cent. of silver, being the richest of all silver ores. It is common among the ores of the celebrated Comstock lode, as well as in many other localities in the U. S. Sulphide of silver forms, in combination with other metallic sulphides, a large number and variety of argentiferous minerals and ores. With sulphide of arsenic it forms the mineral proustite ($3Ag_2S.As_2S_3$), containing 65·4 per cent. of silver. This is a magnificent carmine-red mineral, of adamantine luster when crystallized, the crystals being rhombohedral. Pyrargyrite ($3Ag_2S.Sb_2S_3$), containing 59·8 per cent. of silver, is also a splendid red rhombohedral mineral, of a darker shade of color than pronstite, hence sometimes called dark-red silver ore. Ruby silver ore is also a name applied to both the arsenical and the antimonial species. Proust first showed the true difference between them, as implied in the above formulas in 1804. Proustite is abundant in Mexican, Peruvian, and Chilian mines, but rare in the Comstock lode and most North American silver-districts. It was found, however, very fine and in immense masses, with pyrargyrite, in the Poorman lode in Idaho. Stephanite ($5Ag_2S.Sb_2S_3$), containing 68·5 per cent. of silver, is an iron-black ore, right-rhombic in crystallization, found sparingly in the Comstock lode and in many other North American regions. It is sometimes called brittle silver ore.

Revised by IRA REMSEN.

Silver City: city; capital of Grant co., N. M.; on the Ateh., Top. and S. Fé Railroad; 48 miles N. W. of Deming (for location, see map of New Mexico, ref. 13-Q). It is in an agricultural and stock-raising region; is principally engaged in mining gold, silver, and copper; and contains a smelter, several reduction-mills, flour-mills, a national bank with capital of $50,000, and two weekly newspapers. Pop. (1880) 1,800; (1890) 2,102; (1900) 2,735.

Silver Coinage in the United States: The question whether it is the wiser policy of the U. S. Government to admit the coinage of silver in unlimited quantities at the established ratio with gold, or to restrict the minting of the cheaper metal, has for many years constituted an important issue in party politics. A brief summary of the principal arguments advanced on each side of the question is presented in the following paragraphs:

Free Coinage of Silver.—The advocates of this measure point to the necessity of increasing the supply of currency. Both the national banking system and the policy of buying limited quantities of silver bullion and issuing gold-notes for the purchase-money have failed to furnish an adequate currency. Moreover, the latter policy has been objectionable to bimetallists and monometallists alike, the former party desiring unlimited coinage for both metals, the latter fearing that it would lead to the establishment of silver as the sole standard. In the opinion of the free-silver party, the opposition of the monometallists, and of those bimetallists who would defer the adoption of the double standard till other nations agree to accept it, is based upon merely theoretical grounds, and is at variance with the world's experience. It was not till 1873 that the U. S. Government prohibited the coinage of silver money as full legal tender, and for several years it was evident that the majority of the people strongly desired to return to the old system. The Mint Act of 1792 opened the mints of the Government to the unlimited coinage of both gold and silver at the ratio of 15 to 1. There was no fear of a gold or silver inundation, and though the French Government, in 1803 and 1804, adopted the ratio of 15½ to 1, thus causing the exportation of gold from the U. S., the silver dollar never lost in purchasing power. In 1834 and 1837 the ratio was changed to 16 to 1, which overvalued gold in respect to silver. As a result, but little silver came to the U. S. mints, and the metallic money was principally gold; yet no one complained, except the advocates of the bank, who, in their opposition to the attempt to supersede the bank-note circulation by gold, denounced the latter metal as bitterly as the national banks have since denounced silver. Thus the disparity between the legal and market ratios caused no complaint on either of these occasions, and nothing like an excessive influx of the cheaper metal resulted. As to the argument that the greater value of gold per weight makes it preferable in large transactions, and therefore more suitable for rich nations, while silver is better adapted for the poorer nations, it has lost all force since the expedient of representing gold and silver coins by certificates has been devised. Certificates representing the gold and silver coin in the treasury are accepted by the people in preference to specie.

From the tables submitted to the committee on coinage, weights, and measures, by the director of the mint in his hearings before that body on Jan. 27, 1892, it appears that at the ratio of 15½ to 1 there is about an equal amount of the two metals in circulation. The output of gold and silver from the mines since 1873 shows also about the same ratio in the respective weights of the metals produced. Nor does the fact that in the latter part of this period the ratio has exceeded this in favor of silver invalidate the argument, for the per cent. of increase when compared to the whole stock of gold and silver is too small to be taken into account, and, moreover, is probably but temporary. Since the ratio of the world from 1803 to the demonetization of silver in 1873 was 15½ to 1, and even since the latter date has been about the same, and since the debts of the world, both public and private, have been contracted at this ratio, it is a gross injustice to the producing classes, which at last liquidate these debts, to readjust the ratio so as to conform to the demonetized price of silver as compared with gold. Measured by commodities, gold has risen 50 per cent. since the demonetization of silver in the U. S. in 1873. Silver, as compared with gold, has not fallen more than 30 per cent. Silver, therefore, as measured by commodities, has not fallen, but, on the contrary, the weight of testimony shows that there has been a slight appreciation of silver in spite of its demonetization.

The Secretary of the Treasury, Mr. Windom, in his annual report for 1889, page 73, arguing against the proposition to put more silver in the dollar, says: "The paramount objection to this plan, however, is that it would have a decided tendency to prevent any rise in the value of silver. Seizing it at its present low price, the law would in effect declare that it must remain there forever, so far as its uses for coinage are concerned." In all the centuries of the past no difficulty has been encountered in the question of using both gold and silver as money. For nearly a hundred years the two metals were at par at the French ratio of 15½ to 1. This condition remained till the U. S. and Germany demonetized silver, or, more correctly speaking, the par remained, notwithstanding the demonetization by the U. S. and Germany, till France suspended the coinage of silver. Had France continued the coinage, the par no doubt would still exist. To demonetize silver and thus cause a greater demand for gold, to compel gold to rise 50 per cent. and then insist that silver shall be coined at a ratio to meet the rise in gold, is a legislative confiscation of the rights of debtors. If this policy were generally adopted it would in effect demonetize at least 30 per cent. of the silver stocks of the world; in other words, it would eliminate about one billion two hundred million in value of silver now in circulation. It would also demonetize 30 per cent. of all the future productions of this metal. A restoration of silver by its enlarged demand and consequent enlarged value is demanded. The free use of silver will lessen the demand for gold and increase the demand for silver, thus causing gold to fall and silver to rise, and in this way the par of the two metals can be brought about without injustice to creditors or debtors.

R. P. Bland.

Objections to the Free Coinage of Silver.—Some of the principal objections to the free coinage of silver will appear from the following paragraphs: By the Coinage Act of 1873 the standard silver dollar of 412½ grains was dropped out of the monetary system of the U. S. The act was not passed surreptitiously, as has sometimes been asserted by the silver-money men. It was recommended by the Secretary of the Treasury in three successive messages, the bill was printed thirteen times, considered through five sessions of Congress, and the debates concerning it occupy 140 pages of the *Congressional Record*. Nor did it drive silver out of circulation, because there were no silver dollars in circulation, very few having been coined since 1834 owing to the fact that it had been cheaper to coin gold than silver. Nor was it an attempt to injure the debtor class for the benefit of the creditor class, because at the time the silver dollar was worth 102 cents in gold and no debtor would choose to pay in silver. It is necessary to state these facts in order to show that free coinage of silver can not be demanded on the ground of an original injustice committed in 1873.

From 1873 to 1878 no silver dollars existed in the financial system of the U. S. In 1878 the silver-money men succeeded in passing the Bland-Allison bill restoring the silver dollar as legal tender, but providing for only a limited coinage, so that gold still remained the standard. In 1890 the Sherman act provided for the purchase of a larger amount of silver, 4,500,000 oz. per month, but at the same time declaring it to be the policy of the U. S. Government to maintain all dollars at a parity. Here also there was no adoption of free coinage. In 1893 the Sherman act was repealed so far as the purchasing clause was concerned, and in 1894, the President vetoed the bill for the coinage of the seigniorage. The U. S. since 1873 has therefore rested officially on the gold basis, and for the purpose of maintaining this basis it sold $162,500,000 worth of bonds during 1894 and 1895. On this statement of facts we have the following conclusions:

(1) Free coinage of silver can not be demanded as a matter of justice. Since 1873 all contracts have been entered into on the gold basis, and no injustice has been committed by the Government toward the debtor class.

(2) It is impossible for the Government to maintain the price of silver. Notwithstanding the coinage of $400,000,000 under the Bland act, and the purchase of $152,000,000 under the Sherman act, the price has fallen from $1.29 per ounce to 65 cents per ounce (1895). The fall in the price of silver is due, therefore, to the increased production of silver, not to its demonetization.

(3) Free coinage of silver would not restore its value. Even if it drove all the gold out of circulation the demand for silver as a circulating medium would be limited. If the value of silver went up temporarily an enormous stimulus would be given production, so that the supply would increase and the price would come down. The U. S. would also get silver from other nations who would be glad to unload on it.

(4) Free coinage of silver would therefore not establish bimetallism, but would drive gold out, bring the U. S. to the silver basis and result in inflation of prices. It is said that this inflation would benefit the debtor class who have suffered so grievously during the last twenty years by the fall of prices. It is not probable that such relief would be attained. The first result of free coinage would probably be contraction of the currency by the loss of gold and sinking of values due to panic. All mortgages due would be foreclosed and the land thrown on the market, or the mortgages renewed only on a gold basis. On the other hand, the creditor class would be injured, and in that class are included all depositors in savings-banks, all beneficiaries of trust funds, and all small investors. All men living on fixed salaries would be injured, because the cost of living would go up. Finally, the laboring class would suffer from increased cost of living and because during inflation wages rise more slowly than prices.

Free coinage of silver would seem to be a very hazardous experiment, bringing more hardship and injustice than it remedies. It would remove the U. S. from the ranks of the great commercial nations with the gold standard. It would destroy public credit and lead to partial repudiation of debt. It would drive away the foreign investor of capital and retard the national development. Owing to the apparently unlimited supply of silver it would make the standard of value very uncertain, thus embarrassing all commercial dealings.

R. Mayo-Smith.

Silver Creek: village; Chautauqua co., N. Y.; on Lake Erie, at the mouth of Silver creek, and on the Lake Sh. and Mich. S., the N. Y., Chi. and St. L., and the W. N. Y. and Penn. railways; 9 miles E. N. E. of Dunkirk, 31 miles S. S. W. of Buffalo (for location, see map of New York, ref. 6–B). It is in an agricultural and grape-growing region, and contains manufactories of milling machinery and a weekly newspaper. Pop. (1890) 1,678; (1900) 1,944.

Silvering: See Mirrors.

Silver-plating: See Electro-plating.

Silverside, or **Silver Fish**: See Atherina.

Silver Stick: in the British court, a title borne by the lieutenant and the standard-bearer of the corps of gentlemen-at-arms; also by the field officer commanding any of the guard regiments. See Gold Stick.

Silverton: town; capital of San Juan co., Col.; on the Animas river, and the Denver and Rio Grande and the Silverton railways; 285 miles W. S. W. of Pueblo, 494 miles S. W. of Denver (for location, see map of Colorado, ref. 5–B). It has an elevation of 9,400 feet above sea-level; is surrounded by high mountains, including the noted Sultan Mountain about 2 miles distant; and contains gold and silver mines, smelting-works, a national bank with capital of $50,000, a State bank, and two weekly newspapers. Pop. (1880) 264; (1900) 1,380.

Silvestre, sēēl'vest'r', Theophile Louis: writer on art; b. at Fossat, in the department of Ariège, France, Oct. 12,

1823; was educated in the University of Pamiers and the College of Toulouse, and began to study law and medicine in Paris, but finally devoted himself entirely to the study of art. In 1855–56 he published *Histoire des Artistes vivants*, which attracted much attention (3d ed. 1878). Afterward he visited England, published *L'Art, les Artistes, et l'Industrie en Angleterre* (1859), and lectured on art in various cities in Belgium, etc. Among his other works are *L'Apothéose de M. Ingres* (1861); *Eugène Délacroix* (1864); and *Théodore Rousseau* (1868). D. in Paris, June 20, 1876.

Silvia, Saint, of Aquitania, in the south of France: sister of Rufinus, consul 392 A. D. Her learning is highly praised by Palladius in his *Historia Lausiaca*, and to her is ascribed an interesting but incomplete description of a visit to the Holy Land, *Peregrinatio ad loca sancta*, discovered in a manuscript of the eleventh century at Arezzo, and edited for the first time by J. F. Gamurrini (Rome, 1887), also by J. Pomialowsky (St. Petersburg, 1889). M. W.

Simaruba'ceæ: a family of dicotyledonous trees or shrubs. The leaves are alternate and without glands, and each ovary-cell has only one ovule. The species are mostly inhabitants of warm regions, and the bitter bark of some yields Quassia (*q. v.*).

Simbirsk': government of European Russia; on the Volga, S. of Kazan, E. of Nijni-Novgorod. Area, 19,110 sq. miles. The surface is level and the soil fertile. Agriculture, breeding of cattle and horses, fisheries, and manufactures of coarse woolen and linen fabrics are the principal branches of industry. Rye, wheat, buckwheat, hemp, flax, and tobacco are the common crops. Pop. (1897) 1,550,458.

Simbirsk: capital of the government of Simbirsk, European Russia; on the Volga, in lat. 54° 19′ N. (see map of Russia, 7–G). It manufactures leather, soap, and candles, and has an important annual fair, held in February. In 1864 and 1865 the town was almost destroyed by fires. Pop. (1897) 41,702.

Simcoe: a lake of Ontario, Canada; situated between Lake Ontario and Georgian Bay; 30 miles long and 18 miles wide, and about 126 feet above Lake Huron, into which it discharges itself through Lake Gougichin, the Severn, and Georgian Bay. Its area is 160 sq. miles. The banks are generally clothed to the water's edge with wood, fine whitefish are taken in its waters, and of its many islands, one, Snake island, is a Chippewa Indian reservation.

Simcoe, post-village: capital of Norfolk County, Ontario, Canada; on the river Lynn, 7 miles N. W. of Port Dover; a junction of the "loop-line" and the Georgian Bay and Lake Erie Branch of the Grand Trunk Railway (see map of Ontario, ref. 5–C). It has a fine court-house and jail and some manufacturing interests, and is in a fertile region. Pop. (1891) 2,674.

Sim'eon [from Heb. *Sihm'ōn*, liter., hearing with acceptance]: the second son of Jacob and Leah (Gen. xxix. 33). He was cursed by the dying Jacob, and Moses passed by the tribe in silence (Deut. xxxiii.). The tribe of Simeon numbered 59,300 at the Exodus, but only 22,200 at the entrance into Canaan (Num. i. 23; cf. xxvi. 14). Its territory was scattered, comprising districts wholly within the territory of the tribe of Judah, and tracts in Mt. Seir and Gedor. The tribe sank into obscurity.

Simeon, Charles: clergyman; b. at Reading, England, Sept. 24, 1759; educated at Eton and at King's College, Cambridge, where he obtained a fellowship 1782, taking holy orders in the same year. He was appointed vicar of Trinity church, Cambridge, Jan., 1783, a post which he retained through life; and was distinguished as a leader of the Evangelical party in the Church of England. He was active in the promotion of missionary enterprise, founding the Church Missionary Society, and organized a successful scheme for the purchase of advowsons or presentations to benefices in the Church of England, in order to secure their being conferred upon evangelical preachers, the fund established by him still having control of some sixty livings. His religious gatherings in Cambridge, known as conversation parties, were famous. D. at Cambridge, Nov. 13, 1836. He published a translation of Claude's *Essay on the Composition of a Sermon*, to which he added notes and a hundred skeleton-sermons, and subsequently published such outlines (2,536 in number) upon the entire Bible, *Horæ Homileticæ* (London, 1819–28, 17 vols.). His *Works* were edited by Rev. T. H. Horne in 21 vols. (1832–33), the best known being the several series of skeleton-sermons. His *Life* was written by Rev. William Carus (1846). See Abner W. Brown, *Recollections of Simeon's Conversation Parties* (1862), and H. C. G. Moule, *Charles Simeon* (1892). Revised by S. M. Jackson.

Simeon Styli'tes: pillar-saint; b. at Sisan in the northern part of Syria about 390; grew up in solitude as a shepherd in the mountains of Amanus, but in his sixteenth year entered a monastery at Teleda, where he distinguished himself by the severity of his ascetic practices. Finding the rules of the monastery too lenient, he afterward removed to Telanessa, in the vicinity of Antioch, where he built a hut and determined to live as an anchorite; but soon his fame for holiness attracted swarms of visitors, and in order to escape their intrusion he placed himself on the top of a column, where he spent his days and nights, always standing, never resting, exposed to the severities of the climate, nourished by what was brought to him, and occupied in religious exercises. The first column he occupied was only ten feet high, but the last was sixty feet, with a platform four feet in diameter, and here he is said to have lived for about thirty years. He died Sept. 2, 459, and was buried in Antioch; and his example, which gained for him much admiration and even power during his lifetime, found many imitators after his death. The so-called pillar-saints, air-martyrs, or stylites were numerous in the Eastern countries, and did not wholly disappear until the twelfth century. Wulfailich, near Treves, on the Moselle, in Rhenish Prussia, about 550, was the only stylite in the West. Simeon's biography was written by his disciple Antonius, contained in the first volume of *Acta Sanctorum*, and by a contemporary admirer, Cosmas, presbyter of Thanir in Cœlesyria, contained in Asseman's *Acta Martyrum*. Evagrius, in his history of the Christian Church, translated into English in Bohn's Ecclesiastical Library, devotes a chapter (i., 13) to him, and describes (14) a visit he paid to the church which inclosed Simeon's pillar. Count de Vogüé, in his *Syrie Centrale* (Paris, 1865–77, i., 141–154), describes his visit to the ruins of the same church, now called House of Simeon, which confirms Evagrius. Revised by S. M. Jackson.

Simfero'pol, or **Simpheropol** (Gr. Συμφερόπολις, Union City): town of European Russia, in the Crimea; capital of the government of Taurida; railway station on the line from Lozovaia to Sebastopol (see map of Russia, ref. 11–D); beautifully situated on the Salghir, in a picturesque valley surrounded with gardens and orchards. It consists of a modern part, built by the Russians, and the old Tartar town, with its mosques, Tartar schools, and bazaars. Pop. (1897) 48,821.

Simi'idæ [Mod. Lat., named from *Si'mia*, the typical genus, from Lat. *si'mia*, ape, monkey]: a family of mammals of the order *Primates* and sub-order *Anthropoidea*, containing the mammals most closely related to man. The form is considerably like that of man, but the anterior limbs are very elongate and the posterior relatively short; the spinal column has a slight sigmoid curve; the lumbar as well as the dorsal neural spines are directed more or less backward; the sacrum is large and solid, composed of four or five vertebræ, and tapers gradually backward; there is no tail; the sternum is broad and short. By all these characters the species are approximated to man. To this group belong two types—one containing large, robust species—i. e. the chimpanzee, gorilla, and orang utan, constituting the sub-family *Simiinæ*—and the other comparatively small, slender species—i. e. the gibbons, or sub-family *Hylobatinæ*. The *Simiidæ* are peculiar to the Old World (the monkeys of the New World belonging to two different families—the *Cebidæ* and *Mididæ*), and are confined to tropical Africa and Asia. See Chimpanzee, Gibbon, Gorilla, and Orang Utan.

Simile: See Rhetoric.

Sim'la: district and town in the Punjaub, British India; on the southern slopes of the Himalayas (see map of N. India, ref. 4–E.); acquired by the British after the Gurkha war (1816) from the Rajah of Bassahir (Bisser). Area of district, 18 sq. miles. Pop. 45,000. The town, 170 miles N. of Delhi, is the permanent abode of numerous Europeans, and during the summer the headquarters of the Government of British India, and the temporary home of Europeans from every part of British India. The houses are not massed together, the town being built according to the cottage system; the lowest house stands at 6,617, the highest at 8,008 feet. The annual mean temperature has been calculated at 57·8°. There are fine warehouses, good hotels, and eight schools for European children—excellent insti-

tutions which are in a flourishing condition. Splendid entertainments and balls are given by the viceroy and high functionaries who pass the summer here. Simla has a theater, a concert-room, Episcopal churches, and one Roman Catholic church. Pop. 13,000. See *Gazetteer of the Simla District* (1888–89). Revised by M. W. Harrington.

Simmons, Edward Emerson: genre and portrait painter; b. at Concord, Mass., Oct. 27, 1852; pupil of Boulanger and Lefebvre, Paris; member of the Society of American Artists (1888); honorable mention, Paris Salon, 1882; third-class medal, Paris Exposition, 1889; Temple silver medal, Pennsylvania Academy, Philadelphia, 1889. One of his best works is *The Carpenter's Son* (1890). He lived for several years at St. Ives, Cornwall, England, and painted there, exhibiting at the Royal Academy, London, and in Paris and New York. He visited the U. S. and painted portraits in New York and Boston in 1891 and 1892.

Simmons, Franklin: See the Appendix.

Simms, William Gilmore: novelist; b. at Charleston, S. C., Apr. 17, 1806; studied law, and was admitted to the bar 1827, but abandoned that profession for literature and journalism, publishing in the same year two volumes of *Poems*; became in 1828 editor of the Charleston *City Gazette*, a political journal of Union proclivities, which was discontinued during the nullification excitement of 1832, leaving him in poverty; resided at Hingham, Mass., 1832–33; wrote there his longest and best poem, *Atalantis, a Story of the Sea* (New York, 1833), and his earliest novel, *Martin Faber, the Story of a Criminal* (New York, 1833); returned soon afterward to South Carolina and settled at Woodlands, near Medway; wrote a series of romances founded on Revolutionary incidents in South Carolina, including the *Partisan* (1835); romances of colonial life, of which *The Yemassee* (1835) is considered the best; published 11 volumes of novelettes, collected tales, and essays; 2 volumes of *Views and Reviews in American History, Literature, and Fiction* (1845–46), collected from a large number contributed to the leading magazines and periodicals; a *History of South Carolina* (1840), a *Geography of South Carolina* (1843), and *South Carolina in the Revolution* (1854). He was several years a member of the South Carolina Legislature, and filled other political offices. D. at Charleston, S. C., June 11, 1870. His best works of fiction were republished in 19 vols. (London, 1853–59; new ed. 17 vols., 1865), under the title *Revolutionary and Border Romances of the South*, with illustrations by Darley. A copious selection of his *Poems* appeared in 1864. See the *Life* by George W. Cable in American Men of Letters Series (Boston, 1888).

Simon, Sir John: surgeon and sanitarian; b. in England in 1816; was made professor in King's College, London; surgeon to King's College Hospital and to St. Thomas's Hospital; was the first medical officer appointed to the general board of health of the privy council, in which capacities his annual reports on sanitary science, dealing with important questions of the day in medicine, have been of great value. His *Physiological Essay on the Thymus Gland* (1845) gained the Astley Cooper prize of £300. He has received honorary degrees from the Universities of Munich, Dublin, Oxford, and Cambridge. Among his works are *Aims and Philosophic Method of Pathological Research* (1848) and *Lectures on General Pathology* (1850). He has contributed largely to the *Cyclopædia of Anatomy and Physiology* and to scientific and medical periodicals, and edited (with a prefatory memoir) Dr. J. H. Green's *Spiritual Philosophy, founded on the Teachings of the late Samuel Taylor Coleridge* (2 vols., 1865). Revised by S. T. Armstrong.

Simon, sĕĕ'mōñ', Jules François Suisse: statesman and political writer; b. at Lorient, department of Morbihan, France, Dec. 31, 1814; succeeded Cousin as Professor of Philosophy at the Sorbonne in 1839, but was dismissed in 1851 on account of his opposition to the *coup d'état*; lectured in 1855 and subsequently on philosophy in various cities in Belgium; was elected a member of the Legislative Assembly for the department of Loire in 1863; offered a strong opposition to the policy of Napoleon III., the plebiscite of 1870, the declaration of war against Prussia, etc., and was a member of the Government for the national defense established on Sept. 4, 1870, and of the Government of Thiers, Feb. 19, 1871–May 24, 1873, as Minister of Public Education. During his term of office he carried through important reforms, but provoked the hostility of the clericals by his efforts to establish compulsory education. On Dec. 13, 1876, he became premier, but difficulties with the president caused his resignation in May, 1877. He was chosen senator for life in Dec., 1875, and was elected a member of the French Academy in the same year. D. June 8, 1896. His writings are distinguished by clearness and precision, and some are the result of very comprehensive studies. Among them are *Histoire de l'École d'Alexandrie* (2 vols., 1844); *Le Devoir* (1854); *La Religion naturelle* (1856; translated into English by I. W. Cole, London, 1857); *La Liberté* (2 vols., 1859); *L'Ouvrière* (1863); *Le Travail* (1866); *La Politique radicale* (1868); *Le Libre échange* (1870); *Souvenirs du 4 Septembre* (1874); *Dieu, Patrie, Liberté* (1883); *Thiers, Guizot, Rémusat* (1885); and *La Femme du XX^e siècle* (1891). F. M. Colby.

Simon, Richard: biblical critic; b. at Dieppe, France, May 13, 1638; entered the Congregation of the Oratory in 1659, but left it again in 1678; was for a short time priest at Belleville, but retired in 1682 to his native city; devoted himself exclusively to literary pursuits. D. at Dieppe, Apr. 11, 1712. His writings—*Fides Ecclesiæ Orientalis* (1671); *Histoire critique du Vieux Testament* (1678; Eng. trans., *A Critical History of the Old Testament*, London, 1682); *Histoire critique de la Créance et des Coutumes des Nations du Levant* (1684); *Histoire critique du Texte du Nouveau Testament* (1689; Eng. trans., *A Critical History of the Text of the New Testament*, 1689); *Histoire critique des Principaux Commentateurs du Nouveau Testament* (1692); *Nouvelles Observations sur le Texte et les Versions du Nouveau Testament* (1695)—form the first and, both on account of the consistency of the ideas and on account of the learning of his arguments, one of the most powerful manifestations of that theological standpoint afterward known as rationalism. They were violently attacked by the Port-Royalists, Bossuet, and other theologians. See his *Life*, by A. Bernus (Lausanne, 1869). Revised by S. M. Jackson.

Simone da Pesaro: See Cantavius, Simone.

Simonians: See Simon Magus.

Simonides, sī-mon'i-dēez (Σιμωνίδης), or **Semonides** (Σημωνίδης), commonly called **of Amorgos**, though b. at Samos: Greek iambic poet who flourished about 625 B. C. He is known chiefly by a satirical poem—a manner of "Mirror of Women"—in which various types of women are represented as descended from various animals and from earth and sea. Only one type of the sex receives his commendation, the "bee-woman"; the rest are handled without mercy and with a kind of personal spite. The remains of Simonides were edited by Welcker (1835), and by Bergk in his *Poetæ Lyrici Græci*, vol. ii., p. 441 fol. (4th ed.).

B. L. Gildersleeve.

Simonides (Gr. Σιμωνίδης): one of the greatest lyric poets of Greece; b. at Iūlis, in the island of Ceos, about 556 B. C.; d. about 468 B. C. His sunny temper and his easy philosophy of life made him welcome wherever his vocation took him, whether he sojourned with the Pisistratidæ at Athens or among the Scopadæ and Aleuadæ of Thessaly. After Marathon, this encomiast of tyrants and oligarchs won the prize over Æschylus for his elegy on those who had fallen in the great battle, and his distich on the dead of Thermopylæ is the most famous in the range of literature. In Sicily he served as mediator between Thero and Hiero (476), and was a special favorite at the brilliant courts of Syracuse and Agrigentum. It was at the court of Hiero that he came into collision with his great rival, Pindar, who claimed for himself a loftier spirit and a truer inspiration; and the very wit and grace of Simonides, his ready sympathy with the spirit of the age, the mundane tone of his poetry, his almost sophistic dexterity have justified the claims of Pindar in the eyes of modern critics. Of his many lyrical poems a fragment remains to warrant what the ancients say of the perfection of his style in everything that he touched, of the exquisite tenderness of his dirges, in which he surpassed all rivals, and of his unequaled command over the resources of the epigram. His fragments were edited by Schneidewin (Brunswick, 1835), and by Bergk in his *Poetæ Lyrici Græci*, vol. iii., pp. 384–535 (4th ed.). B. L. Gildersleeve.

Simon Magus: a Samaritan of the apostolic age; b., Justin Martyr says (*Apol.*, i., 26), at Gitton, which has been identified with *Kuryet Jît*, a village near Nablus. He is described in Acts viii. 9–24 as a sorcerer, called by the people "that power of God which is called great," who was apparently converted by the preaching of Philip, and sought to purchase with money the power of imparting the Holy Ghost; whence the expression *simony*. Of his subsequent

history the ancient accounts are utterly discordant. The Simonians, one of the earliest of the Gnostic sects, lasting for several centuries, took their name from him, and he became a sort of archetype of heresy.

Simonoseki: another spelling of SHIMONOSEKI (*q. v.*).

Simony: in canon law, the buying or selling of ecclesiastical offices or benefices. It received its name from Simon Magus, who wished to buy of the apostles, for gold, the power of conferring the Holy Ghost (Acts viii. 18–24). By all Christian denominations simony is considered and denounced as a great crime, but it has been nevertheless, at various periods, an almost universal practice.

Simoom [from Arab. *samūm*, a sultry pestilential wind, deriv. of *samma*, to poison]: a hot, scorching wind which rises in the sandy deserts when intensely heated by the sun, and blows, loaded with fine sand and dust, over Palestine, Syria, and Arabia. It generally occurs at the time of the equinoxes, and lasts for several hours. It is much dreaded, as it often proves fatal to animal life, partly on account of its heat, which rises to 126°, partly on account of the suffocating dust with which it is filled. Similar winds are the khamsin in Egypt, the samiel of Turkey, the sirocco of Italy, the solano of Spain, the harmattan of Guinea and Senegambia, etc.

Simplicidenta'ti [Mod. Lat.; Lat. *sim'plex*, *sim'plicis*, simple, single + *denta'tus*, toothed, deriv. of *dens*, *den'tis*, tooth]: a sub-order of rodents. See RODENTIA.

Simpli'cius: a Neo-Platonic philosopher, native of Cilicia; flourished in the first half of the sixth century A. D. Nothing is known of his personal history except that he had as teachers Ammonius and Damascius, that he taught at Athens, and that he was one of the philosophers who, after the edict of Justinian (A. D. 529) closing the schools of philosophy at Athens, emigrated, at the invitation of King Khosru Nushirvan (Khosroes) to Persia, where their high hopes were doomed to disheartening disappointment, and whence, with the aid of the friendly king, they soon returned to Athens, to enjoy liberty of thought indeed, but not liberty to teach. Simplicius is known principally as a scholarly and conscientious commentator on Aristotle. Of his commentaries we still possess those on the *Categories*, the *Physics*, the *De Cœlo* (see *Philological Museum*, vol. ii., pp. 588, *seq.*), and the *De Anima* of Aristotle, and one on the *Enchiridion* of Epictetus. Besides these, he is known to have written one on Aristotle's *Metaphysics*. Like most philosophers of his school, he makes no claim to originality. Adopting unquestioningly the doctrines of Plato, he endeavors to bring those of Aristotle into harmony with them by showing that, however much they may conflict in appearance, they do not do so in reality. He was a great admirer of Chaldæan and Orphic lore. THOMAS DAVIDSON.

Simplon, Fr. pron. săñ'plōñ' (Ital. *Sempione*, Germ. *Simpeln*): village and mountain-pass near the boundary between Valais and Piedmont; famous for the military road which Napoleon I. built here from 1800 to 1806. That much-admired piece of engineering, extending from Brieg to Domo d'Ossola, 42 miles long and 30 feet wide, with several long tunnels, 611 bridges, and 10 houses of refuge, was, after the Brenner Pass, the first carriage-road across the Alps. The culminating point is 6,218 feet above the sea. Near by, at the base of Monte Leone (10,977 feet), a hospice has been erected for the gratuitous accommodation of travelers. The scenery on the southern slope is grand and severe in the extreme.

Simpson, ALEXANDER RUSSELL: obstetrician and gynæcologist; b. at Bathgate, Scotland, Apr. 30, 1835. He was educated at Edinburgh University, where he graduated M. D. in 1856. Afterward he studied on the Continent, and on his return to Edinburgh was assistant to Sir James Y. Simpson from 1858 to 1865. He practiced in Glasgow from 1865 to 1870, when he returned to Edinburgh University to fill the chair of Professor of Midwifery and the Diseases of Women and Children. He was president of the Obstetrical Society of Edinburgh 1876–77, 1882–83, and 1892–93; president of the Medico-Chirurgical Society of Edinburgh 1890–91; and president of the Royal College of Physicians of Edinburgh 1892–93. He was editor of *Sir James Y. Simpson's Clinical Lectures on the Diseases of Women* (Edinburgh, 1872); author of *Contributions to Obstetrics and Gynæcology* (Edinburgh, 1880), and of many papers and lectures published in the Edinburgh *Medical Journal* and *British Medical Journal*. S. T. ARMSTRONG.

Simpson, Sir GEORGE: b. at Lochbroom, Ross-shire, Scotland, about 1796; accompanied the Earl of Selkirk, who employed him in the establishment of his Red river colony, to Canada 1820; pushed his settlements northward to Athabasca Lake in rivalry with the Hudson Bay Company, and after the two companies had coalesced (1821) received the appointment of governor of Rupert's Land and of general superintendent of the affairs of the Hudson Bay Company. He planned the successful expedition under his nephew, Thomas Simpson, 1836–39, which traced the coast of the Arctic Ocean from the mouth of Mackenzie river to Point Barrow, and from the mouth of Coppermine river to the Gulf of Boothia. He made an overland journey around the world 1841–42, of which he published a *Narrative* (2 vols., London, 1847); was knighted in 1855. D. at Lachine, near Montreal, Canada, Sept. 7, 1860.

Simpson, JAMES HERVEY, A. M.: soldier; b. in New Jersey, Mar. 9, 1813; graduated at the U. S. Military Academy July 1, 1832, and was assigned to the artillery; was mainly in garrison until 1838, when transferred to the topographical engineers with rank of first lieutenant (captain 1853, major 1861, lieutenant-colonel of engineers 1863), and was thenceforward engaged on the survey and improvement of lakes and harbors, and on lighthouse and Coast Survey duty until 1858; was then appointed chief topographical engineer with the army in Utah, and opened a wagon-route from the valley of Great Salt Lake across the Great Basin of Utah, by which the journey to the Pacific coast was shortened some 200 miles: a report of which he submitted early in 1861. In the early days of the civil war he served as mustering officer in Ohio and chief engineer of department of the Shenandoah. He was appointed colonel of the Fourth New Jersey Volunteers Aug. 12, 1861, and in the Virginia Peninsular campaign led his regiment in the action at West Point and in the battle of Gaines's Mill, where he was taken prisoner and held until Aug., 1862. On his release he resigned his volunteer commission, and thereafter served as chief engineer of the department of the Ohio and had general charge of fortifications in Kentucky till the close of the war. In Aug., 1865, he was detailed as chief engineer of the Department of the Interior on proposed change of route of the Union Pacific Railroad, W. from Omaha, and served as Government commissioner of that road until 1868; subsequently engaged in the regular line of duty with his corps, in which he attained the rank of colonel in 1867; was brevetted colonel and brigadier-general; retired 1880. D. at St. Paul, Minn., Mar. 2, 1883. Revised by JAMES MERCUR.

Simpson, Sir JAMES YOUNG, M. D., D. C. L.: obstetrician; b. at Bathgate, Scotland, June 7, 1811; educated at the University of Edinburgh and at the medical school of the same institution, taking his degree 1832; lectured there on pathology 1836; became Professor of Midwifery 1840; introduced the use of chloroform as an anæsthetic 1847; became president of the Royal Society of Physicians at Edinburgh 1849, and of the Medico-Chirurgical Society 1852; foreign associate of the French Academy of Medicine 1853; received the Montyon prize for his introduction of anæsthesia 1856; was made a knight of a Swedish order about 1854; was created a baronet 1867, and enjoyed an enviable reputation, not only as a skillful medical practitioner but as an eminent antiquarian. D. in Edinburgh, May 6, 1870. In 1871 his principal works were collected under the titles *Selected Obstetrical Works*, *Anæsthesia and Hospitalism*, and *Clinical Lectures on the Diseases of Women*; and his *Archæological Essays* appeared in 1872.
Revised by S. T. ARMSTRONG.

Simpson, JOHN PALGRAVE: author; b. at Norfolk, England, in 1805; was educated at Corpus Christi College, Cambridge; traveled for several years on the Continent, and published *Second Love* (1846); *Gisela* and *Letters from the Danube* (1847); *Lily of Paris; or, The King's Nurse*, and *Pictures from Revolutionary Paris* (1848). After his return to England, in 1850, he wrote with success for the stage—*The World and the Stage*, *Sibylla; or, Step by Step*, etc.—in all about forty pieces of various kinds. He also published a *Life* of Karl Maria von Weber. D. in London, Aug. 19, 1887. Revised by H. A. BEERS.

Simpson, MATTHEW, D. D., LL. D.: bishop; b. at Cadiz, Harrison co., O., June 20, 1810; graduated at Madison College, Pennsylvania, 1829, and was tutor in the same institution 1829–32; studied medicine and received the degree of M. D. 1833; was licensed the same year in the ministry and joined the Pittsburg Conference of the Methodist Episcopal

Church; became vice-president and Professor of Natural Science at Allegheny College 1837; president of Indiana Asbury University at Greencastle, Ind., 1839; editor of *The Western Christian Advocate* 1848, and was elected bishop 1852. He was an intimate friend of President Lincoln, at whose request he devoted much of his time during the civil war to the maintenance of public sentiment in behalf of the Union by addresses in many Northern cities, being also employed by the Government in several important confidential commissions. In 1863–64 he made an extended tour of inspection of the missions of his Church in Syria and the East generally, and traveled through several countries of Europe upon a similar errand. He visited the Mexican missions 1874, and the European mission conferences 1875, and on his return became a resident of Philadelphia. Author of *A Hundred Years of Methodism* (1876); *Cyclopædia of Methodism* (1878); *Yale Lectures on Preaching* (1879); and *Sermons* (1885). D. in Philadelphia, June 18, 1884. See his *Biography*, by G. R. Crooks (New York, 1890).

Revised by A. Osborn.

Simpson, Thomas: mathematician; b. at Market-Bosworth, Leicestershire, England, Aug. 20, 1710; was in early life a weaver, but became an accomplished mathematician by private study; was for some years a teacher in Derby and in London; became Professor of Mathematics in the Royal Military Academy at Woolwich 1743, and a fellow of the Royal Society 1745; and published many ingenious papers on pure mathematics and physical astronomy. He published works on fluxions, the laws of chance, doctrine of annuities, algebra, geometry, and trigonometry. D. at Market-Bosworth, May 14, 1761.

Simrock, Karl: poet and author; b. at Bonn, Germany, Aug. 28, 1802; studied jurisprudence in his native city and in Berlin; entered the Prussian civil service, but was dismissed in 1830 on account of a song he wrote on the revolution of July in Paris; devoted himself to literature, and studied especially the old German language and literature, of which he was appointed professor at Bonn in 1850. His chief poetic work is *Wieland der Schmied* (1835), one of the best epic poems of modern German literature, in which the old hero-legend is successfully revived. He translated with excellent taste and remarkable skill the *Nibelungenlied* into modern German (1827); several works of the minnesingers; the *Edda* (1851); *Beowulf* (1859) and *Heliand* (1856); Shakspeare's *Sonnets* (1867); Tegnér's *Frithiof's Saga* (1863); and many other mediæval works of poetry. He also published a *Handbuch der deutschen Mythologie* (1864); *Die Rheinsagen* (1836); *Deutsche Volksbücher* (1839–67); *Quellen des Shakspeare* (1831), and other works. D. at Bonn, July 18, 1876.

Revised by Julius Goebel.

Sims, George Robert: journalist and dramatist; b. in London, Sept. 2, 1847; was educated at Bonn; entered journalism, and contributed to the press the *Dagonet Ballads* (1879); *Three Brass Balls* (1880); *The Social Kaleidoscope* (1880); *Ballads of Babylon* (1880); *The Theatre of Life* (1881); *How the Poor Live* (1883); *Stories in Black and White* (1885); *Mary Jane's Memoir* (1887), etc. His letters to the London *Daily News* on the condition of the poor attracted much attention, and led, in part, to the appointment of a royal commission. Has written with success for the stage—*The Lights o' London* (1882); *The Romany Rye* (1883), etc.

H. A. Beers.

Sims, James Marion, M. D., LL. D.: surgeon; b. in Lancaster co., S. C., Jan. 25, 1813; graduated at South Carolina College, Columbia, 1832; studied medicine at Charleston and Philadelphia, graduating M. D. at Jefferson Medical College 1835; in 1836 entered upon the practice of his profession at Montgomery, Ala.; in 1845 called attention to his new theory of the nature and origin of trismus nascentium, and also to the subject of vesico-vaginal fistula, inventing instruments and an operation for the cure of that lesion. He urged the use of metallic sutures in every department of general surgery. In 1852 he published a full account of his discovery in *The American Journal of Medical Sciences*. In 1853 he settled permanently in New York. His investigations of the diseases peculiar to women early led him to perceive the importance and necessity of establishing a great permanent woman's hospital in New York, and a temporary hospital was opened in May, 1855. Dr. Sims was elected attending surgeon, with Drs. Mott, Francis, Stevens, Green, and Delafield as a consulting board. In 1857–58 he obtained from the Legislature a charter for the Woman's Hospital of the State of New York, and the city of New York granted a site on which a hospital was built. In 1861 Dr. Sims went to Europe, and he operated in Dublin, in London, in Paris, and in Brussels. He received decorations from the French, Italian, Spanish, Portuguese, and Belgian Governments as a public benefactor. In 1868 he returned to New York. In 1870, on the breaking out of the Franco-German war, he organized in Paris the Anglo-American Ambulance Corps, took charge of it as surgeon-in-chief, and went with it to Sedan. Soon after this Dr. Sims returned to New York. To his labors and discoveries are mainly due the establishment of the science of gynæcology as a new department in medicine, recognized by a special professorship in all well-organized medical colleges. Dr. Sims was a corresponding member of many learned societies in the U. S. and Europe, notably of London, Edinburgh, Berlin, Christiania, etc., and of the Royal Academy of Medicine of Brussels. He was elected president of the American Medical Association at its meeting at Louisville, Ky. D. in New York, Nov. 13, 1883. There is a monument of him in Bryant Park, New York. See his autobiography, *The Story of my Life*, edited by his son, H. Marion Sims, M. D. (1884).

Sims, Winfield Scott: See the Appendix.

Simulation: See Feigned Diseases.

Sinai, sī′nā, or sī′nī [from Heb. *Sīnay*: cf. *Sīn*, the wilderness of Sin, liter., clay]: (1) a triangular peninsula of Arabia Petræa, between the Gulfs of Suez and Akabah. Its apex points S.; its base is 150 miles across from gulf to gulf; its western side 186 miles long, its eastern side 133, and its area about 11,500 sq. miles. First comes the wedge-like protrusion of the limestone plateau known as the Desert of the Wandering, then a sandstone belt, and finally the mountain-masses of granite and porphyry, flanked right and left by narrow strips of lowland bordering the gulfs. These mountains may be divided into three groups, the highest peaks of which, respectively, are Serbal (6,734), Catharine (8,526), and Shomer (8,449). The ancient Egyptians called this peninsula "the land of the gods." Its solitary grandeur impresses all travelers alike. Mines of iron, copper, and turquoise were once worked here. It is still the home of about 5,000 Bedouin. The curious inscriptions, found mostly on the western side of the peninsula, are generally in the Nabatæan character, and the Nabatæans were, about the beginning of the Christian era, the chief traders between Egypt and Assyria. They were an Arab people living on the east and southeast of the Holy Land. Some of the inscriptions are Greek and a few Coptic. With them are rude drawings. The whole was probably the work of caravans between 200 B. C. and 400 A. D., and of no more importance than such scratchings usually are.—(2) Used in the Old Testament interchangeably with Horeb to designate the Mountain of the Law. Lepsius and others have tried to identify it with five-peaked Serbal, the most picturesque of all the mountains of the peninsula: but the true Sinai is a gigantic mass, about 2 miles long from N. to S., and about half a mile wide from E. to W. Its southeastern peak, called Jebel Musa, is the traditional scene of the giving of the Law; but there was not open space enough on the south side of the mountain to accommodate the Hebrew host. Its northwestern peak, called Sufsafeh, overlooks three wadies (Rahah, Deir, and Leja), which might easily have held 3,000,000 or 4,000,000 people; and there is no other such spot anywhere in the whole peninsula. Here the Israelites encamped for a year, and here the Law was given. The watershed at the foot of Sinai is 5,140 feet above the sea, Jebel Musa 7,359, Sufsafeh a little lower. The famous convent of St. Catharine, in whose library Tischendorf discovered the Sinaitic Codex of the Scriptures (in 1844), and Mrs. Agnes Smith Lewis the oldest text of the Syriac Gospels (in 1893), is on the east side of the mountain.

Revised by S. M. Jackson.

Sinaitic Inscriptions: See Codex Sinaiticus.

Sinaloa, sē̆e-nă̆a-lō′ă̆ă (sometimes written Cinaloa): a northwestern maritime state of Mexico, bounded by Sonora on the N. W., Chihuahua and Durango on the N. E., Tepec on the S. E., and the Pacific and the Gulf of California on the S. W. (see map of Mexico, ref. 4–D). Area, 36,184 sq. miles. The eastern and northeastern parts are covered with spurs and terraces of the Sierra Madre, which have a true mountainous character, and sometimes attain 6,000 feet in altitude; on their slopes are extensive oak forests, and the valleys are very fertile. The coast belt is low, and in parts unhealthful; there are many lagoons near the gulf. Several rivers cross the state, flowing down from the Sierra

Madre, but none of them is navigable. The greater part of the state is in the temperate zone; in general, however, the climate of the coast belt is essentially tropical, and the higher lands have a mild and equable climate (*tierra templada*). The rainy season (June to September) is well marked in the highlands, but in parts of the coast belt the rainfall is insufficient for agriculture and the vegetation is scanty. The state is rich in gold and silver, and mining is the most important industry; agriculture is generally on a small scale, sufficing only for home consumption. There are considerable manufactures of cotton cloths, etc. Pop. (1893) estimated, 245,733; a large proportion are Indians or mixed races. Capital, Culiacan; chief port, Mazatlan. Sinaloa, the ancient capital (96 miles N. N. W. of Culiacan, on the river Sinaloa), had formerly 10,000 inhabitants, now reduced to 3,000. HERBERT H. SMITH.

Sinapis: See MUSTARD.

Sinclair, Sir JOHN: author; b. at Thurso Castle, Caithness, Scotland, May 10, 1754; educated at the Universities of Edinburgh, Glasgow, and Oxford; became a member of the Faculty of Advocates at Edinburgh 1775; was called to the bar at Lincoln's Inn 1782; published *History of the Public Revenue of the British Empire* (3 vols., 1785–89); was made a baronet in 1786; built up the port of Thurso; was influential in reviving the fisheries and in establishing the Scottish Society of Wool-growers (1791) and Board of Agriculture (1793), of which associations he was the first president; maintained an extended correspondence with Gen. Washington; sat in Parliament with brief interruptions from 1780 to 1811; compiled *A Statistical Account of Scotland, drawn up from the Communications of the Ministers of the Different Parishes* (Edinburgh, 21 vols. 8vo, 1791–99); wrote in all 39 volumes and 367 pamphlets, covering almost the whole range of literature, being aided therein during his later years by his daughter CATHARINE, who became eminent as a novelist. D. in Edinburgh, Dec. 21, 1835. —His eldest son, Sir GEORGE, b. in Edinburgh, Oct. 23, 1790, was for some years a member of Parliament, and wrote several works against Roman Catholicism. D. in Edinburgh, Oct. 9, 1868.—Another son, JOHN, b. in Edinburgh, Aug. 20, 1797, was archdeacon of Middlesex from 1842; published *Memoirs* of his father (2 vols., 1837), and *Sketches of Old Times* (1875). D. in London, May 22, 1875.

Sinclair River: See ST. CLAIR RIVER.

Sindh, Sind, or **Scinde**: western province of British India; adjoining Baluchistan; part of the Bombay Presidency; on the lower Indus, W. of Rajputana and N. of the Runn of Kuch. Area, 47,789 sq. miles, or including the tributary state of Khairpur, which forms a part of it administratively, 54,435 sq. miles. It occupies the Indus delta, and is for the most part monotonous, nearly treeless, with many dead and few live watercourses. The desert of Thar occupies its eastern part and that of Shikarpur the northwest. The soil is sandy or clayey, and is much impregnated with salt and alkali. It lacks the monsoons, and rain in some parts is almost unknown. The Indus bears to it the same important relation that the Nile does to Egypt. The climate is generally hot and the extremes great. It is considered unhealthful, and is especially subject to fevers and cholera. Only 7 or 8 per cent. of the land is cultivated, and nearly all of this has to be irrigated. The canals have a total length of about 6,000 miles. There are two annual crops; those of the spring are chiefly cereals, legumes, and oil-seeds. The second harvest yields millet, rice, and cotton. The fruits are numerous and excellent. The fauna includes the tiger, hyæna, wolf, fox, onagra, wild boar, antelope, and deer. Fishing is an important industry, and dried fish are exported. The population in 1891 was 2,871,774 for the districts of Sindh and 131,937 for Khairpur, an increase since 1881 of nearly 20 per cent. in the districts, but a decrease for Khairpur. The inhabitants are mostly Mohammedans, including the indigenous Sindhis, formerly Hindus, now Sunnites. These form about half of the population; they are tall, robust, apathetic, and lazy, are without caste, have a pure Neo-Sanskrit language of great interest, with a small literature, chiefly theological and from Arabic sources. The capital is Karachi or Kurrachee; pop. (1901) 115,407. A railway extends from this place up the Indus to the Punjaub, with a branch from Shikarpur into Baluchistan. This is a very ancient country historically. It was probably visited by the Persians under Scylax, and by one of the generals of Alexander the Great. It probably formed a part of the Græco- or Indo-Bactrian kingdom. The sacred city of Patala was once its capital, and it is supposed that Haidarabad, a later capital, occupies its site. It has undergone remarkable political revolutions, and the variations in the course of the Indus have made its physical changes quite as remarkable. It contains numerous ruins of towns and cities, often in localities now entirely uninhabitable because of lack of water. It became a British province in 1843. See Ross, *The Land of Five Rivers and Sindh, Sketches Historical and Descriptive* (1883). MARK W. HARRINGTON.

Sin'dia, or **Scindia**: the dynastic name of the most powerful of the native Mahratta princes of India, having their capital at Gwalior. The family took its rise in the person of RANOJI SINDIA, a low-caste retainer of the Mahratta peishwa, who rose to a high rank in the body-guard, and in 1743 received as a fief half of the province of Malwa.—His son, MADHOJI SINDIA (d. 1794), joined the Mahratta confederacy; fought against the Afghans at the great battle of Paniput (1761); became a useful ally of the Emperor of Delhi; expelled the Sikhs from Central India, and became virtual ruler of the empire; fought against the British 1779–82; was confirmed in his possessions by the treaty of 1783; captured Gwalior 1784; seized on Delhi and Agra; reduced the Rajput states, and formed a vast army, well disciplined by French adventurers.—His grand-nephew and successor, DAULAT RAO SINDIA, ruled from 1794 to 1827; waged war with varying success against the rival family of Holkar; was defeated by Sir Arthur Wellesley (afterward Duke of Wellington) at Assaye, and by Lord Lake at Laswari, and submitted to British influence, but retained his capital and a portion of his territories.—BAJI RAO SINDIA (1843–86) was a loyal ally of the British during the mutiny of 1857–59.

Si-ngan-foo, sē'ng'ăn'foo', or **Si-an-foo** (sometimes SI-GAN-FOO): city of China; capital of the province of Shensi, and the capital of the empire during some of its most famous dynasties—e. g. the early Han (202 B. C.–24 A. D.), the T'ang (618–905 A. D.), and the Sung (960–1127). It is splendidly situated in the basin of the Wei, the most important affluent of the Yellow river, and is commercially of great importance. Its walls, which have a circuit of 24 miles, are well built, and its pavilioned gates surpass in magnificence those of Peking. It is the seat of a Roman Catholic bishopric, and contains the oldest mosque in China, founded about 1,100 years ago. In 1868–71 the city and surrounding country suffered much from the Mohammedan rebellion. Pop. about 200,000. Here in 1857 was found an immense tablet covered with inscriptions in Chinese and Syriac, and dated 827 A. D., recording the establishment of Christianity in this neighborhood by the Nestorians in the fourth century. See Yule's *Book of Ser Marco Polo* (2d ed. 1876). R. L.

Singapore': an island at the extremity of the Malayan Peninsula. It contains the town of Singapore, founded by the Malays 1283, ceded to the British by the Sultan of Johor 1819, and rendered a free port in order to strike a blow at the Dutch; became in 1853 the capital of the Straits Settlements (see map of East Indies, ref. 6–B). The area of the island is 207 sq. miles; the surface varies from 20 to 30 feet above the sea-level; low hills are numerous, varying from 50 to 200 feet; Bukemata, a hill in the center of the island, has a height of 517 feet. The climate is agreeable to Europeans; the mean annual temperature is 80·7° F.; during the day the heat is intense; the atmosphere is very moist, there being usually a fall of rain every week. The drainage of the town, formerly as bad as possible, has been considerably improved. The seamen's hospital is an excellent building, well adapted for its purpose and well attended to. The population of the island was 184,554 in 1891, of whom 121,908 were Chinese, 35,992 Malays, 16,035 natives of India, and 2,769 whites. The city was once a dreaded lurking-place for pirates, but developed into a great commercial center of the Malayan Archipelago, doing in 1893 a total business in native produce and foreign goods of $232,430,724. Numerous harbors on the Malayan Peninsula, especially Pulo-Penang, in Borneo, in Sumatra, in Siam, and Cochin-China, formerly traded exclusively through Singapore, but afterward established direct connections. The city had 110,000 inhabitants in 1891. The port has excellent docks and is strongly fortified. It has considerable trade with the U. S., and is connected by telegraph with Madras, Java, Australia, and Japan. See STRAITS SETTLEMENTS. Revised by M. W. HARRINGTON.

Singer, OTTO: See the Appendix.

Singhalese: the people and language of CEYLON (*q. v.*).

Single Tax: a term which has come into use since 1887 to denote the proposal, theory, or movement which aims at the collection of all public revenues from one single source, what in political economy is termed "rent," the value of land itself, irrespective of the value of any improvement in or on it; or, to adopt another form of statement, a proposal or movement which aims at the appropriation of economic rent, the "unearned increment of land values" to public uses, by means of taxation.

These two forms of statement, though often indiscriminately used, since the practical method of reaching the single tax from existing conditions is "to abolish all taxation save that on land values," are suggestive of two different points of view—the fiscal and the moral—that of governmental expediency and that of social justice. Although social justice must really include governmental expediency, the argument for the single tax may perhaps be most concisely put by presenting it first from the narrower and then from the wider of these standpoints.

From the fiscal side, the single tax offers the cheapest and in all respects the best mode of raising public revenues. Every owner of a valuable estate has the power of raising revenue from those who use it. He may, as was largely the custom of feudal landlords, require from his tenants a multiplicity of payments, conditioned on what they may do or have—as on the building or repairing of houses, the growing of crops, the engaging in certain occupations, the possession of certain amounts or forms of wealth, the bringing in or taking out of goods; or even on such occurrences as births, deaths, or marriages. But reason and experience both show that the largest revenue can be raised with the least trouble and expense by substituting for such small exactions one single charge or rent, and this has become the custom of enlightened landlords. Now the taxing power of the state is simply that of the superior landowner or "over-lord" of a certain area. It exists only within that area, and, as in the case of the individual landlord, is limited by what people are willing to pay for the privilege of living in it. For though the state still retains the power of seizure and punishment, which once belonged to the larger landlords (the "right of pit and gallows"—i. e. of life and death—having in Scotland been taken from them only in comparatively recent times), this avails nothing in the raising of permanent revenues. If taxes be imposed beyond a certain point in any given area, men will refrain from coming into it, those already there will leave if they can, and those who can not leave will become impoverished and finally starve and die. There are many instances of populous cities reduced to ruins and fertile districts to deserts by ill-laid and excessive taxation.

Thus the same principles that enable the individual landlord to raise the largest revenue with the least waste, cost, and trouble, by a single rent-charge, apply in the case of public revenues; and the common-sense way for the state or any of its subdivisions to obtain revenues is by a single tax on the value of land. The attempts of governments to raise revenues by other taxes are really as stupid and barbarous as would be the resort of an individual landlord to petty feudal exactions. Such taxes invite evasion, fraud, and perjury; they require an expensive array of tax-gatherers, and even then can not be fairly assessed or fully collected. They check production, lessen accumulation, and take from the people much more than the state receives. The waste involved in the more important of them is not merely in the expenses of trying to collect them and of trying to evade them. Taxes on imports, taxes on internal production or exchange, taxes on capital in any of its forms, nearly all license taxes, and all that part of real-estate taxes that rests on buildings and improvements do not really fall on those who pay them to the state, but with added interest and profits finally fall upon the ultimate user or consumer. These taxes are really of the nature of that most destructive of fiscal devices, the farming of revenue.

Since a tax on the value of land is not a tax on land, but on an advantage accruing on specially desirable land, which can in no case go to the land-user as user, it can not check production, or lessen the return from use or improvement, or be shifted from shoulder to shoulder, increasing in weight as it goes. Avoiding all the waste, loss, and fraud of indirect taxes, it also avoids the evasions and injustice that attend attempts to tax incomes of all kinds, and is of all possible taxes that which may be most cheaply, certainly, and equitably obtained. It can not be evaded. It must fall on the owner, wherever he may be, taking from him, not in proportion to anything his labor or capital may have contributed to the general wealth, but only in proportion to the unearned income which the adjustments of the state give him the special privilege of receiving. Land can not be concealed or removed, and its value can be ascertained with greater ease and certainty than any other value. A small sign on each separate piece of land, giving boundaries, area, and valuation, would bring public knowledge and opinion to the aid and correction of the assessment, while under a proper system the collection would involve little more than the clerical labor of receiving. In the U. S., as taxes are levied on land-values for state and local purposes in the tax on real estate, and as the percentage needed for national purposes could be collected by the same system, the substitution of this one method of raising public revenues for the complicated system in use would involve no new machinery, but only the abolition of many offices and the great lessening of corruptive and demoralizing agencies.

From the Moral Side.—The perfection of the single tax as a fiscal measure does not, however, account for the rapid spread of the idea and the ardor it excites. These come from its moral side, in which it is apprehended as the easy, yet, under the conditions of the times, the only possible way of relieving undeserved poverty, establishing social justice, and avoiding that monstrous inequality in the distribution of wealth that is so rapidly developing destructive tendencies in modern civilization. The argument from this side may thus be briefly stated:

The equal right to land flows from the right to life, and is the corollary of the right of property, or exclusive right of the producer to the product. In the rude stage of social life, where a simple industry seeks to satisfy primary needs from the spontaneous offerings of nature, the equal right to the use of land and the exclusive right to the products of labor are secured when all have free access to the land ranged over by the tribe, and each may dispose of what his efforts obtain. But as society begins to take settled form, the division of labor begins to separate occupations, and a higher use of land calls for the use of capital, social order, industrial necessities, and the recognition of the right of property, all require such exclusive possession of land as shall assure to him who plants that he may reap, and to him who builds that he may enter in. This need becomes wider as civilization advances and improvements become more costly and industry more complex.

But no matter how far civilization advances, the exclusive right of property need never interfere with the equal right to the use of land. For these rights are correlative, the one involving the other, and the denial of one being really a denial of the other. Thus to deny to a man his equal right to the use of land is to deny him the benefits of his own labor, and to compel him to yield that labor or its products without due return. So far from the right of property making it necessary to attach to land that right of ownership which by natural law attaches to things temporarily drawn from land by labor, such treatment of land is as truly a denial of the right of property as making property of men. Between chattel slavery, the rude method of appropriating labor, and industrial slavery, the more civilized method, the difference is only of form. In the one, the man himself is treated as the property of another; in the other, the land on which the man must live is treated as the property of another. The result in either case is robbery, and robbery that may go to the same pitch. To the chattel slave must be left enough of his earnings to support life. Are there not to-day in so-called free countries great bodies of men who think themselves fortunate to get this?

In the relations of individuals with each other we find no difficulty whatever in combining exclusive possession with equal rights to use. A man may leave a horse, a ship, a building, or anything else incapable of division, to his children or to others equally; or such equal rights may be acquired in daily transactions without difficulty being encountered. Where a right to use can not be divided, its value may. So the exclusive possession of land called for by social advance need involve no denial of the equal right to use. That equality may be secured in a way permitting the best use of land by requiring from him who is accorded exclusive possession of any piece of land a contribution to common uses equivalent to any advantage it gives over that obtainable from the best land that others are free to use. There is nothing new in this. The principle lay at the base of feudal tenures, and is applied partially in Chicago, where the equal right of the whole community to the use of a cer-

tain piece of land now covered with very valuable buildings, the property of individuals, is recognized by the appropriation of the ground-rent to municipal expenses; and there are similar examples in many other cities. The special advantage attaching to the possession of any piece of land is always exactly measured by ground-rent, since it is what gives value to land itself. By taking that, and that alone, for common needs, the equal right to land and the exclusive right of property may both be secured in any stage of civilization, however advanced, and the society placed on the only enduring basis, that of exact justice between man and man.

Fiscal considerations and moral considerations both point to a complementary relation between the need for public revenues and the value of land. If we consider the appearance, growth, and direct cause of the two phenomena, this conclusion becomes irresistible; and the same recognition by which we see that the milk secreted in the mother's breast is intended for the sustenance of the babe shows us in land-values the intended provision for public revenues.

In that primitive social condition in which land may be left to free access, the state exists only in the rudimentary form of patriarchal authority or an occasional council, and there is no need for regular public revenues. The division of labor, which is the mark and measure of civilization, does not yet require that some men shall devote themselves to public service; there are no courts or schools to maintain; no roads to make; no public buildings to erect; no streets to pave and clean and sewer; none of the public needs of civilization to provide for. In this social condition land has no value whatever, for land has no original value, such as attaches from the first to things produced by labor. But the same advance in civilization that brings the need for public revenue attaches value to land; and while, by lessening the cost of production, it tends steadily to lessen the value of products of labor, it as steadily tends to increase land-values. When a few self-contained families roamed over Manhattan Island there was no need for public revenue and no value to land. In New York to-day immense public revenues are needed to meet legitimate public wants, and land has such an enormous value that the most costly and towering buildings are not so valuable as the bare land they cover.

This we may see wherever civilization centers. The same social advance which by increasing public needs calls for larger public revenues, correspondingly, and even more than correspondingly, increases the value of land. The reason is that the integration of individuals, in which civilization consists, besides increasing the power of individual exertion to satisfy desires, develops in the society itself an additional power of satisfaction which tends to localization, not merely bringing out important differences in the original qualities that adapt land to the satisfaction of human desires, but, in places where exchanges center, attaching enormous value to mere standing-room. It is not only that all public improvements, material, political, and even moral, increase this "unearned increment"; it also grows by private improvement, for the erection of a beautiful dwelling, the opening of a good hotel, or well-appointed store, or of a mine or factory, or even improvement in the personal qualities or conditions which make people more desirable neighbors, localize an advantage that becomes tangible in land-values. The adoption of the single tax itself, while it would destroy speculative rent, would by promoting general prosperity tend to vastly increase the aggregate of economic rent, the value attaching to land itself.

"Rent" is not produced by land, which is but the passive factor in production; nor yet is it produced by the landlord, who as landlord contributes no more to production than could a sun-lord or air-lord. The active factor in all production is human exertion or labor, of which capital (wealth applied in further production) is a subdivision. In the most primitive form of industry the whole product goes to labor as wages. In the next higher form it is distributed between the economic terms labor and capital, in wages and interest; but in that still higher form of industry which comes at the point in social development when a value begins to attach to land, the distribution of the product is into wages, interest, and rent. This distribution is a matter of natural law, and there is no possible device of human law or of individual ingenuity by which rent can be made to increase wages or interest. If it be turned over to a laborer or a capitalist, he becomes in receiving it a landlord to that extent, and may at any time separate what he receives of it from what he receives as laborer or as capitalist, for there is no true rent until, and so long as, some one stands willing to pay for the privilege of using land.

Thus economic rent, the "unearned increment," is a natural growth, born of civilization and increasing with its advance; belonging to the society itself as distinguished from its individual members, by the same right of property which gives to the individual the ownership of his product. It is the natural provision for the natural need of public revenues; a fund secreted by the social organism to meet the wants, analogous to those of the physical body for sustenance, which come with its definite appearance and grow with its growth.

To see this is to see more. For that civilization develops a fund belonging to the social all and not to the social each, shows that the wider and closer co-operation of man with his fellows, to which all increase in his knowledge and powers is due, should bring a greater and greater equality of condition, and thus that our highest moral perceptions are not mocked by, but correspond to, the design of that Originating Intelligence manifest in the phenomena of nature. Now good and evil lie not in things, but in their uses, whatever is potent for good being correspondingly potent for evil. Thus the neglect or perversion of the natural provision by which the advance of civilization tends to bring about a higher and higher equality in human conditions must turn that advance toward a more and more monstrous inequality.

In the perversion of the great law of rent lies the explanation of those threatening facts obvious throughout modern civilization to-day. Rejecting what rightfully belongs to it, the state is driven by its need for public revenues to ignore the moral right of property and to take what rightfully belongs to individuals, by taxes that necessarily fall most heavily on those least able to bear them, that check production, render distribution inequitable, foster monopolies, create artificial crimes, put a premium on fraud and perjury, corrupt government, and debauch morals. But worse than this: what the state refuses to take must go to mere landowners, thus not only creating a class of idle rich, who become demoralized and demoralizing social factors, but by attaching a premium to the forestalling of land and developing speculative rent turn the very forces of invention and improvement which directly increase the productive power of labor into agencies which degrade and impoverish the laboring masses, by creating an artificial scarcity in the indispensable natural element of all production and all life.

This is why those who apprehend the single tax from the moral side see in it the easy yet only possible way of saving our civilization from otherwise certain destruction, and turning its advance to nobler heights than have yet been more than dreamed of. To them the single tax means the abolition of all real taxes; the taking for society of the provision made in the natural order for its needs; the conforming of the most fundamental of all social adjustments to the moral laws of the Creator.

HENRY GEORGE.

Sing Sing: village; Westchester co., N. Y.; on the Hudson river, and the N. Y. Cent. and Hud. River Railroad; 31 miles N. of New York. Its name was changed to Ossining in March, 1901. Its streets and avenues, rising one above another to the height of from 200 to 300 feet, afford views of the lovely scenery of the Hudson. The river is wider at this point than at any other; the broad Tappan Zee and Haverstraw Bay are separated by the long peninsula known in Revolutionary times as Teller's Point (where the Vulture waited for Arnold and André), and now, as Croton or Underhill's Point, famous for its vineyards. The Croton aqueduct crosses the Kill Brook by a magnificent stone arch of 88 feet span and 70 feet above the stream, and beneath this arched bridge is a second one for highway uses. Among the articles manufactured here are porous plasters, pills, baking-powder, self-feeding cotton-gins, cotton-gin saws, gas and water pipes, steam-engines, files, wrenches, carriages, and sleighs. A soldiers' monument was unveiled here May 30, 1887. The village contains several churches, 4 boarding-schools for boys, 2 being under military discipline, a boarding and day school for young ladies, 2 public schools, several private schools, a public library (founded in 1838), 4 other libraries, one of the most noted prisons in the U. S., gas and electric lights, electric street-railways, a national bank with capital of $100,000, a savings-bank with deposits of over $1,379,000, and a monthly, a bi-monthly, and 2 weekly periodicals. Pop. (1880) 6,578; (1890) 9,352; (1900) 7,939.

M. F. ROWE, EDITOR OF "REPUBLICAN."

Sinim: the name used in the Bible for the Seres, or ancient Chinese. See CHINA.

Sink-hole: a hollow of the land drained at the bottom. Districts underlain by limestone or gypsum are often drained through subterranean channels, and the surface waters find their way to these channels through vertical crevices which are sometimes opened out into shafts of some size. The washing of soil, etc., into such shafts usually produces a funnel-shaped cavity, and this is known in the U. S. as a sink-hole or limestone-sink, and in England as a swallow-hole. Such hollows are abundant in the great Appalachian valley, which is underlain by limestone from Pennsylvania to Alabama. The word sink is sometimes inappropriately applied to drainless hollows which receive the water of streams, and discharge it to the air by evaporation. See PLAYA. G. K. GILBERT.

Sinking Fund: See FINANCE (*Public Loans*).

Sinnett, ALFRED PERCY: journalist; b. in London, 1840; the son of E. W. Sinnett, a journalist; joined the staff of the London *Globe* in 1859; afterward edited *The Daily Press* at Hongkong; returned to England in 1868; went to Allahabad, India, in 1871, as editor of *The Pioneer*; joined the Theosophical Society in 1879, and, returning again to England in 1882, expounded theosophy to the British public in two widely circulated volumes, *The Occult World* (1881) and *Esoteric Buddhism* (1883). H. A. BEERS.

Sino'pe (Gr. Σινώπη, Turk. *Sinûb*): town; in Asia Minor, in the vilayet of Castamouni (see map of Turkey, ref. 4–G). Situated on a peninsula with a splendid harbor, it was the most important of the Greek colonies on the Black Sea. It was the capital of the kingdom of Pontus. Mithradates the Great was born here (134 B. C.). During the Middle Ages it belonged to the empire of Trebizond, and was captured by Mohammed II. (1470). In its harbor the Ottoman fleet was defeated with a loss of 4,000 men and twelve ships by the Russian admiral Nachimoff (Nov. 30, 1853). This event decided France and Great Britain to interfere, and brought on the Crimean war. The town is well fortified, and has an arsenal and shipyard. It exports dried fruits, fish, skins, nuts, and tobacco. Pop. (1889) 7,162, of whom 2,840 are Greeks. E. A. GROSVENOR.

Sinters [loan-word from Mod. Germ. *sinter* < O. H. Germ. *sintar*: O. Eng. *sinder* (the spelling *cinder* due to influence of Fr. *cendre* < Lat. *cinis*)]: a general designation for mineral substances deposited as incrustations or porous and cellular masses from the waters of mineral springs. The principal kinds are siliceous and calcareous sinters. Some siliceous sinters are classed by Dana with the crypto-crystalline varieties of quartz. They proceed from waters containing silica itself in solution, or sometimes, doubtless, soluble silicates of bases which are decomposed by the carbonic acid of the air. The great mass of siliceous sinters are composed of hydrates of silica. Fiorite, michaelite, and geyserite are names that have been given to some of these. Calcareous sinters are also called calcareous tufas. They are similar in nature and origin to the material of STALACTITES (*q. v.*).

Sintra: See CINTRA.

Sinus: See FISTULA.

Sion, Mount: See ZION.

Sioot, or **Siut**: See ASSIUT.

Siouan (soo'ăn) **Indians**: that linguistic stock or family to which the "Sioux" and cognate tribes of North America belong. According to Trumbull, Sioux, the popular appellation of the tribes which call themselves Dakota, Lakota or Nakota, is an abbreviation of Nadowessioux, which is a corruption of Nadowe-ssi-wag, "the snake-like ones" or "enemies" (derived from the Algonquin word *nadowe*, a snake). The characteristic languages are eminently vocalic and abound in inflections; agglutination and juxtaposition are also found.

Tribes.—The family comprises a number of tribes commonly arranged in ten groups, as follows: 1. (*A*) *Dakota* and (*B*) *Assiniboin*. The former includes the six Dakota sub-tribes, (*a*) Santee, comprising the Mde-wa-ka^{n}-to^{n}-wa^{n} (Spirit-lake village) and Waqpe'kute ("to shoot among deciduous trees"); (*b*) Sisseton (Sisito^{n}wa'^{n}); (*c*) Wahpeton (Wa-qpeto^{n}wa^{n}, "dwellers among deciduous trees"); (*d*) Yankton (Ihañkto-wa^{n}, "end village"); (*e*) Yanktonnai (Ihañkto^{n}wa'^{n}na, "little end village"), divided into Upper Yanktonnai (including the Cut Head band or Pa-baksa gens) and Lower Yanktonnai; and (*f*) Teton (Ti'to^{n}-wa^{n}, "dwellers on the prairie"), in seven divisions, namely, Brulé (Sitea^{n}xu, "burned thighs"), including Upper or Highland Brulé and Lower or Lowland Brulé; Sans Ares (Ita'zipteo, "without bows"); Blackfeet (Sihasapa); Minneconjou (Miniko'oju, "planting beside streams"); Two Kettles (Oo'heno^{n}-pa, "two boilings"); Oglala (o-gla'la, "she poured out her own"), including the Wazaza and the Loafers (Waglu'xe, "inbreeders"); and Huñkpapa (Unepapa or Uncapapa). The tribal organization of the Assiniboin is uncertain; they are called Hohe (rebels) by the Dakota. 2. *Dhegiha* (or *Cegiha*), consisting of the tribes known as (*a*) Omaha (Uma^{n}ha^{n}, "upstream people"); (*b*) Kwapa or Quapaw (Uka'qpa, "downstream people," the Arkansa or Arkansas of early writers); (*c*) Ponka or Ponca; (*d*) the Osage (Waeaea, etc.), divided into Little Osage (Ütsĕhta, "campers on the lowland") and Big Osage (Pahe'tsi, "campers on the mountain"), and the "Arkansaw band" (Santsu'kci$_{n}$, "campers in a highland grove"); and (*e*) the Kansa (Kaw, Ka^{n}ze, referring to the wind). 3. *Tciwere*, comprising (*a*) the Iowa (Pa'qotce, "dusty noses" or "dusty heads"); (*b*) the Oto (Watota, "lovers of sexual pleasure"); and (*c*) the Missouri. 4. *Winnebago*, including only the Winnebago tribe (who call themselves Hoteañgara, "people of the parent speech"). 5. *Mandan*, consisting of the Mandan tribe. 6. *Hidatsa* (Minnetaree or Gros Ventres of the Missouri), consisting of (*a*) the Hidatsa and (*b*) the Crow (Absoroka or Absaruqe, etc.) tribes. 7. *Tutelo* (Yesa^{n}), comprising the Tutelo, Sapona, and cognate tribes. 8. *Biloxi* (calling themselves Tanĕksha^{n}yadi), including the Biloxi and very probably the Paskagula or Pascagoula tribes. 9. *Catawba* (Flatheads), comprising the Catawba, Woccon, and cognate tribes (? Eutaw, ? Chickoree, ? Nachees, etc.). 10. The "Virginia group," composed of the Mannahoak, Monacan, and cognate eastern tribes and confederacies (mainly extinct).

Habitat.—Excepting the Biloxi, Paskagula, Tutelo, Sapona, Catawba, and Woccon tribes, the territory of the Siouan Indians was mainly in one body, extending from about 53° N. in the Hudson Bay Company territory to about 33°, including a considerable part of the watershed of Missouri river and that of the upper Mississippi. The detached portion of Siouan territory on the E. was occupied by Catawba, Biloxi, etc. It comprised a portion of the present States of Virginia, North Carolina, and South Carolina. Contrary to current opinion, the general trend of Siouan migration has been westward.

General Characteristics.—The Dakota tribes were warlike. They were hostile not only to the white people and Indians of other families (especially the Ojibwa and Pawnee), but also to the Crow, Hidatsa, Mandan, Omaha, and other tribes of their own family. Many of the Dakota have come under the influence of Christianity, and are advancing toward civilization. The Omaha and the Ponka have been warlike, but they have never fought against the U. S.; this might be said also of the southern tribes of this family.

Sociology.—The civil and religious institutions are determined by kinship as expressed in terms of consanguinity and affinity. The unit of the social organization is the *gens*, which is usually characterized by one or more taboos. The religious and the legislative, executive, and judicial functions are not differentiated, being exercised by chiefs whose tenure of office is limited by age or other physical incapacity, or by misconduct. The chiefship descends from father to son, unless the ambition and influence of a near relative displace him. With some exceptions descent is in the male line, although the entire system of consanguinity and affinity bears traces of a period in which descent was in the female line. A plurality of wives is deemed essential to the amassing of wealth, which is one avenue to power; divorce is optional with the husband. Civil government, personal conduct, property rights, corporations or organized bodies of persons, war, and international relations are regulated by laws and compacts. Indirectly related to the civil government are two kinds of associations for religious, industrial, and other purposes, the first being the feasting organizations and the second the brotherhoods or dancing societies, to some of which the shamans belong. Murder and rape, as a rule, are punished or avenged by death at the hands of kindred of the victim.

History.—The Dakota were mentioned in the *Jesuit Relations* as early as 1639–40. In 1658 they had thirty towns W. N. W. from the mission St. Michel of the Potawatami; in 1689 they were on the upper Mississippi near St. Croix river. In the nineteenth century the Teton Dakota went into the Black Hills region, previously occupied by the Crow tribe.

The Yankton and Yanktonnai passed from the upper Mississippi into the upper Missouri country prior to 1800. In 1862 the Santee and other Dakota joined in a formidable uprising in which over 1,000 whites were killed. Spotted Tail, Red Cloud, Crazy Horse, Sitting Bull, American Horse, and Even-his-horse-is-feared (popularly called Man-afraid-of-his-horses) are among the most famous Dakota chiefs and warriors of the nineteenth century. An outbreak of serious proportions was narrowly averted during the ghost-dance excitement at Pine Ridge agency in the winter of 1890–91. In all, over 850 Dakota are located in Canada and over 27,500 in the U. S., chiefly in North and South Dakota, Montana, and Nebraska.

Hennepin (1680) described the Assiniboin as dwelling N. E. of the Issati (Isanyati, Santee, or Mdewakantonwan), who were on Knife Lake, Minnesota. The Jesuit map of 1681 placed them on Lake of the Woods, then called Lake Assinepoualacs. They were near this lake in 1766, when they were said to have 1,500 warriors. In 1829 they were W. of the Dakota and N. of the Missouri and Assiniboine rivers, with a population of 8,000. Drake (1848) numbered them at 10,000 before the smallpox epidemic of 1838; that epidemic carried off 4,000. Since 1843 they have been decreasing in numbers. In 1890 there were about 3,000, mostly in Canada; some 700 were at Fort Peck reservation, Montana.

According to tribal traditions, the Omaha, Ponka, Kwapa, Osage, and Kansa tribes were originally one people, dwelling on the Ohio and Wabash rivers. A separation took place as early as 1500, as it preceded de Soto's discovery of the Mississippi; those who went down the Mississippi became the Kwapa, and those who went up the river the Omaha; the Ponka settled on Niobrara river. The Omaha subsequently occupied the country between Covington, Neb., on the N. and Nemaha river on the S., ranging W. as far as the Ponka and Pawnee habitats. About the beginning of the nineteenth century they were near Omaha, Neb. In 1890 they numbered nearly 12,000. They are citizens of the U. S. and of Nebraska.

Although archaic, the name Ponka does not appear in history till 1700. The Ponka were met by Lewis and Clark in 1804, when they had been reduced by the smallpox to about 200. In 1829 they numbered 600; in 1842, 800; and in 1871, 747. Prior to that time they had been friends of the Dakota; but a cession of lands to the Sioux reservation made the tribes enemies. The warfare continued until the forcible removal of the Ponka tribe to the Indian Territory in 1877. A commission appointed in 1880 visited both settlements of the Ponka, and their investigations resulted in legislation in favor of the tribe. Those who agreed to remain in the South are said to be prospering. In 1890 they numbered over 600, while those in Nebraska numbered 217.

The Kwapa were found in 1541 by de Soto on the Mississippi, above the St. Francis, apparently near the site of the present New Madrid. La Salle (1681) found them in three villages along the Mississippi. The earliest mention of "Akansa" is by La Métairie in 1682. Saint-Cosme says the greater part of the Kwapa died of the smallpox in Oct., 1699. Gravier (1701) mentions five villages, the Imaha (equivalent to Omaha in meaning), which he terms "the largest village of the Akansa confederation," being the *highest up* the Arkansas, while Sibley (1805) says the Arkansa were in three villages about 12 miles above Arkansas Post. The Kwapa subsequently affiliated with the Caddo, though of another linguistic family. In 1877 the Kwapa were on their reservation in the Indian Territory, but most of them later removed to the Osage country. Their total number in 1890 was 232.

The Osage were mentioned by Marquette (1673) as the Ouchage and Autrechaha. In 1829 Porter gave their number as 5,000, and described their country as beginning 25 miles W. of the Missouri line, running to the Mexican line (of that date), being 50 miles wide. Schoolcraft said that in Apr., 1853, they numbered 3,788. In 1894 they were on the Osage reservation, Oklahoma; in 1890 they numbered 1,581.

After the cession of Louisiana to the U. S., a treaty with the Kansa tribe was made by the Government. They were then on Kansas river, at the mouth of the Saline, and numbered about 1,500, in 130 earth lodges. In 1825 they ceded their lands on the Missouri, retaining a reservation on Kansas river. In 1846 they again ceded their lands, and a reservation was assigned them on Neosho river, in Kansas. This was soon after sold, and a new reservation acquired in Indian Territory. In 1890 they numbered 214.

In 1761 Jefferys located the Iowa Indians on the east side of Missouri river, W. of the heads of Des Moines river, above the Oto and below the Maha (Omaha). Drake (1848) said that in 1805 they numbered 800, and dwelt 40 leagues up Des Moines river, on the southeast side. Part of the Iowa afterward removed to the Sac and Fox reservation in what is now Oklahoma, but the rest remain on the Great Nemaha reservation, Kansas. Their number in 1890 was 273.

The Oto was the third tribe to separate from the Winnebago, the Iowa being the first and the Missouri the second. In 1673 they were placed by Marquette between 40° and 41° N. lat., W. of Missouri river, E. of the Maha (Omaha) and S. E. of the Pana (Pawnee or Ponka?); in 1680 they were 130 leagues from the Illinois, almost opposite the mouth of Miskoncing (Wisconsin) river; and in 1687 they were on Osage river. Iberville (1700) located the Iowa and Oto with the Omaha, between Mississippi and Missouri rivers, about 100 leagues from the Illinois tribe. In 1833 Catlin found the Oto and Missouri together in the Pawnee country. In 1894 they were with the Missouri on the Ponka, Pawnee, and Oto reservation, Oklahoma. Together with the Missouri, they numbered nearly 400.

The name Missouri first occurs about 1687. Their village was placed by Bourgmont (1723) 30 leagues below Kansas river, and 60 leagues below the principal Kansa village. The tribe formerly dwelt at the mouth of Missouri river, but gradually ascended that stream. About 1798 or 1800 they were dispersed by the Sac and Fox and other Indians; five or six lodges joined the Osage tribe, two or three took refuge with the Kansa, and most of the remainder amalgamated with the Oto. In 1805 Lewis and Clark found the Missouri in villages S. of Platte river, numbering 300 souls. They were with the Oto in 1829, when they numbered 80, and followed them to Indian Territory in 1882.

The Winnebago are closely related to the Iowa, Oto, Missouri, and Mandan. The earliest mention of the name is in the *Jesuit Relation* of 1640. Nicollet found them on Green Bay, Wisconsin, in 1639. Kelton says that they derived their popular name from their former residence on Winnebago Lake, called by the Algonquin tribes near it *Winibi*, dirty water. In 1811 Pike named seven Winnebago villages. In 1822 the Winnebago population was estimated at 5,800, with 900 warriors. By treaties in 1825 and 1832, they ceded all their land S. of Wisconsin and Fox rivers for a reservation on the Mississippi above the Oneota. One of their villages in 1832 was at Prairie la Crosse. During their third visitation of smallpox, in 1836, more than one-fourth of the people perished. In 1837 they relinquished their title to the country E. of Mississippi river, and in 1840 removed to the Territory of Iowa. In 1846 they surrendered their reservation for one above Minnesota river, and in 1856 removed to Blue Earth, Minn., and thence to a new reservation on the Omaha lands above Fort Randall, where they occupy lands allotted in severalty. In 1890 there were 1,215 here, with nearly 1,000 elsewhere, chiefly in Wisconsin.

The Mandan settled about 1750 on Missouri river, near the mouth of Heart river, in nine villages; they afterward ascended the river to a point 1,430 miles above its mouth. In 1837 the Mandan were almost destroyed by the smallpox, there being left only thirty-one (according to one account, though others vary from 125 to 145) out of 1,600. About 1872 a reservation was set apart for the Mandan, Hidatsa, and Arikara, in Dakota and Montana, along Missouri and Yellowstone rivers. In 1890 the Mandan numbered 252.

The Hidatsa were formerly known as the Minnetaree or Gros Ventres of the Missouri, and so were often confounded with the Minnetaree or Gros Ventres of the Plains, or the Atsina, of the Algonquian family. In 1796 there were three villages of this tribe on Knife river, in what is now North Dakota. The largest, Hidatsa, gave its name to the tribe. After the smallpox epidemic of 1837, the villages united. In 1845 the Hidatsa tribe (and about the same time the Mandan) moved up the Missouri and established a permanent village 30 miles by land and 60 by water from their old home. They were joined by the Arikara in 1862. In 1890 the Hidatsa on Fort Berthold reservation numbered 522.

The real name of the Crow tribe, which is Absaroka or Absoruqe (Hoffman), does not mean "crow," but refers to a species of hawk. When met by Lewis and Clark the Crow were in four "bands." In 1817 Brown located them on Yellowstone river. The Indian *Report* of 1842 gave their number as 4,000, inhabiting the head waters of the Yellowstone. They were later gathered on the Crow reservation, Montana, and in 1890 numbered 2,287.

The Tutelo or Yesan was the leading tribe of the seventh group of Siouan Indians. To this group belonged the

Sapona and probably the Occanecche or Akenatzy, Keyauwee, Shoccorie, Stenkenock, and Meipontsky tribes. The Tutelo were first referred to by Capt. John Smith. They were in Southern Virginia in 1671, according to Batt; in North Carolina in 1714, according to Lawson. They and the Sapona returned to Virginia, and in the eighteenth century, with the Nottoway and Meherrin, migrated into Pennsylvania and subsequently joined the Six Nations. At the close of the Revolutionary war the Tutelo followed the Six Nations into Canada, settling on Grand river reservation, Ontario. The tribe was nearly exterminated by smallpox in 1848, and the last survivor died in 1870.

In 1669 the Biloxi had one village on Biloxi Bay, near the Gulf of Mexico; thirty years later there were three villages, Biloxi, Paskagula, and Moctobi. In 1804 the Biloxi were on Red river, and in 1828 they were reduced to twenty families on Neches river, Texas. In 1894 about twenty-five of the tribe survived in Lecompte, Rapides parish, La.

Of the Catawba tribes, those mentioned earliest were the Wateree and St. Helena, seen by Juan Pardo's expedition in 1567. In the earlier part of the next century the Catawba proper (who were called Flatheads) were on Catawba creek, in Botetourt co., Va., and may have occupied the adjoining county, Roanoke, where there is now a settlement bearing their name. About 1660 they migrated to South Carolina. Lawson (1701–02) spoke of the Kataba on Catawba river, South Carolina, as Esaw, and distinguished them from the Kadapaw on Lynches creek. Adair states that in 1743 the Catawba had 400 warriors; Ramsay (1795) that in 1780 they numbered 490 with 150 warriors. In 1780 they withdrew before Cornwallis to Virginia, where some of them joined the American army, returning to establish themselves in two new villages. About 1841 they sold to the State of North Carolina 14 sq. miles of their territory, reserving only 1 sq. mile and a tract of land on the east side of Catawba river. At that time, as also in 1890, they numbered about 120.

The Mannahoak confederacy of Virginia consisted of about a dozen tribes, of which the names of eight have been preserved. Their habitat was between tide-water and the Blue Ridge. Of the Monacan confederacy of Virginia five tribes were named by Capt. John Smith, Lederer, and Jefferson. Both confederacies are extinct.

For a description of the manners, customs, etc., of the Siouan Indians (with others), see INDIANS OF NORTH AMERICA.

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JAMES OWEN DORSEY.

Sioux (soo) **City**: city; capital of Woodbury co., Ia.; at the junction of the Big Sioux and Missouri rivers; on the Chi., Mil. and St. P., the Chi., St. P., Minn. and Om., the Ill. Cent., the Sioux City and North., the Sioux City and Pac., the Sioux City, O'Neill and W., and the Union Pac. railways; 80 miles S. of Sioux Falls, S. D., and 100 miles N. by W. of Council Bluffs (for location, see map of Iowa, ref 4–C). It is the second city in size in the State, has a large frontage on the Missouri river and a picturesque residence quarter on high bluffs, and is an important commercial center. It is the gateway to South Dakota, the upper Missouri region, and the Black Hills mining and grazing country.

Public Interests.—The city has all the modern improvements: water-works (cost $1,000,000); 51 miles of electric and 3 miles of elevated railway; gas and electric lights; over 40 miles of sewers; 25 miles of paved streets; city-hall and public library (cost $80,000); police building ($30,000); county court-house; U. S. Government building ($250,000); Y. M. C. A. building ($60,000); 2 hospitals; a Union dépôt ($600,000); and a bridge across the Missouri river ($1,000,000). There are over 40 churches, several of which cost from $50,000 to $75,000 each; 30 public-school buildings (cost over $650,000), including a high-school building that cost $130,000: the University of the Northwest, and 3 daily and 13 weekly papers.

Business Interests.—The census returns of 1890 showed 195 manufacturing establishments (representing 50 industries), with a combined capital of $4,938,606, employing 2,997 persons, paying $1,862,612 for wages and $10,329,994 for materials, and turning out products valued at $14,164,667. In 1895 there were 5 meat-packing houses with a capacity for slaughtering and packing 13,000 hogs, 3,000 cattle, and 1,600 sheep per day. Over $6,000,000 was invested in manufacturing. The principal productions were stoves, engines, shoes, flour, soap, starch, wagons, plows, tile, brooms, furniture, and clothing. The jobbing trade amounts to about $30,000,000 per annum. There were 17 banks of all kinds, having a combined capital of $3,575,000 and a surplus of $940,000, and 2 loan and trust companies.

History.—The city was settled by traders in 1849, was an important Government post during the early Indian troubles, and was the outfitting point for the Black Hills expeditions. It achieved great fame from its corn palaces, beautiful structures decorated with grains, grasses, and other products of the soil. Five were built, in which annual fairs and festivals were held, lasting a month. Since the palaces were abandoned annual interstate fairs have been held at Riverside Park, a beautiful retreat in the suburbs, with ample grounds and a race-track.

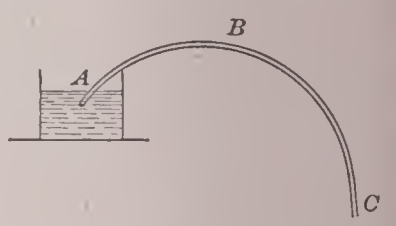
Pop. (1880) 7,366; (1890) 37,806; (1900) 33,111.

ORA WILLIAMS, MANAGING EDITOR OF "JOURNAL."

Sioux Falls: city (incorporated as a town in 1877, as a city in 1883); capital of Minnehaha co., S. D.; on the Big Sioux river, and the Burl., Cedar Rap. and N., the Chi., Mil. and St. P., the Chi., St. P., Minn. and Om., the Great N., and the Ill. Cent. railways; 90 miles N. of Sioux City, Ia. (for location, see map of South Dakota, ref. 7–G). It is in an agricultural and stone-quarrying region; has large stock-raising interests; derives great power from the river, which falls nearly 100 feet in a series of cascades within a distance of half a mile; and contains water-works, sewers, and gas and electric-light plants. The streets are paved with jasper, quarried near the city, and many buildings are constructed with the same stone. There are 30 churches, 7 public-school buildings, public-school property valued at over $175,000, Sioux Falls University (Baptist), All Saints' School (Protestant Episcopal), a Norwegian-Lutheran college, a business college, the State School for Deaf Mutes, the South Dakota penitentiary, 4 national banks with combined capital of $450,000, 3 State banks with capital of $200,000, and 2 daily, 7 weekly, and 3 monthly periodicals. Sioux Falls is the seat of the Protestant Episcopal bishopric of South Dakota and of the Roman Catholic bishopric of Sioux Falls. Pop. (1880) 2,164; (1890) 10,177; (1900) 10,266.

CHARLES M. DAY, EDITOR OF "ARGUS-LEADER."

Siphon [from Lat. *si'pho*, *sipho'nis* = Gr. *σίφων*, reed, pipe, tube, siphon]: a bent tube for conveying water from a reservoir, A, to a lower level, C, over an elevation, B, which is not more than 33 feet higher than A. To put the siphon into action the air must be exhausted, and then the atmospheric pressure on the surface of the water at A causes the water to rise and flow over, with a velocity depending upon the difference of level between A and C. The siphon is used for emptying casks, and sometimes on pipe-lines for water-works, but in the latter case a pump is placed at B, in order to remove the air which otherwise accumulates there and diminishes the flow. See HYDRAULICS.



M. M.

Siphonap'tera [Mod. Lat., from Gr. *σίφων*, tube + *ἄπτερος*, wingless]: an order of insects which contains the fleas. See ENTOMOLOGY.

Siphona'ta [Mod. Lat., deriv. of *sipho* = Gr. *σίφων*, tube]: one of the two divisions into which the lamellibranch molluscs (clams, etc.) were formerly divided, the name being given in allusion to the fact that the posterior edges of the mantle were united with a tube (familiar in the so-called "head" of the common clam). See LAMELLIBRANCHIATA.

Siphonoph'oræ [Mod. Lat., from Gr. *σίφων*, tube + *φορός*, bearing]: a group of HYDROZOA (*q. v.*) characterized by the formation of free-swimming colonies, the individuals of which have become highly differentiated. These individuals are each modified jellyfishes, and are connected by a tube, whence the name. In a typical form the following individuals may occur: (1) A float, to suspend the colony, occurring

at the end of the tube; (2) swimming bells; (3) feeding polyps; (4) digestive polyps; (5) reproductive polyps; (6) sensory polyps; (7) tentaeles; (8) covering scales, which cover and proteet some of the others. Of these the swimming and reproductive individuals retain most clearly the medusan features. Usually one or more of the individuals may disappear, while in many forms the tube may be eontraeted into a disk. The siphonophores, of whieh there are many speeies, vary greatly in size and appearanee. Some are but an ineh or two in length, while others are 2 yards or over. Some are perfeetly transparent and eolorless, while others (e. g. *Physalia* and *Velella*) are brilliantly eolored with blues, reds, and greens. Many of the species are armed with powerful batteries of nettle-cells, and contaet with them will eause severe pain in man. Most of the speeies inhabit tropical seas. See Haeckel, *Zoölogical Reports* of the Challenger expedition, vol. xxviii. (1889), and papers by Gegenbaur, Huxley, Claus, and Fewkes. J. S. Kingsley.

Siphonosto'mata: See Copepoda.

Sipuncula'cea, or **Sipunculoi'dea** [Mod. Lat., named from *Sipun'culus*, the typieal genus, from Late Lat. *sipunculus*, for Lat. *siphun'culus*, dimin. of *si'pho*, *sipho'nis*, tube. See Siphon]: a group of marine worms in whieh the body is usually elongate and cylindrieal, without traees of segmentation, and without bristles or other appendages. The mouth is at the anterior end of the body, and this region can be inverted into the rest by the aetion of retraetor muscles. The mouth is usually surrounded by tentaeles. Internally, all traees of segmentation are lost, and the viseera are suspended in an extensive body-eavity. The intestine is usually coiled upon itself, and the vent is dorsal, near or in front of the middle of the body. There are one or two exeretory organs (nephridia), and the genital produets, whieh arise at the origin of the retractor muscles, and whieh are set free in the body-cavity, pass out through the nephridia. A eirculatory system is well developed, and the tentaeles subserve respiratory purposes. There is a metamorphosis in development, the larva being strikingly like that of the true annelids. These worms burrow in the sand or inhabit tubes, dead shells, etc. Over 100 speeies are known. See Selenka, *Sipunculiden*, in Semper's *Philippinen Reise* (1883); Andrews, *Anat. Sipunculus.*, Studies Johns Hopkins Laboratory, iv. (1890); Hatsehek, *Entwickelung*, in *Arbeiten d. zool. Inst. Wien*, v. (1884). J. S. Kingsley.

Sirbonian Bog, or **Sirbonic Lake**: formerly a long, narrow body of water, separated from the Mediterranean by a low strip of shore, and extending eastward from Pelusium in Egypt. It is now dry and eovered with sand. At the beginning of the Christian era Strabo (*Geogr.*. i., 3, 4) spoke of it as a marsh, and just previously Diodorus reported that it was overgrown with reeds and papyrus. These statements do not agree with the further statements of Strabo (xvi., 2, 33, and 42, 43) that it was a deep body of heavy water into which one could not dive, and that asphalt or bitumen rose to the surfaee near the middle of it, whenee it was gathered by men on rafts. One of the prineipal routes to Asia led along the narrow neek between sea and lake, but it was dangerous at eertain states of wind and tide. Artaxerxes is said to have lost a part of his army when attempting the passage. The route of the Exodus proposed by Brugseh included the erossing of the bog by the Israelites, but the discovery of the site of Pithom overthrew his theory by loeating the initial stages of the itinerary about midway of the isthmus. Charles R. Gillett.

Sir-Darya: See Syr-Darya.

Sire'don [Mod. Lat., from Gr. σειρηδών, late collateral form of σειρήν, siren]: a name at first applied to the axolotl of Mexico, but now extended to inelude the large larvæ with external gills of several species of salamanders belonging to the genus *Amblystoma*.

Siren [Mod. Lat., from Gr. σειρήν, siren. So named because supposed to have a singing voiee]: a genus of tailed amphibians of the southern parts of the U. S. The only species is *Siren lacertina*, the mud-eel of the Carolina rieeswamps. It has two weak fore legs, no hind limbs, permanent gill-tufts, as well as lungs, is 2 feet long, and blaek. It is eonsidered venomous by the Negroes. *Pseudobranchus striatus* is a smaller but very similar animal.

Sirene: See Acoustics.

Sire'nia [Mod. Lat., from Gr. σειρήν, siren. So called from a fancied resemblance of the dugong to the fabled sirens]: an order of mammals, containing speeies familiarly known as sea-cows. They are adapted for habitual life and progression in the water, but less modified than the eetaceans. The form is fish-like, the skull short and head small in proportion to the body; front limbs are present as flippers, hind limbs are absent; the body ends in a transversely flattened tail, whieh may be rounded, as in the manatee, or, as in the dugong, forked like the flukes of a whale. The brain essentially resembles that of the higher mammals, but is notable for the compression and elevation of the cerebrum, the upturned bulbous olfactory nerves, and the depression of the eerebellum. Molar teeth, adapted for the trituration of herbage, are in the sides of both jaws; the neek is moderate, and the seeond vertebra has a distinet odontoid proeess; the heart is deeply fissured between the ventrieles. The speeies are all herbivorous, and feed upon the vegetation growing on the banks of estuaries and rivers, as well as seaweed. When at rest they remain upraised from the bottom of the water by their tail, but with the head downward, and the back eonsequently arehed; at intervals of about one minute to one minute and a quarter they rise to breathe, and the valves of the nose open and shut as they come to the surfaee and go downward again. The order is now represented by two families—*Trichechidæ*, ineluding the manatees, and *Halicoridæ*, containing the dugongs. Up to the end of the eighteenth century a third family (*Rhytinidæ*) existed in the North Pacifie (Bering Sea), but its only living species was in a short time exterminated by the attaeks of man. The earliest extinet representatives of the order yet known are of Eoeene age, and sinee then several peeuliar forms have flourished and died out. See Dugong and Manatee. Revised by F. A. Lucas.

Sirenoi'dea: same as Dipnoi (*q. v.*).

Sirens [plur. of *Siren* = Lat. = Gr. Σειρήν, plur. αἱ Σειρῆνες, the Sirens]: in Greeian mythology, maidens who lived on an island between Seylla and the island of Ciree, and by their ravishing songs eharmed mariners to their ruin, for whoso heeded their singing saw nor wife nor home again. It was fated that the Sirens should die as soon as any one should pass by without heeding their singing. Odysseus eseaped their allurements only by stuffing his eompanions' ears with wax and having himself seeurely tied to the mast. The Argonauts eseaped them beeause they were eharmed by the superior singing of Orpheus. The Sirens were ehanged for one reason or the other to sunken roeks loeated at Pelorum, or Sorrento, or Capri, or the Sirenusæ. In earliest times they were represented as birds with the heads of maidens, and later as ereatures with the body of a maiden and the legs and wings of a bird. J. R. S. Sterrett.

Si'rius [= Lat. = Gr. Σείριος]: the dog-star, a star of *Canis major*, the brightest star in the heavens. It may be seen in the S. in the winter evenings. From the expressions of several aneient writers it is sometimes elaimed to have been red in aneient times, though now a brilliant white, but the question of its former color is not yet settled. It was formerly believed to exereise a powerful and, to some extent, a baleful influence upon human affairs.

Revised by S. Newcomb.

Siroc'co [= Ital., from Arab. *shoruq*, deriv. of *sharq*, sunrise, east, deriv. of *sharaqa*, rise; ef. Saracen]: a hot, relaxing wind which rises in the Sahara, then blows aeross the Mediterranean, where it occasionally beeomes filled with moisture, and finally over Sieily, Southern Italy, Malta, ete. It generally oeeurs in spring and autumn, lasts for one or two days, though sometimes for a whole week, and is very injurious to vegetable and animal life, causing general exhaustion, great prostration, and mental depression.

Sisal' Hemp [named from *Sisal*, a port of Yueatan]: the fiber of various species of Agave (*q. v.*). Sisal hemp is produeed in eonsiderable quantities in Yucatan and at Key West, Fla., and adjaeent islands. It makes exeellent eordage, superior to that of true hemp, but it is ehiefly made into hammoeks of great strength and durability.

Sis'co, or **Cisco**: any one of several fishes of the genus *Coregonus*, natives of the Great Lakes of North Ameriea. The prineipal speeies are the *C. artedi* (also ealled herring), and the *C. hoyi* of the deep waters of Lake Michigan. They are reeognizable by their herring-like form, terminal mouth, with the lower jaw longest, short intermaxillary bones, and the long and narrow suborbital bones. They are small, rarely weighing as mueh as a pound. The *C. artedi* inhabits the shoaler waters. It is in some places excessively abundant.

Sis'cowet, Siskowit, or **Siskawitz** [from native (Amer.-Ind.) name]: a variety of the great lake-trout (*Salvelinus namaycush*, var. *siskawitz*), found in Lake Superior. It is similar to the namaycush, but is less elongated, and becomes extremely fat.

Sisen'na, Lucius Cornelius: historian; b. about B. C. 119; was prætor B. C. 78; defended Verres in 70, and died B. C. 67 in Crete, being at the time legate of Pompey in the war with the pirates. Having been an actor in public affairs, he was well fitted to relate the events of his own time (including the Social war and the civil wars of Sulla) in his work entitled *Historiæ*, written in an archaic style. Cicero says of him (in his book on *Laws*) that he surpassed all previous Latin historians, and Sallust highly praises his diligence. Sisenna translated also into Latin the Milesian tales (Μιλησιακά) of Aristides. Whether the Sisenna who wrote commentaries to several plays of Plautus is the same is disputed. Only fragments of the *Historiæ* remain, collected by Peter in *Hist. Roman. Fragmenta*, pp. 175–189.

Revised by M. Warren.

Siskin [from Dan. *sisgen*, or Swed. *siska*; Germ. *zeisig*, from Sloven. *čižek*: Polish *čyžŭ*, siskin]: an Old World bird, *Spinus* or *Chrysomitris spinus*, of the family *Fringillidæ*. The male is a prevailing olive green above and yellowish white below, streaked with black on the back and sides, and with a black throat and crown. It is a favorite cage-bird. The pine-siskin (*S. pinus*) and the American goldfinch are related North American species.

Sismon'di, Jean Charles Léonard Simonde, de: historian and political economist; b. at Geneva, Switzerland, May 9, 1773; educated in the college of his native town, and was a clerk in a large counting-house in Lyons; political disturbances drove his family into exile, and he lived in England and later in Italy for several years; settled finally in his native town in 1800; devoted himself to studies and literary work, though at the same time participating very actively in politics; married in 1819 an English lady. D. near Geneva, June 25, 1842. His first work was a treatise on political economy. *De la Richesse commerciale* (1803), based on the ideas of Adam Smith, which, however, he afterward abandoned, and even opposed, in his *Nouveaux Principes d'Économie politique* (2 vols., 1819) and *Études sur les Sciences sociales* (3 vols., 1836). His acquaintance with Madame de Staël, Benjamin Constant, Guizot, etc., turned his attention from political economy to history, and it was as an historian that he acquired his great celebrity. His *Histoire des Républiques italiennes du moyen âge* (16 vols.) appeared at Zurich in 1807–18; *La Littérature du Midi de l'Europe* (4 vols., 1813) was translated into English by Thomas Roscoe in 1823. Of his principal work, *Histoire des Français* (31 vols., 1821–44), he gave an abstract, *Précis de l'Histoire des Français* (2 vols., 1839). See *Sismondi, Fragments de son Journal et de sa Correspondance avec Mlle. de Sainte-Aulaire* (1863), *Lettres inédites à Madame d'Albany* (1864), and another collection of *Lettres Inédites* (1878).

Sistan: See Seistan.

Sisterhoods: in the religious sense, unions of women devoted by public vows to religious work. They are in idea nearly as old as monasticism, for female branches of all the principal monastic orders were organized by the original founders, whose members are called nuns, and are technically spoken of as female religious. A distinction should be made, however, between a sister and a nun, for the former, unlike the latter, is not shut up in a convent, nor given up to contemplation and ascetic practices. Sisterhoods in the strict sense are modern, for the first one, still the most famous of all, was founded by St. Vincent de Paul in 1629, and is known variously as Daughters or Sisters of Charity, Gray Sisters, and Sisters of St. Vincent de Paul. (See article Charity, Sisters of.) There are now many sisterhoods, all doing similar work. One of them, the Irish Sisters of Charity, founded in 1815, uses an adaptation of the Jesuit rule. The vows of all are the monastic ones of poverty, celibacy, and obedience. To these are added, in some cases, other obligations. The sisters wear a distinctive dress, and have houses to live in and start from on their daily round of labor.

Protestant women, although equally devoted to the relief of suffering, do not, as a rule, favor sisterhoods. They prefer to work independently. Besides, they resent the implication of the vow as to "chastity," that the married relation is in any sense derogatory, instead of being in every respect an honor and glory to woman, and that it is a hindrance to spiritual life, whereas it is a divinely ordered help. Protestant sisterhoods date from the revival of what is called "Catholic" teaching in the Church of England. The first sisterhood in the Church of England was founded by Dr. Pusey in 1845. The Society of the Holy Trinity was founded at Devonport in 1847, and many others have since been organized. One of the largest is Sisters of the Poor, founded in 1851. The saintly Sister Dora (Dorothy Pattison, 1832–78) belonged to the Sisterhood of the Good Samaritans.

The first Protestant sisterhood in the U. S., the Sisterhood of the Holy Communion, was founded by Rev. Dr. W. A. Muhlenberg in New York in 1852. It took charge of St. Luke's Hospital in that city in 1859, and St. Johnland in 1866. The Sisterhood of St. Mary was founded in New York in 1865. There were in 1895 nineteen sisterhoods in the Protestant Episcopal Church, four being branches of English ones.

The Protestant sisterhoods differ somewhat in methods and objects, but agree in promoting a combination of piety and good works. They pay particular attention to the inner life, and strive to put the spiritual force thus gained to practical account. In dress their members resemble those in the Roman Catholic Church, except that they do not cover up the hair. They take vows, but not irrevocable ones, although it is very seldom that a woman leaves a sisterhood. For the allied order of Deaconesses, see Deaconess.

Sadlier's Catholic Directory (New York) annually gives the figures for the Roman Catholic sisterhoods in the U. S. and Canada, and the *Catholic Directory*, published in Dublin, those for Great Britain and Ireland. For the sisterhoods in the Church of England, see the yearly list in the *Kalendar of the English Church* (London). For those in the Protestant Episcopal Church see the *Living Church Quarterly* (Milwaukee, Wis.). On the general subject, see Mrs. Jamieson, *Sisterhoods of Charity* (London, 1855); Mary Goodman, *Sisterhoods in the Church of England* (1863; 2d ed. 1865); J. M. Ludlow, *Woman's Work in the Church* (1865); W. A. Muhlenberg, *Evangelical Sisterhoods* (New York, 1867); C. E. Stephen, *The Service of the Poor* (London, 1870); H. C. Potter, *Sisterhoods and Deaconesses at Home and Abroad* (New York, 1871); C. C. Grafton, *Vocation; or, The Call of the Divine Master to a Sister's Life* (1886).

Samuel Macauley Jackson.

Sisters of Charity: See Charity, Sisters of.

Sisters of Mercy: a Roman Catholic religious sisterhood, founded at Dublin, Ireland, in 1827, by Miss Catherine McAuley. The rule is similar to that of the Presentation nuns. Originally each convent was independent, but offshoots from the parent house, especially outside of Ireland, are usually subject to it. These religious women are always under the jurisdiction of the bishop in whose diocese they are located. They were introduced into the U. S. in 1843, at Pittsburg. Their convents are more than 200 in number, and the sisters are chiefly occupied in the conduct of parochial schools, private academies, hospitals, and homes for the aged. See *Life of Mother Catherine McAuley, Leaves from the Diary of a Sister of Mercy*, and *Hoffman's Catholic Directory* for 1895.

J. J. Keane.

Sisto'va: town and fortress; in Bulgaria, on the Danube, between Nicopolis and Rustchuk (see map of Turkey, ref. 3–D). It manufactures leather and cotton goods and carries on a large trade in wheat and wine. The treaty of Sistova was signed here between the Ottoman empire and Austria (1791), and the Russians crossed here in 1877. Pop. (1893) 13,212.

E. A. G.

Sis'yphus (Gr. Σίσυφος): in Grecian mythology, son of Æolus, father of Glaucus, grandfather of Bellerophon, and king and founder of Corinth. Because of his wickedness Zeus sent Death to take him to Hades; but Sisyphus bound Death and held him long time prisoner, so that no one died until Death was finally released by Ares. For this reason (though other reasons also are given) Sisyphus, when finally he had come to the house of Hades, was doomed to roll to the top of a high mountain a huge rock, which always broke away from him just as the top was being reached.

J. R. S. Sterrett.

Sit'ka (formerly New Archangel): capital of Alaska Territory, on Baranof island, near the Pacific coast, in lat. 57° 2′ N. (see map of Alaska, ref. 4–H). It has a harbor that is deep and commodious, but is difficult of ingress and egress. It was founded by the Russians in the eighteenth

century, and was long the headquarters of the Russian-American Fur Company, but consisted, when transferred to the U. S. in 1867, of only about 100 log huts. Since then several large edifices have been built, and the presence of a detachment of U. S. troops until 1877 did much to contribute to the prosperity of the place. A noteworthy relic is the Greek church of St. Michael, built in 1816. The Presbyterian mission established an industrial school there in 1878; also a hospital and a museum. Pop. (1890) 1,190; (1900) 1,396. M. W. Harrington.

Sitt'idæ [from *Sitta*, the typical genus]: a family of birds containing the nuthatches. See Nuthatch.

Sitting Bull (Indian name, Tatanka Yotanka): Sioux chief and medicine-man; b. on Willow creek, Dakota, 1837; became the leader of the unruly members of his tribe, who raided settlements of whites and small reservations of Indians—massacred whites at Spirit Lake, Iowa, and in Minnesota 1862, and were driven by Gen. Sully into the Big Horn region and to the Yellowstone 1864. They were defeated in a battle on the Muscle Shell river 1868; were placed on a reservation in the Black Hills, from which they were driven by miners, 1876; refused to be transported to the Indian Territory; resisted and slew a party of troops under Gen. Custer. On being pursued by Gen. Terry, Sitting Bull and some of his followers escaped into Canada. He surrendered on a promise of pardon 1880, and returned to Dakota, but continued to ferment trouble among the Sioux, and in 1890 the military authorities determined to arrest him. He was attacked Dec. 15 in his camp near Grand River, North Dakota, and during the fight that ensued was killed.

Siut: See Assiut.

Śiva, or **Shiva** [Sanskr., the gracious or blessed one]: a Hindu god, usually spoken of as the "Destroyer and Regenerator," the third member of the Hindu Trimurti or triad of divinities, of which Brahmā, the "creator," and Vishnu, the "preserver," are the first and second respectively. He appears, however, under a great variety of names, attributes, and functions. As the Destroyer he is represented by Rudra. As the Regenerator or Reproducer his symbol is the linga or phallus, and under this he is now usually worshiped. (See Linga.) He also represents the contemplative and ascetic side of Hinduism. He is represented as sitting absorbed in thought, naked, and smeared with funereal ashes, with matted hair, and wearing a necklace of human skulls and bones. He has three eyes, and fire from them consumes those who dare to interrupt his devotions. His worship is called *Saivism*, or *Sivaism*, and his worshipers *Saivas*.

Sivas' (anc. *Sebasteia*, Σεβάστεια): town; in Asia Minor, in the vilayet of Sivas, on the Kizil Irmak (see map of Turkey, ref. 4–G). Though situated in the center of an extensive and fertile plain at the juncture of natural routes, lack of roads nullifies these advantages, and the town is poverty-stricken and lifeless; hundreds of the natives work in distant places, above all in Constantinople, and thus support their families. It manufactures excellent carpets and woolen and linen goods. Pop. (1889) 39,368, of whom 23,619 are Mussulmans and 14,439 Armenians. E. A. G.

Sivathe'rium [Mod. Lat.; Eng. *Siva*, i. e. *Çiva*, the Hindu god + Gr. θηρίον, wild animal]: an extinct genus of ruminating animals from the Siwalik Hills, India, remarkable for their size and peculiar horns. *S. giganteum* nearly equaled the elephant in size, and was armed with two pairs of horns, a small pair springing from the anterior part of the head, and a much larger pair from the top. The bony cores of these horns, the only part preserved in the fossil state, show that these animals belonged to the hollow-horned type of ruminants. The front pair were divergent, apparently nearly straight, and simple. The posterior pair were branching, and had at least three points. The American antelope or prong-buck is the only living hollow-horned ruminant with branching horns. It is also the only one known to shed its horns. The posterior horns of *Sivatherium* seem to have closely resembled in structure those of the prong-buck, and may have been deciduous. The bones of the skeleton of *Sivatherium* were massive, like those of oxen. The nose was probably more or less movable, as evinced by the short projecting nasals. Falconer and Cautley supposed the animal to have possessed a true proboscis, but Dr. Muric concludes, from a study of the remains and a comparison with allied forms, that the nose was similar to that of the saiga of Tartary. O. C. Marsh.

Si'wah (anc. *Am'mon*, or *Ammo'nium*, Egypt. *Amun*): an oasis in Northwestern Egypt, 360 miles W. of Cairo, and 160 miles S. of the Mediterranean. Area, 6 sq. miles. The eastern part of the oasis is very fertile and rich in springs; in the northern part some limestone hills are found. In ancient times the place was celebrated as the seat of the temple of Jupiter Ammon, of which remains are extant, and of the Fountain of the Sun, whose waters were cold at noon and hot at midnight. The temple was immensely rich and guarded by strong fortifications. Cambyses attempted in vain to capture it. Alexander visited it, and was hailed by the priests as a son of the god. The Emperor Justinian built a Christian church here. The oasis is inhabited by about 3,350 Berbers and Negroes, who profess Mohammedanism, and speak a peculiar dialect much mixed with Arabic. The town of Siwah is in lat. 29° 12′ N., lon. 25° 30′ E., near the site of the ancient temple.

Revised by M. W. Harrington.

Six Nations: See Iroquoian Indians.

Six-principle Baptists: a sect of American Christians who take as their creed the six principles laid down in Heb. vi. 1, 2, viz.: (1) repentance, (2) faith, (3) baptisms (of repentance, of fire, and of Christ's sufferings), (4) laying on of hands, (5) the resurrection, (6) the eternal judgment. They especially insist upon the laying on of hands, and refuse to commune with those who do not practice it. They are Arminians, and neither educate nor adequately support their ministry. They are found in Rhode Island, Massachusetts, New York, and Pennsylvania. They were first organized in 1652 by William Wickenden, Chad Brown, and Gregory Dexter, at Providence, R. I., and once composed the most numerous and influential section of American Baptists. In 1900 they reported eighteen organizations and 937 communicants. Revised by W. H. Whitsitt.

Sixth: in music, an interval comprising five degrees of the diatonic scale. See Interval.

Sixtus: the name of five popes. (See Pope.) Sixtus IV. (Francesco della Rovere), b. 1414, entered the Franciscan order, attracted notice by his eloquence and learning, became the close friend of Cardinal Bessarion, through whose influence, it is said, he was chosen pope 1471. His pontificate was marked by munificence in founding and improving useful institutions, and in the patronage of arts and letters, but his nepotism caused great scandal, his connivance in the Pazzi conspiracy against the Medici was most dishonorable, and the war with Florence which he entered into was inglorious for the Holy See and disastrous for Italy. D. in Aug., 1484. Sixtus V. (Felice Peretti), one of the ablest of the Roman pontiffs, was born near Montalto, Dec. 18, 1521; entered the order of the Franciscans in 1534; became a teacher of canon law at Rimini and at Sienna, acquired great reputation as a preacher, and became a cardinal in 1570. Arrived at this point, his ambition seemed to go no further. He was not anxious either to exercise influence on the papal government or to procure lucrative positions for his relatives. He lived quietly, and gave the impression of being a man easy to lead. After the death of Gregory XIII. (1585) the cardinals, thinking he would be a mild and indulgent pope, elected him to the Holy See, but to their astonishment he threw off all concealment of the natural energy of character, and at once began vigorous measures of reform. In all theological controversies he was cautious and tried to remain neutral. His great idea was to raise the papal see once more to its former splendor, and although his negotiations with the Emperor Rudolph II. of Germany and Stephen Báthori, King of Hungary, led to no permanent result, they show his ambition and his talent. He pronounced the ban upon Henry III. of France; and when that monarch was assassinated by the Dominican monk Jacques Clement he openly approved of the deed. The celebrated aqueduct Acqua Felice, the great dome of St. Peter's church, the obelisk in front of this church, and the library buildings of the Vatican, are among the public works that he successfully executed. He also suppressed the banditti, encouraged commerce and manufactures, and enforced the law in his states. He died suddenly at Rome, Aug. 27, 1590. See Ranke's *History of the Popes*. F. M. Colby.

Sjöberg, syö'bärg, Erik (pseudonym *Vitalis*): poet; b. in Södermanland, Sweden, Jan. 14, 1794. The son of a laborer, his life was a hard struggle with poverty and disease. He was a master of satire, and his ridicule of the excesses of the Phosphorists had a wholesome influence upon Swedish literature. His style strongly resembles that of Byron. During the last years of his life he was a sincere Christian, and de-

voted himself to the study of Thomas à Kempis. D. at Upsala, Mar. 14, 1828. The complete works of Vitalis were published at Stockholm in 1873. D. K. DODGE.

Skagerrak', or **Skager-Rack**: an arm of the North Sea, 80 miles broad, extending between Norway and the Danish peninsula of Jutland, and connecting the German Ocean with the Cattegat or Kattegat. The current generally sets E. along the coast of Jutland, where the depth varies between 30 and 40 fathoms, and W. along the Norwegian coast, where the depth generally is 200 fathoms. There is neither haven nor good anchorage on Jutland, but good harbors abound on the opposite coast.

Skaneateles, skăn-ĕe-ăt'lĕez: village (settled in 1796, incorporated in 1833); Onondaga co., N.Y.; at the outlet of Lake Skaneateles; on the Skan. Railroad; 7 miles E. by N. of Auburn, 18 miles W. S. W. of Syracuse (for location, see map of New York, ref. 4–F). It is in an agricultural and teasel-growing region; derives good power for manufacturing from the lake; contains flour-mills, woolen-mills, iron-works, hydraulic lime-kilns, printing-paper mill, carriage-factories, Union School and Academy, public library (founded in 1877), a State bank with capital of $60,000, a savings-bank, and two weekly newspapers, and is a popular summer resort. Pop. (1880) 1,669; (1890) 1,559; (1900) 1,495.

EDITOR OF "FREE PRESS."

Skate: a name given to certain species of fish of the family RAIIDÆ (*q. v.*). See also RAIÆ.

Skeat, skēt, WALTER WILLIAM: clergyman and philologist; b. in London, England, Nov. 21, 1835; educated at King's College School and at Sir R. Cholmeley's school, Highgate; graduated at Cambridge University 1858; became a fellow of Christ's College 1860; took orders in the Church of England; curate 1860–64; became lecturer on mathematics at Christ's College Oct., 1864, and subsequently lecturer on English; was in 1873 one of the founders of the English Dialect Society. A prolific and useful writer and editor, he has published some forty works, among which are the following for the Early English Text Society: *Lancelot of the Laik, a Scotch Metrical Romance* (1865); *Parallel Extracts from 29 MSS. of Piers the Plowman* (1866); *The Romans of Partenay or Lusignan, otherwise known as the Tale of Melusine* (1866); *Pierce the Ploughman's Crede* (1867); *The Vision of William concerning Piers the Plowman* (3 parts, 1867–73); *The Romance of William of Palerne, or William and the Werwolf* (1867); *The Lay of Havelok the Dane* (1868); *The Bruce, by Master John Barbour* (part i., 1870); *Joseph of Aramathie, or the Romance of the Seint Graal* (1871); and Chaucer's *Treatise on the Astrolabe*. For several of these he prepared introductions, notes, and glossarial indexes. For the Philological Society he edited a *Mœso-Gothic Glossary* (1868), for the Oxford University Press 2 vols. of *Specimens of English Literature* and several of Chaucer's *Canterbury Tales*, and completed for the Cambridge University Press the *variorum* edition of the *Anglo-Saxon Gospels* left unfinished by John Mitchell Kemble. In a new edition of Chatterton's *Poems* he settled the question of authenticity by showing the precise sources of Chatterton's diction; is author of a *Handlist of some Cognate Words in English, Latin, and Greek* (1871); *Questions for Examination in English Literature* (1873); an *Etymological Dictionary of the English Language* (1882); *The Principles of English Etymology* (2 vols., 1887–91); an edition of *Chaucer's Minor Poems* (1888); and *Complete Works of Geoffrey Chaucer* (6 vols., 1894).

Revised by BENJ. IDE WHEELER.

Skeleton [= Mod. Lat., from Gr. σκελετόν (sc. σῶμα, body), dried body, mummy, skeleton, liter., neut. of σκελετός, parched, dried up, deriv. of σκέλλειν, dry, parch]: in its broadest sense, the structures serving to support and protect the more delicate tissues of the body of an animal. Among the invertebrates the skeleton is often represented by calcareous or siliceous plates or masses developed in connection with the integument, hence known as the exoskeleton, as distinguished from the more highly specialized supporting apparatus developed within the connective tissue as the cartilage or the true osseous substance which constitutes the endoskeleton. Ignoring the feeble attempts at the formation of a connective-tissue skeleton which are found among the lower animals, as the *Vermes* and the *Mollusca*, a true skeleton, composed of cartilaginous or osseous pieces forming a definite framework throughout the body, may be said not to exist except in vertebrated animals.

In addition to the endoskeleton, many vertebrates also possess in connection with the integument supplementary protecting structures which constitute an exoskeleton. Conspicuous examples of such structures are seen in the external skeletal plates of the sturgeon, the tortoise, or the armadillo. In other animals, again, a partial bony support is formed within the substance of certain organs, as, for example, the bony plates within the heart-walls of ruminants, the osseous rods within the tongue of certain lizards, or the slender bone within the male copulative organ of many carnivora, rodents, bats, and some monkeys. Such osseous structures occurring within the substance of the viscera constitute the splanchno-skeleton.

The first framework formed within the immature animal is the primary cartilaginous skeleton which is developed by the specialization of parts of the connective tissue of the embryo. This framework of cartilage in a general way outlines the bony skeleton, although much simpler than the latter in its details. Among the higher vertebrates the cartilaginous structures are only temporary, and after affording support to the delicate softer tissues of the developing organs for a limited time are replaced by the permanent bony skeleton. While such substitution is almost complete among the higher animals, some of the lower vertebrates, as the sharks, retain the primary cartilaginous framework throughout life as their permanent skeleton. Usually, however, after a time, at certain points called centers of ossification, the cartilage becomes invaded by true bone-producing tissue, and the substitution of osseous for cartilaginous structures is effected. For the details of the process of bone-formation, see the article HISTOLOGY.

Every vertebrate, whether fish, amphibian, reptile, bird, or mammal, possesses in the spine or vertebral column a fundamental axis in regard to which the remaining portions of the endoskeleton are symmetrically arranged. This axis is not necessarily bony in character, since in some fishes it never develops beyond the cartilaginous condition. In the lanceolet, or amphioxus, it never attains even to the cartilaginous stage, but represents the primitive embryonic axis, the notochord. See EMBRYOLOGY.

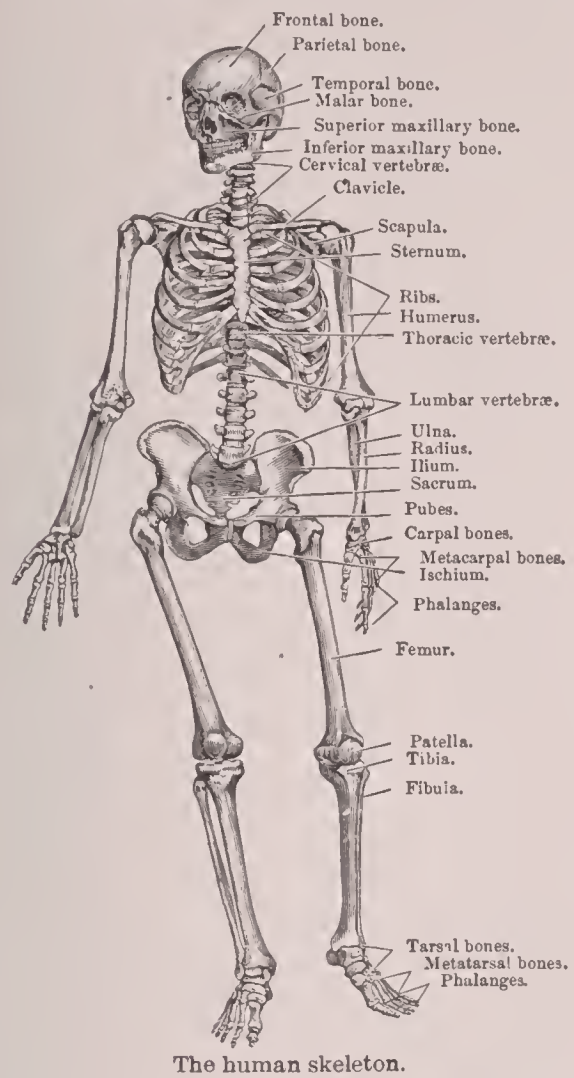
The vertebrate axis is formed by a series of disks, the bodies of the vertebræ extending from the base of the skull to the caudal pole and including a variable number of segments, as few as fifteen or as many as 365. From this fundamental axis two series of very unequal dorsal and ventral arches extend. The dorsal arches are formed by the union of short vertebral plates—the laminæ—which thus form a tube extending from the cephalic to the caudal pole of the animal. This tube is the vertebral canal and contains the spinal cord. At its anterior, or cephalic extremity, the tube usually widely expands into the cranial cavity containing the brain. The brain-case, or cranial portion of the skull, may be considered in a qualified sense as being composed of enlarged and modified vertebral segments. The dorsal or vertebral canal is distinguished therefore as containing and protecting the great cerebro-spinal nervous axis.

The ventral arches proceeding from the vertebral axis, on the other hand, are less constant, varying greatly in their number and position. The ventral arches are principally represented by the ribs, thoracic or abdominal, and by the variable series of branchial bows, or gill-arches, placed at the base of the head. The ventral arches inclose the thoracic and abdominal organs, affording them protection and support.

The osseous framework of man, in common with that of other high vertebrates, consists of two parts—the axial and the appendicular skeleton. The former includes the more constant and essential portions of the vertebrate framework, namely, the vertebral column, the skull and the ribs, with the breast-bone. The appendicular skeleton depends for its development upon the presence of limbs, since it includes the bones of the extremities, together with those forming the skeletal connection between the framework of the limbs and the spine. These connections are known respectively as the shoulder-girdle and pelvic girdle.

The shoulder-girdle in man consists of the collar-bone or clavicle, and the shoulder-blade or scapula, by means of which the bones of the upper limb are indirectly connected to the axial skeleton, an arrangement favoring the great latitude of motion enjoyed by the upper extremities. The pelvic girdle is much more fixed, consisting of the hip-bones or innominata, which give firm support to the thigh-bones and transmit the weight of the upper portions of the body. In animals, as the whales, where the hind limbs are wanting, the pelvic girdle, and hence the pelvis, is absent.

The individual osseous pieces composing the skeleton are so related that usually more or less extended movement is possible between the several bones. These latter are united by fibro-elastic bands—the ligaments—and the structures of the joints. The opposed surfaces of bones may be so intimately united that only a thin membrane intervenes. This may undergo absorption at a later period, in which case the earlier distinct bones become fused and the original line of articulation disappears. The bones of the roof of the skull afford examples of such union, followed by the obliteration of former lines of contact or the sutures.



The human skeleton.

The more usual relation between the bones allows of a certain amount of movement, the surfaces of contact and motion being inclosed within the structures of the joints. The articulations at the shoulder, the elbow, the knee, and the hip afford striking examples of the wide latitude of movement enjoyed by the bones of the extremities. For the details of the joints, see articles JOINT and SYNOVIAL MEMBRANES.

In addition to affording support and protection to the tissues and the organs of the body, the skeleton supplies the points of attachment for the numerous voluntary muscles. These latter, with very few exceptions, have at least one extremity, and more usually both ends, attached to portions of the skeleton, acting upon the more movable parts from the fixed points. The leverage afforded by the long bones of the extremities is an important factor in many movements essential to the proper use of the limbs.

The exact number of separate bones composing the human skeleton varies with age, since many bones which at middle life consist of a single piece in early infancy are represented by several distinct segments, as instanced in the sacrum and innominate bones forming the pelvis. Again each fully formed bone in very many cases is the product of the fusion of several segments, which before maturity become united by the substitution of true osseous tissue for the layer of cartilage connecting the pieces. Thus the thighbone or femur represents the fusion of at least five distinct segments, the union not being fully completed until about the twentieth year. The adult human skeleton consists of 206 distinct bones, as follows:

The spine, including 24 vertebræ, the sacrum, and the coccyx	26
The ribs, 12 pairs, the sternum, and the hyoid	26
The skull, 22, together with the 6 ear-bones	28
The upper extremities, each 32	64
The lower extremities, each 31	62

At birth their number is 278; at the age of twenty-five, 224; and in advanced old age, 194. About 660 segments are needed in the formation of the 206 permanent bones.

Notwithstanding the great diversity in size, shape, and proportions, the general groups of long, short, broad, and irregular bones suffice for the usual purposes of classification of the constituents of the skeleton. A description of the individual bones is contained in the article OSTEOLOGY, while their chemical composition and structural peculiarities are given in the articles BONE and HISTOLOGY respectively. See also FOOT, HAND, and SPINAL COLUMN.

G. A. PIERSOL.

Skeleton Leaves: See CELLULOSE.

Skelton, JOHN: poet; b. probably in Norfolk, England, about 1455; graduated at Cambridge about 1482; was laureated at Oxford University about 1490; was ordained deacon 1498 and priest 1499; was tutor to Prince Henry (afterward Henry VIII.); held a nondescript position at court, by some considered equivalent to king's jester, by others to poet-laureate; became rector of Diss, Norfolk, and curate of Trompington, Cambridge, 1504; subsequently became royal orator; was suspended from his benefice by the Bishop of Norwich, having concealed the fact of his marriage; incurred the resentment of his former patron, Cardinal Wolsey, by his satirical verses; was obliged to take sanctuary at Westminster, and died there June 21, 1529. Skelton was one of the earliest English poets whose writings are easily intelligible to modern readers. Most of his verses are coarse, but were highly esteemed by Erasmus and the wits of the day. His best-known poems are *Philip Sparrow* and *Colin Clout*; he also wrote Latin epigrams. The only good edition of his complete *Works* is that of Rev. Alexander Dyce.

Skelton, Sir JOHN: See the Appendix.

Skene, skeen, ALEXANDER JOHNSTON CHALMERS, M. D.: gynæcologist; b. in the parish of Fyvie, Aberdeenshire, Scotland, June 17, 1837; studied medicine at King's College, Scotland, the University of Michigan, and at Long Island Medical College, where he graduated in 1863; served as acting assistant surgeon in the Union army 1863–64; returned to Brooklyn in the latter year, and was appointed adjunct professor and instructor in medicine in Long Island Medical College; subsequently was appointed Professor of Gynæcology in that institution, and for a time occupied the same chair in the Post-Graduate Medical School, New York. He is a member of various domestic and foreign scientific societies. His best-known works are *Diseases of the Bladder and Urethra in Women* (New York, 1878) and *Diseases of Women* (New York, 1888). D. July 4, 1900.

Skene, PHILIP: soldier; b. in London, England, in Feb., 1725; entered the British army 1739; served in the taking of Portobello and Cartagena in South America, at the battles of Fontenoy and Culloden, and in the American campaigns against Ticonderoga and Havana; received in 1759 a large grant of land on Lake Champlain, and with a view to strengthening the hold of the British on Canada founded Skenesboro (now Whitehall), N. Y.; was made governor of Crown Point and Ticonderoga, with rank of colonel in the army; was arrested as a loyalist in Philadelphia June, 1775, and exchanged Oct., 1776; accompanied Burgoyne in his invasion of Northern New York; was taken prisoner at Saratoga; was attainted by the Legislature of New York 1779, his estate being confiscated; was granted a pension by the British Government, and spent the remainder of his life in England. D. near Stoke Goldington, Bucks, June 10, 1810.

Skene, WILLIAM FORBES, LL. D.: historian; b. at Inverie, Kincardineshire, Scotland, June 7, 1809; educated at the High School and University of Edinburgh, also at that of St. Andrews, and in Germany; became a lawyer, a distinguished archæologist, an officer of several learned societies; and in 1881 historiographer for Scotland. He was the author of *The Highlanders of Scotland, their Origin, History, and Antiquities* (2 vols., 1837), and editor of *The Dean of Lismore's Book, a Selection of Ancient Gaelic Poetry* (1861); *Chronicles of the Picts and Scots and other Early Memorials of Scottish History* (1868); *The Four Ancient Books of Wales* (2 vols., 1868); *The Coronation Stone* (1869); *John of Fordice's Chronicles of the Scottish Nation* (2 vols., 1871); and *Celtic Scotland* (3 vols., Edinburgh, 1876–80).

Skepticism: See SCEPTICISM.

Skimmer, or **Scissors-bill**: any bird of the genus *Rhynchops*. These birds skim over the sea with the lower mandi-

ble, which is much longer than the upper and compressed like a knife-blade, cutting through the water. They are related to the terns, but belong to a distinct family. The black skimmer (*R. nigra*) is black above, white below. The spread of wing is 3½ to 4 feet; length, 16 to 20 inches. It ranges northward to New Jersey, but *R. albicollis* is Indian and *R. flavirostris* African. F. A. L.

Skin: See HISTOLOGY.

Skin Diseases: diseases affecting the skin. These diseases appear as primary or secondary eruptions. The following are the primary forms: (1) The *macule* or *spot*, a change of the normal color of the skin without elevation, arises from hyperæmia, hæmorrhage, or inflammation, sometimes from anomalies of the distribution of the coloring granules of the skin. (2) The *papule* or *pimple*, a projection above the surface, varying in size from that of a millet-seed to that of a lentil, is produced by diseases of the cutaneous glands, inflammation, and new growths of the papillary layer. (3) The *tubercle* is a solid projection of the size of a lentil up to that of a hazel-nut. (4) The *wheal* is slightly raised above the surface, and greatly exceeds the thickness in horizontal extension, varying in size from that of a finger-nail to that of the palm of the hand. (5) The *tumor* forms a solid projection of the size of a walnut to that of a man's fist. (6) *Vesicles* are elevations of the epithelial layer of the skin produced by a transparent or milky fluid, corresponding in size to that of papules, and as such never being of a long duration; while (7) *blebs* surpass the size of vesicles up to that of a goose's egg, and (8) *pustules* always contain pus, and therefore form superficial abscesses of the skin. Vesicles, blebs, and pustules almost always are surrounded by inflammatory areas.

Secondary forms of eruptions are (1) the *excoriation*, a flat abrasion of the epithelial layer of the skin, arising from destruction and rupture of primary eruptions, very often through scratching with the finger-nails. They always heal without the formation of a scar. (2) The *ulcer* presents a loss of substance penetrating into the derma, which heals slowly and with formation of a cicatrix. (3) *Fissures* are elongated cracks in the skin on parts liable to much stretching. (4) *Scales* are produced by detached epidermis. (5) *Crusts* result from drying of an exuded fluid or of extravasated blood. (6) *Scars* or *cicatrices* are connective-tissue formations which replace deeper losses of substance of the derma.

The causes of diseases of the skin are either rooted in the whole organism, or they are local ones, by which the skin is primarily or chiefly attacked; hence the division into symptomatic and idiopathic affections of the skin. Certain rashes occur in variola, scarlet fever, measles, syphilis, in typhoid fever, in purulent infection of the blood, so-called pyæmia, in scrofulosis, scorbutus, etc. Moreover, diseases of internal organs may involve the skin, especially affections of the intestinal tract, of the liver and spleen, of the internal genital organs, of the urinary apparatus, of the nerve-centers. There are, lastly, normal processes—dentition, menstruation, pregnancy—which lead to various kinds of cutaneous affections. Besides general injurious influences—heat and cold, dryness and moisture, different arts and trades—merely local diseases are caused by the operation of caustic substances, neglect of cleanliness or exaggerated washing and rubbing with strong kinds of soap, long-continued pressure upon certain parts, and parasitic organisms which penetrate the skin. The scratching of the patient himself who suffers from itching is an important cause for producing mechanically lesions of the skin. Thus parasites give rise to such affections by irritating the skin directly or by exciting the sensibility of the cutaneous nerves by producing the sensation of itching.

The changes of the skin, by too great an afflux of blood (hyperæmia) or lack of blood (anæmia), as such do not produce diseases of their own, being always of a transient character or rooted in diseases of the whole organism, and are therefore omitted in the following enumeration.

1. *Diseases due to Perverted States of the Secretions of the Cutaneous Glands.*—The sweat-glands of the skin (see HISTOLOGY) produce a fluid, the perspiration, which contains 99·3–99·5 per cent. of water, the residue consisting of solid matters, among which are chloride of sodium, phosphate of lime, hydrochlorate of ammonia, and traces of iron and of fatty matters. Even in the normal state each individual diffuses a special odor. There are persons with a peculiar rancid odor of their perspiration, a disease called *bromidrosis*, either universal or local—for instance, lasting in the armpits, on the feet—in spite of the most scrupulous cleanliness. This disease is always dependent on too copious perspiration (*hyperidrosis*), and curable by repeated treatment with diachylon ointment. The secretion of a colored perspiration is termed *chromidrosis*. The sebaceous glands, which secrete a fatty mass, may produce the sebum in excessive quantity, there being no impediment to its secretion —the so-called *seborrhœa*. The disease is very common on the scalp (dandruff), and always leads to loss of the hair. It yields readily to certain preparations of tar, and a new growth of hair can very often be obtained. If, on the contrary, the excretion of the sebaceous mass be interfered with, the result is its accumulation within the glands or their ducts, the so-called flesh-worm—*comedones*. In the mass of a flesh-worm there is often found a mite, the *Acarus folliculorum*. The flesh-worms, again, are the most common causes of pimples, as they act upon their neighborhood like foreign bodies.

2. *Diseases due to Inflammation.*—Inflammatory affections of the skin may be acute or chronic. The acute contagious inflammations, so-called *exanthemata*, are due to diseases which attack the whole organism, are attended with febrile symptoms, present certain definite appearances on the surface of the body, and run a course the duration of which can be computed beforehand. In these diseases—*measles*, *scarlet fever*, and *smallpox*—the sympathy of the entire organism is manifested by symptoms of various kinds, both while the rash is present and also after its disappearance. The acute, non-contagious inflammations have a definite typical course, as their symptoms succeed one another in regular order. If the inflammation be manifested mainly by redness, with a slight exudation of the fluid part of the blood, fugitive rashes are produced, which, when spread over large parts of the surface are termed *erythema*, but when presenting isolated red spots are termed *roseola*. Extended and isolated superficial inflammations, accompanied with stinging or itching sensation, receive the name of *urticaria*, the latter being always characterized by the development of wheals. Diseases of this kind often are produced by disturbances of the stomach or by local irritations of the skin. They usually disappear after a short time without special treatment, but are very liable to recurrences. Lastly, there exist acute inflammations with accumulation of fluid beneath the epidermis, leading to the formation of vesicles and blebs, with short duration and no liability to return. The *herpes zoster* (shingles) is the most important of the forms of HERPES (*q. v.*). Shingles attack the individual, in most instances, only once during life. The chronic inflammations, such as PSORIASIS, LICHEN (*qq. v.*), and *pityriasis rubra*, are characterized by a tendency to repeated relapses and the protracted course which they run. Psoriasis is a very common disease, characterized by white, rough patches on a dark-red ground, dispersed all over the body, mainly on the elbow and knee. The patches are not liable to any further change, such as suppuration and ulceration; they leave no scars, though they are sometimes followed by persistent pigmentation. Sensations of pricking or itching are complained of only when the patches first come out; afterward there are no subjective symptoms. The disease occurs often on otherwise healthy and strong individuals.

A second group of inflammatory affections is characterized by intense itching, and besides the primary form of eruption they irresistibly provoke scratching in consequence of the itching; this, again, gives rise to further changes in the skin known as excoriations. To this group belong ECZEMA (*q. v.*) and *prurigo*.

A third group of chronic inflammatory diseases embraces those pimply and pustular affections which arise from inflammation of the hair-sacs and sebaceous glands. They include *acne*, *sycosis*, and *rosacea*. Acne on the face, the chest, and the back—one of the most disfiguring diseases—is always produced by accumulation of sebaceous masses in the glands (flesh-worms), and is entirely curable by repeated emptying of the glands.

To the fourth group of chronic inflammations belong the eruptions in shape of blebs, termed PEMPHIGUS (*q. v.*). Chronic inflammations of the skin of very variable but characteristic forms are produced by a general disease, *syphilis*; here the skin is merely symptomatically attacked, besides different other organs. With traumatic lesions of the skin, as well as with its inflammatory diseases, hæmorrhage is very often combined. Hæmorrhage is furthermore a symptom of universal disease in *scorbutus* and in *purpura rheumatica*. See PURPURA.

3. *Diseases due to Hypertrophy.*—Too copious production of any tissue of the skin may be a consequence of a chronic inflammatory process, or it may occur without the symptoms of irritation as a consequence of anomalous congenital productivity. The *corn* and the *tyloma*, for instance, are products of a long-continued local irritation of the skin, but instances are known in which tyloma, the hardening and hypertrophy of the skin of the palms and the soles, must be considered as a congenital disease. The Elephantiasis (*q. v.*), an immense hypertrophy of all constituting tissues of the skin, is doubtlessly due to chronic inflammation of the lymphatics; while Ichthyosis (*q. v.*), the exuberant growth of epidermis, is due to the congenital hypertrophy of the papillæ. *Warts* and *papillary growths* of the skin may be produced by either kind—local irritation as well as anomalous function of papillæ. *Horns* of the skin, hypertrophy of the nails and the hairs—*polytrichia*—always are dependent on congenital anomalies in the formation of the tissues of the skin. The pigment-granules of the rete mucosum are very often hypertrophied, leading to formation of brown spots, *ephelides* (freckles), *chloasma* (liver-spots), while long-continued irritation of the skin leads to universal dark discoloration—*melasma*.

4. *Diseases due to atrophy* are based on the same principles as hypertrophy. Inflammation often produces first hypertrophy, afterward ulceration, loss of substance, and atrophy. Hypertrophy of the pigmentum is not rarely combined with its partial atrophy in *vitiligo*, *leukopathia*, etc. Merely to atrophy are due the senile changes of the skin, the white color of the hairs, the early falling out of the hairs without visible cause, the localized atrophy of hairs in *alopecia areata*. (See Baldness.) A plain atrophy is also the *xerodermia*. Very little can be done with regard to the cure of these diseases.

5. *Diseases due to New Growths.*—New growths or tumors either belong to the connective-tissue formations of the skin, the derma, or are products of an anomalous epithelial growth. Tumors of the former kind may be benign or innocent, viz., painless, not ulcerating, not recurring after extirpation, and not infecting the organism, such as *fibroma*, a variety of which is the formation of scars without preceding lesion, the so-called *cheloid*; furthermore, *papilloma*, growth of the papillary layer, embracing most of the *warts* and *nævi*; lastly, *angioma*, erectile tumors produced by copious new formation of blood-vessels. Or the connective-tissue tumors are malignant, viz., painful, ulcerating, producing new growths around the first-formed tumor, and easily recurring after extirpation, even leading to secondary formations of identical tumors in the lungs, the liver, etc., such as *sarcoma*, one variety of which, the *pigmented* or *melanotic sarcoma*, forms the most malignant kind of tumors of the organism. Cancer is considered to be essentially an epithelial formation, which always is malignant. In all tumors the radical extirpation is the only reliable means of curing the disease, very often of saving the life of the patient.

6. *Diseases due to Anomalies of Innervation.—Neuroses.*—Many of the already named diseases of the skin can be looked upon as being disturbances of the nerves in the first instance (*urticaria*, *herpes zoster*, *leprosy*, *atrophy of pigment*). Disturbances in the property of sensation of the skin are lowered sensibility—*anæsthesia*—and excited sensibility—*hyperæsthesia*. To the latter kind belongs the itching of old persons, *pruritus senilis*.

7. *Diseases due to Parasites.*—The Scabies (*q. v.*) is produced by the presence of the itch-insect within the epidermis. The disease is readily curable by local application of preparations of sulphur. Analogous is the action of the flea, the bed-bug, and the louse. By vegetable parasites are produced slightly scaling and itching brown spots, *pityriasis versicolor*; furthermore, *herpes tonsurans* (ringworm), a very common disease, appearing first in the shape of small vesicles or ring-like red eruptions, which, when situated on the parts provided with hairs, lead to baldness; lastly, Favus (*q. v.*), a disease kindred to ringworm. If the parasites are killed locally, a perfect cure can be obtained; but on the scalp and the beard, where the parasites advance deeply into the root-sheaths of the hairs, these diseases usually are very obstinate.

Revised by G. H. Fox.

Skink: any one of the lizards of the family Scincidæ (*q. v.*).

Skin-moths: beetles of the family *Dermestidæ*, which attack skins, etc., and are often very destructive in museums. The most notable species are (1) *Dermestes lardarius*, (2) *Dermestes vulpinus*, and (3) *Anthrenus museorum*. The first is for the most part blackish, with a broad brownish-gray band on the elytra, relieved by three black spots on each side. Both the imago and the larva are very destructive. The second is totally black above, but the sides of the thorax and the under part of the body are covered with white scales. It is less common and less generally distributed than the preceding, but almost equally to be dreaded. Both the preceding attain about a quarter of an inch in length. The third species has three transverse waved lines on the elytra. It is often very destructive to museum specimens, and especially to collections of pinned insects. It has become a household pest, and is known as buffalo-bug or carpet-beetle. It is only about a tenth of an inch in length. All these species may be killed by applications of benzine, and camphor and turpentine are also used. Specimens for museums should be prepared for resistance to the attacks of these insects by applications of arsenic, carbolic acid, corrosive sublimate, and benzine.

E. A. Birge.

Skinner, Charles Rufus: See the Appendix.

Skinner, John Stuart: editor; b. in Maryland, Feb. 12, 1788; was admitted to the bar 1809: settled at Baltimore 1813; was postmaster of that city 1822–37; began in 1819 the publication of *The American Farmer*, the first periodical exclusively devoted to agriculture in the U. S.; afterward edited several other periodicals of similar character, including *The Turf Register* and *The Plough, Loom, and Anvil*; was the first organizer of agricultural shows and fairs in the Middle and Southern States; wrote several works on farming and sporting topics, and was third assistant postmaster-general 1841–45. D. in Baltimore, Mar. 21, 1851.

Skinner, Stephen, M. D.: etymologist; b. in London, England, in 1623; graduated at Christ Church, Oxford, 1646; studied philology and medicine on the Continent, especially at Heidelberg; became a physician at Lincoln; was an earnest student of many languages, and devoted his life to the preparation of a vast work on English etymology, which he left incomplete at his death, which occurred at Lincoln, Sept. 5, 1667. Fortunately his MSS. fell into the hands of Thomas Henshaw, who edited them under the title *Etymologicon Linguæ Anglicanæ* (London, folio, 1671), a work of great value to the critical student of English.

Skipjack: any one of several fishes having a tendency to leap from the water, as the Bonito (*q. v.*), the Bluefish (*q. v.*), the Saury (*q. v.*), and a fresh-water herring, *Clupea chrysochloris*.

Skipper: (1) the Saury (*q. v.*); (2) any one of several small dark-colored butterflies of the family *Hesperiidæ*.

Skirret: the *Sium sisarum*, an umbelliferous parsnip-like plant, a native of Asia, long cultivated in Europe, and rarely in the U. S., for its root, which is very nutritious and palatable. Skirret affords a good percentage of alcohol when distilled, owing to the large amount of sugar present.

Skit'tagetan Indians [*Skittagetan* is derived from Skiteiget, the name of a chief, and was first employed by Gallatin in 1848]: a linguistic family, also well known as the Haida. They are in two divisions, the Haida proper and the Kaigani. The former are confined to the Queen Charlotte islands, Northwestern America; the Kaigani, who form an offshoot of the Haida proper, emigrated to Forrester and Prince of Wales islands, probably since 1750. In the Haida division there are thirteen villages, besides eleven that have been abandoned, and in the Kaigani division there are seven occupied villages and three abandoned ones. Five other villages, which can not be identified with any of the preceding ones, were named by Krause in 1885.

General Characteristics.—Investigations into the native languages by Dr. Franz Boas render it quite probable that the family should be merged into the neighboring Koluschan family. (See Koluschan Indians.) They are larger, better proportioned, and of lighter complexion than the Salish and other southern coast-tribes. The Haida are essentially maritime Indians, and derive their subsistence from the rivers and sea. Shellfish are much used, as are all edible roots and berries. The first rude beginnings of agriculture are discernible among them in the cultivation, from a remote period, of tobacco, either the true plant or one of the several substitutes employed. The dog was their only domesticated animal. The Haida live in permanent villages, but they scatter more or less at different seasons in pursuit of food. The houses, which are the large structures common to the northwest coast, are occupied communally, several

related families dwelling under one roof, the household being governed by an elder or sub-chief. There is nothing in the nature of a confederacy of the several villages. The chieftaincy was hereditary, and, as descent was through the female line, it passed, on the death of a chief, to his eldest brother, or, there being no brother, to his sister's son. Customs came to have the force of laws, and persons were restrained from injury to the person or property of a fellow tribesman by the custom of reprisals. In some respects, apparently, the tribes of the northwest coast, especially the Haida, had advanced beyond the condition of the eastern Indians, as partially shown by the extent to which they possessed personal property, and by the establishment of personal ownership in land. The Haida appear to have been of martial character, internal warfare having been common, as also forays upon distant tribes for the purpose of procuring slaves. The institution of hereditary slavery seems to have been intimately woven into the social system of the Haida, and slaves were regular objects of barter. The Haida are skillful workers in wood, and to some extent in metal, particularly copper. Their great skill at carving is seen, perhaps at its best, in the well-known carved totem-posts which adorn each village. Tattooing was formerly universal; labrets were worn by the females. The institution of the potlatch—the free distribution of property on certain ceremonial occasions—exists among the Haida, as among all the tribes of the northwest.

Population.—Dawson estimates the present number of the Haida to be from 1,700 to 2,000; Petroff gives the number of the Kaigani as 788. These figures indicate a marked decrease of population since 1850.

Authorities.—H. H. Bancroft, *Native Races* (1882), iii., 564, 604; J. C. E. Buschmann, *Spuren der aztek. Sprache* (1859), 673; Dawson, *Queen Charlotte Islands* (1880); A. Gallatin, in Schoolcraft's *Indian Tribes* (1853), iii., 402; Krause, *Tlinkit Indianer* (1885), 304; L. H. Morgan, *Ancient Society* (1878), 176; I. Petroff, Tenth Census, Alaska (1884), 32; Poole, *Queen Charlotte Islands* (1872), 195, 309; H. R. Schoolcraft, *Indian Tribes* (1855), v., 489; Tolmie and Dawson, *Comparative Vocabularies* (1884), 15, 26. See Indians of North America.

James Owen Dorsey.

Skittles: See Bowls and Bowling.

Sko'beleff, Michael Dmitrievitch: Russian general; b. in 1841; served in the army against the Polish insurrection in 1863; was called to join the general staff in 1866; and in 1869 was sent to Turkestan, where he secured much valuable geographical information, which he afterward employed to great advantage in the expedition against Khiva in 1873. In this expedition he won great distinction. He afterward crushed the rebellion in Khokand, and became governor of the territory he had subdued. In the Russo-Turkish war he showed a degree of valor and skill in marked contrast to the inefficiency at the Russian military headquarters. He commanded the left wing at Plevna, captured the so-called Shipka army, Jan. 9, 1878, and took Adrianople. D. suddenly in Moscow, July 7, 1882. See Ossipovitch, *Michael Dmitrievitch Skobeleff* (Hanover, 1887).

Skoke: See Garget-root.

Skowhe'gan: town; capital of Somerset co., Me.; on the Kennebec river, and the Maine Central Railroad; 35 miles N. by E. of Augusta, and 50 miles W. of Bangor (for location, see map of Maine, ref. 6–C). It derives excellent water-power from the river, which has here a perpendicular fall of about 30 feet, and has manufactories of woolen goods, scythes and edged tools, shoes, oilcloth, pulp, lumber, and flour. There are electric-light and power plants, water-works, 7 churches, free public library (founded in 1867), 2 national banks with combined capital of $275,000, a savings-bank, and 2 weekly newspapers. The town was originally known as Canaan; was incorporated under the name of Milburn in 1823; has been called Skowhegan since 1836. It was enlarged by the annexation of the town of Bloomfield in 1861. Pop. (1890) 5,068; (1900) 5,180, village 4,266.

J. O. Smith, editor of "Somerset Reporter."

Skua, or **Skua-gull**: See Jaeger.

Skull [M. Eng. *skulle*, loan-word from Scandin.; cf. Icel. *skāl*, bowl: Germ. *schale*; cf. *hirnschale*. Eng. *scale* (of balance) is a doublet, of native origin]: the hard framework of the head of vertebrates. It consists of two portions, the cranium which forms the protecting case for the brain, and the facial structures. These may all consist of cartilage throughout life, as in the sharks, or entirely of bone, as in adult birds and mammals, or of both bone and cartilage, as in many fishes and amphibians. In the lower forms no separate cranial elements can be recognized, the brain-case forming a continuous structure, with openings here and there for the passage of nerves, blood-vessels, etc. In the higher vertebrates distinct elements or bones can be recognized in the cranium, and these arise either by ossification of the cranial cartilage or by the formation of bone in the membranes outside the cartilage cranium. A similar distinction can be drawn between the cartilage-bones and the membrane-bones of the face. For the details of the bones of the skull, reference should be made to works upon comparative anatomy. The following are the bones more frequently found in the skull, arranged according to their origin and position:

Cranium.
- Cartilage-bones:
  - Floor. Basioccipital, basisphenoid, presphenoid.
  - Sides. Exoccipital, bones of the ear-capsule (otic), orbitosphenoid, alisphenoid.
  - Roof. Supraoccipital (part).
  - Front. Mesethmoid, lamina cribrosa.
- Membrane-bones:
  - Floor. Parasphenoid.
  - Sides. Temporal or squamosal, parietal, supra- and post-orbital.
  - Roof. Supraoccipital (part), frontal, pre- and post-frontal.

Face.
- Cartilage-bones: Palatine, pterygoid, quadrate, and articular.
- Membrane-bones: Premaxillar, maxillar, vomer, nasal, lachrymal, jugal, and quadratojugal, and in the lower jaw the dentary, splenial, and angular.

It is rarely that all these bones are present in one and the same form. Usually there is an over-development (hypertrophy) of one and an under-development (atrophy) of its neighbors, or a fusion of two or more may occur. Still other bones may exceptionally appear (e. g. in the suspensory apparatus of fishes), which are properly not to be regarded as belonging to the skull. Although the subject of an enormous amount of study, the skull is yet far from thoroughly known. The best general account will be found in Parker and Bettany's *Morphology of the Skull* (London, 1877).

In the human skull but twenty-two bones exist, eight in the cranium and fourteen in the face. This is largely due to the fusion of bones distinct in the embryo as well as in the adult of lower forms.

J. S. Kingsley.

Skull-cap [so called from the helmet-like appendage to the upper lip of the calyx]: any one of a genus (*Scutellaria*) of perennial herbs found over a wide range of climates in America, especially in Mexico and the sub-tropical regions, though several species grow in northern parts of the U. S. and in Europe. They derive their name from an envelope around the fruiting calyx, have little aroma, and—especially for the cure of hydrophobia—enjoy a popular reputation which is entirely undeserved.

Skunk [from Abenaki (Amer.-Ind.) *segan'ku*, skunk]: a musteloid carnivorous mammal of the sub-family *Mephitinæ*. The body is moderately elongated and arched backward; the legs comparatively short; the feet sub-plantigrade; the tail rather long and very bushy; the color is particolored, black and white being contrasted. Their anal glands, according to Chatin, are essentially like those of the badgers and ratels, and are in a single pair and of large dimensions; their outer walls are formed by a thick fleshy tunic formed of two layers of interlaced fibers, capable of sudden strong compression of the receptacles; these are enormous reservoirs, with a dense resisting fibrous coat, always containing a considerable quantity of the follicular product. The glandular substance is not spread all over the central pouch, but is restricted to a particular portion, and contrasts by its dark color with the white ground of the envelope of the pouch. The receptacles contain a nauseous liquid, which the animal, on being alarmed, discharges with such force that the jet is carried to a distance of from 8 to 12 feet. The voiding of the liquid must be sudden; and it does not suffice that the receptacle is large and powerfully muscular; the offensive liquid must be directed far backward, so as to flow as little as possible upon the rectal muscular membrane; so the opening is large and upon the summit of an umbilicated papilla, around

which rests a cutaneous fold which in a measure directs the discharge. The skunks are distributed throughout America, North as well as South, except the coldest parts, and are found in no other portion of the world. The species are all active carnivorous animals, feeding on small quadrupeds and birds as well as reptiles. They burrow in the ground, and in the northern parts of North America remain torpid during the winter. They bring forth from six to nine young at a birth. The mephitic fluid has been employed medicinally to some extent as an antispasmodic in hysteria, asthma, etc. The bite of the animal is in some quarters much dreaded, and is said to induce hydrophobia. *Mephitis mephitica* is the common large skunk; *Mephitis putorius* is the little striped skunk; *Conepatus mapurito* is about the size of *Mephitis mephitica*, and extends into the southwestern parts of the U. S. (Texas, etc.), from Mexico. Although they vary much in color, they can generally be distinguished as follows: The common species is black, with the crown white and with two white streaks diverging thence; the little striped skunk is black, with a spot on the forehead and one on each temple, and a number of white but interrupted longitudinal streaks on the back; *Conepatus mapurito* is black, but with a broad white dorsal median band.

Revised by F. A. Lucas.

Skunk-cabbage: the *Symplocarpus fœtidus*, a large marsh-plant of the arum family, common in the U. S. from Maine to South Carolina, distinguished by the unpleasant smell of its large, broad, and veiny leaves. It is a monocotyledon, producing early in the spring its four-petaled flowers in a globular cluster upon a short stem within a shell-shaped spathe or hood, of a dark purplish, or with yellow and purple stripes and spots, variegated with patches of red or green. The fruit is oval and fleshy, inclosing large purple seeds. The roots and leaves have been used as stimulants. Revised by Charles E. Bessey.

Skye: an island of Scotland, the largest of the Inner Hebrides, belonging to the county of Inverness, from the mainland of which it is separated by the channel of Kyle Rhea, half a mile broad. Area, 535 sq. miles. The surface is mountainous and rugged; the coast-line is steep, abrupt, and wild, but often strikingly picturesque on account of its peculiar basaltic formations, its caves, and waterfalls. The soil is not unproductive, but, on account of the extreme dampness of the climate, it is unfit for agriculture. The name of the island, *Skye*, means cloud in the old Scandinavian tongue, and is very appropriate, as the days during the year on which no rain falls are very few. Turnips and potatoes grow well, however, and sheep-breeding is carried on with some success. Fishing is the principal occupation, and large quantities of salt and dried cod, herring, ling, and saithe are exported. The inhabitants, who are of Gaelic descent, interspersed with Norse settlers, and who still use the Gaelic language, are poor, and their number decreases, as many emigrate. Pop. (1851) 21,521; (1891) 15,705.

Skylark: the *Alauda arvensis*, an Old World bird, noted for its song. It has the feathers of the occiput slightly prolonged, the first primary very small, the second and third (which exceed the fourth) equal, and the external tail-feathers margined with white; the upper parts are variegated with blackish and reddish gray; the lower parts white on the abdomen, but with the neck, breast, and sides tinged with reddish and spotted with brown. The length is about 7 inches, the tail being 3. The skylark is found all over Europe, as well as in Northern Africa and the corresponding zones of Asia. It frequents meadows, and does not perch. It feeds chiefly on the seeds of various plants and larvæ. Its nest is formed on the ground. It lays four or five eggs of a whitish gray. It is almost equally esteemed for the delicacy of its flesh and the melody of its song.

Sky'ros, or **Scyros**: Greek island; in the Ægean Sea; N. E. of Eubœa. It consists of two mountains, the valley between forming a narrow isthmus. It has two good harbors, is well watered, and has fine forests of oak and pine. Its silver-mines and marble-quarries are no longer worked. The inhabitants are supported by their vineyards and flocks of sheep and goats. Here, according to mythology, Theseus was killed, and here Achilles concealed himself before the Trojan war. Pop. 3,188. See Sporades.

E. A. G.

Sladen, Douglas B. W.: See the Appendix.

Slags [from Swed. *slagg*, dross, slag, or Dutch *slagge*; cf. Germ. *schlacke*, dross, slack, borrowed from like source; akin to *schlagen*, strike—i. e. the splinters struck off in forging]: the imperfect glassy or vitrifiable compounds which are produced during the reduction of metallic ores by various fluxes. The slags produced in metallurgical operations should have the following properties: They should fuse at the right temperature; be of such fluidity and specific gravity as to allow the metal or matte (*regulus*) produced to sink readily through them; have such a composition that they will not attack the desired product or the furnace-walls, and will not allow undesirable bodies to separate from themselves; must be able to take up foreign substances, and must be in sufficient quantity to protect the desirable products from the hurtful influence of the blast or other agencies. It is seldom the case that all of these conditions can be fulfilled, and therefore the efforts of the smelter must be directed to securing as advantageous a combination as possible. The slags of ordinary occurrence are silicates, combinations of silicic acid with bases already present in the charges or formed during the operation; but they frequently contain earthy sulphides and fluorides, as well as particles of metal and matte. Sometimes they may be looked upon as single chemical compounds, at other times they appear to consist of mixtures, but in normal slags the amount of silicic acid is always within certain limits.

Frequently, by judicious mixture of ores, the proper slag can be obtained without adding any flux; at other times a basic flux, like limestone, will be absolutely necessary. Occasionally there will be an excess of alumina, and it is then to be regarded as playing the part of an acid, but aluminates without silicates do not occur as slags. The most infusible silicates, like silicate of zinc or tin, can be made to fuse when combined with other silicates. A slag should not fuse before the desired effect has been produced in the furnace, such as the reduction of an oxide, absorption of carbon by iron, sulphurization of metals, etc. Slags are often affected by the manner in which they solidify; rapid cooling producing a glassy, brittle slag, while slow cooling tends to produce a stony, tough slag, provided the chemical constitution is right. For this reason the slags when used for paving or building are slowly cooled. Slags have also been used to manufacture cement and alum, for fertilizers, and for ornament. The slag from the basic Bessemer-steel process is used as a substitute for phosphates.

The color of slags is very various. Generally a dark slag will owe its color to metallic oxides, dark green or black indicating iron oxides, and dark brown manganese; light green indicates protoxide of iron; red or reddish brown, suboxide of copper. Some very dark slags from iron furnaces, however, owe their color probably to sulphur, and contain little iron oxide. The peculiar blue of some blast-furnace slags has been referred to the presence of vanadium, molybdenum, cobalt, and titanium. While each or all of these may be present in blue slags, and may possibly cause their color, especially the cobalt oxide, Bontemps has shown that oxide of iron alone can impart all colors to glass; while Fournet refers the blue shades of most of these slags to their physical constitution. The blue color of old zinc retorts has been also referred to the presence of titanium; and Wöhler considered that certain blue slags from blast-furnaces owed their color to a compound like ultramarine, but containing sulphide of calcium in place of sulphide of sodium. Among the minerals closely imitated by certain slags in composition and crystalline form may be mentioned amphibole, pyroxene, wollastonite, diopside, gehlenite, and labradorite. Revised by C. Kirchhoff.

Slander: See Libel and Slander.

Slate [M. Eng. *slat*, *sclat*, from O. Fr. *esclat*, a shiver, splinter, deriv. of *esclater*, shiver, chip (> Fr. *éclater*, burst, break forth)]: a rock, consisting largely of silicate of aluminum, which is easily split into slabs or plates. It is supposed to have been formed by the consolidation, under heat and pressure, of clay deposited in still water. It is known also as clay-slate and argillite. It weighs from 170 to 180 lb. per cubic foot, and its most extensive use is for roofs. The output of slate in the U. S. in 1892 was valued at $4,117,125, of which $2,333,000 worth was quarried in Pennsylvania and $1,014,000 worth in Vermont. In 1893, owing to business depression, the output was much less. See Merrill's *Stones for Building and Decoration*, and articles on *The Strength and Weathering Qualities of Roofing Slates*, in *Transactions of the American Society of Civil Engineers* for Sept., 1892, and Dec., 1894. M. M.

Slater: town; Saline co., Mo.; on the Chi. and Alton Railroad; 12 miles W. of Glasgow, 96 miles E. of Kansas

City (for location, see map of Missouri, ref. 3-F). It is in an agricultural region, and contains 2 State banks with combined capital of $150,000, a high school, and a daily and 3 weekly papers. Pop. (1880) 771; (1890) 2,400; (1900) 2,502.

Slater, Samuel: manufacturer; b. at Belper, Derbyshire, England, June 9, 1768; was apprenticed at the age of fourteen to Jedidiah Strutt, partner of Arkwright in the business of cotton-spinning; saw in a newspaper in 1789 the law passed by the U. S. Congress in that year for the encouragement of manufactures, and a notice of the bounty offered by the Pennsylvania Legislature for the introduction of the Arkwright patents into the U. S., the communication of the models of the new machinery to foreign countries being then forbidden by English law under severe penalties. Believing himself able to construct new machinery from memory, he sailed for New York. He entered into a contract with William Almy and Smith Brown, of Pawtucket, R. I., to construct and work the new cotton-spinning machinery, and started at Pawtucket, Dec. 21, 1790, a mill with three carding-machines and seventy-two spindles, which was the virtual beginning of the manufacture of cotton in the U. S. He erected cotton-mills at Oxford (now Webster), Mass., in 1812, to which he added woolen-mills 1815–16, the nucleus of the village of Slatersville. D. at Webster, Mass., Apr. 21, 1835. See Rev. George S. White's *Memoir of Samuel Slater* (Philadelphia, 1836; 2d ed. 1846).—His nephew, John Fox Slater (1815–84), became a manufacturer, and in 1882 gave $1,000,000 for the education of freedmen in the South.

Slatington: borough (incorporated in 1864); Lehigh co., Pa.; on the Lehigh river, and the Lehigh Val. and the Phila. and Reading railways; 16 miles N. W. of Allentown, the county-seat (for location, see map of Pennsylvania, ref. 5-I). It has 9 churches, 14 public schools, including a high school with college preparatory department, extensive slate-quarries, rolling-mills, steam-boiler works, large school-furniture factory, a national bank with capital of $100,000, and a weekly newspaper. Pop. (1880) 1,634; (1890) 2,716; (1900) 3,773.

Editor of "News."

Slave Coast: old geographical name for that part of the coast of Upper Guinea which is about the Bight of Benin, so named because formerly a favorable place for obtaining slaves. It is now in part Dahomey, under French protection, and in part (to the E.) the territory of the Royal Niger Company. See Dahomey and Niger Territories.

Slave Lake and River: See Great Slave Lake.

Slavery [deriv. of *slave*, of like source with Germ. *sklave* < M. H. Germ. *sklave*, *slave*, Dutch *slaaf*, Fr. *esclave*, originally a Slave, a Slavonian. The word acquired its meaning in Italy in the eighth or ninth century]: a state of bondage in which one human being is in complete subjection to the will of another. In its usual sense it is restricted to chattel slavery, in which the slave may be bought and sold like ordinary property, and it thus excludes the milder forms of bondage, such as serfdom or villanage. In its origin it was the sign of advancing civilization, in that it arose from the practice of sparing the lives of captives, who in the period of primitive savagery were generally slain by their captors. The arts of production must have reached the point at which a man's labor produced a surplus over what was necessary for his own support, for among barbarians clemency toward captives sprang from the perception that an economic benefit might be gained by their enslavement. The slavery of the industrial classes has characterized the early history of all civilized races, and as forcing men to labor, despite the natural reluctance inherent in barbarous tribes, seems to have been a necessary element of progress. It existed among all the races of antiquity of whom there is historic record, but in some its rigors were mitigated by peculiar laws and customs, as among the Hebrews, whose slaves became free after seven years had elapsed from the beginning of their servitude, while every fiftieth year, on the occasion of the jubilee, all slaves were emancipated.

Greek Slavery.—The Homeric poems bear witness to the antiquity of the practice of holding slaves among the Greeks. In the historic period the supply seems to have been kept up by capture in war, and by purchase from the slave-owners of Asia Minor and Thrace. Kidnapping, the sale of children by their parents, and enslavement for debt were also sources of supply. The rearing of slaves was never an abundant source in Greece, as it was cheaper to purchase those who had already reached the age of labor. They were employed in domestic service, in agriculture, and even in commerce, manufactures, and occupations in which the risk and responsibility were great. As to the relative numbers of the slaves in Greece reliable statistics are lacking, but it is probable that in the cities they were greatly in excess of the free population. It is estimated that in Attica the slaves bore to the free native population the ratio of three to one, and in Sparta the Helots are said to have numbered 220,000, while the Spartans numbered only 32,000. Their treatment differed greatly in the different cities. In Sparta the Helots suffered cruel treatment at the hands of their masters, despite their kinship of race, while the Athenian masters were noted for their mildness. By the Athenian law a slave who had just grounds for complaint against his master could demand to be sold; he had a right to asylum in the temples and sacred places, and his death could be avenged like that of a free citizen. He could purchase his freedom with the money that he had saved during servitude, and could be liberated by the act of his master. As a reward for fidelity or honorable services emancipation was frequent. No consciousness of the injurious moral effects of slavery seems to have been felt by the greatest thinkers of classic Greece. Aristotle and Plato both regarded the institution as necessary, the former holding it to be beneficial to both parties if practiced with justice.

Roman Slavery.—In Rome slavery became more highly developed, and formed a more essential part of the social and political system than in any other ancient state. As in Greece, the sources of supply were wars and commerce with the slave-producing countries of the East, the latter being by far the more important source in the latter years of the republic and under the empire. The proportion of slave to free population is estimated by Blair at three to one in the period from the middle of the second century B. C. to the reign of Alexander Severus (222–235 A. D.), and the number of slaves owned by a single master was often very large. A freedman in the reign of Augustus is said to have left by his will over 4,000, and families of 200 or 300 slaves were not uncommon. As to the legal status of the slave, he was under the complete dominion of his master, against whom he had no legal redress. The marriage of slaves had no legal recognition, and their union (*contubernium*) was terminable at the will of the master; nor could a slave legally acquire property, though it became customary to permit him to enjoy a share of his earnings, known as his *peculium*. In general, punishments for crime were more severe against slaves than against free men. Their harsh treatment is attested by several servile insurrections, of which the most formidable were that of Eunus in Sicily in 133 B. C. and that of Spartacus in 73 B. C. By the second century, however, when the period of conquest had closed and the policy of the state aimed at peaceful development within existing limits, a greater humanity began to display itself in dealing with the slaves. This was furthered by the spread of Christianity, which, though it did not expressly forbid slavery or brand it as a crime, rested upon premises which must lead inevitably to its destruction. Accordingly, when the Teuton invaders settled within the Roman empire, they found the condition of slavery greatly modified. A system of caste or heredity in occupation had developed in both private and public business. The *coloni* on the landed estates were personally free, but could not leave the lands of the proprietors, and the prædial slaves in the course of time approached the condition of the *coloni*. Upon contact with the Roman civilization the Germanic tribes were naturally affected by the system of agricultural labor which they found in operation. Almost the only form of slavery known among them had been the slavery of the cultivator of the soil, and this gradually conformed to the condition of the Roman agricultural laborer. The resulting system was serfdom (see Serf), the effect of which was to lower somewhat the position of the old *colonus* while it raised that of the class of agricultural laborers as a whole.

Mohammedan Slavery.—During the Middle Ages slavery was still practiced, but among Christian races the enslavement of Christians was opposed by the Church. No such scruple applied to the enslavement of Mohammedan captives, many of whom were held as slaves throughout Europe, while numerous Christian slaves were left in the hands of the Turks and Saracens in the course of the many conflicts between Christianity and Mohammedanism. Many Moslem slaves were introduced into Europe by the great commercial cities of Italy, which carried on an extensive slave-trade with the East. On the other hand, the corsairs of Barbary carried off thousands of Christians into slavery, even pene-

trating into the interior of Spain and Southern France, and seizing the peasants in their homes. Charles V. is said to have set free 20,000 Christian slaves after his expedition against Tunis in 1535, and 12,000 Christian galley-slaves were liberated after the battle of Lepanto in 1571. White slavery still exists among the Mohammedans, but the slaves are on the whole humanely treated. The traffic in black slaves, however, is marked by every form of atrocity, and has continued despite the prohibition of the Porte.

Negro Slavery.—Though black slaves were to be found in Europe in the time of the Roman empire, African slavery on an extensive scale was not practiced by Europeans till after the discovery of America, when a great demand arose for Negro labor in the West Indian colonies of Spain. The Portuguese, who had introduced slaves into Europe some fifty years before, had at first a virtual monopoly of the slave-trade, but the English subsequently took part in supplying the Spanish demand. The rise of the North American colonies opened up another source of profit to the slave-traders. The first slaves sold to the English colonists were brought by a Dutch vessel to Jamestown in 1619, but the English afterward supplied the greater number, and continued the trade throughout the eighteenth century, despite the increasing opposition to it on both sides of the Atlantic. The Quakers had from the first opposed it, but they lacked numbers and influence. Encouraged, however, by Lord Mansfield's decision in the Somerset case in 1772, the enemies of slavery at last succeeded, through the labors of Clarkson, Sharp, Wilberforce, and others, in bringing the matter before Parliament. After repeated failures to secure legislation against the slave-trade, they triumphed at last under the Grenville and Fox ministry, and an act abolishing the slave-trade was passed in 1807. They then turned their attention to the suppression of slavery itself. On Aug. 28, 1833, a law was enacted fixing Aug. 1, 1834, as the date for the emancipation of all slaves within the British empire, and providing for the payment of £20,000,000 to the masters, who, however, were to retain their slaves as apprentices till Aug., 1840. The apprenticeship system was found to work badly, and was discontinued in 1838.

In the U. S. the slave-trade was forbidden by law in 1808. For many years before that time the abolition of slavery had been favored, not only by the Quakers, but by some of the leading statesmen. Franklin, Jefferson, Madison, and Jay were among the advocates of emancipation, and in the North this policy was so far carried out that by 1821 slavery had ceased to be a power in that region. The ordinance of 1787 prohibited slavery in the Northwest Territory. In the South, however, Eli Whitney's invention of the cotton-gin caused an ever-increasing demand for slave-labor, and the Southern States were growing more tenacious of slavery while the abolition sentiment was developing in the North. The more moderate opposition to slavery confined itself to attempts to restrict its sphere, and did not aim at unconditional abolition, but the latter policy was favored by radical reformers like Benjamin Lundy and William Lloyd Garrison, who represented a small and discredited but aggressive party. The story of the contest on the slavery question belongs to the history of the U. S., and is discussed under that title. In the Missouri Compromise (*q. v.*), in the struggle over the Wilmot Proviso, resulting in the formation of the Free-soil Party (*q. v.*), in the Kansas-Nebraska difficulty (see Kansas), and finally in the formation of the Republican Party (*q. v.*), the question of the extension of slavery became the leading issue in national politics. When civil war followed the secession of the Southern States from the Union, the expediency of the emancipation of the slaves as a war measure began to be seriously considered, and on Jan. 1, 1863, President Lincoln issued a proclamation granting immediate and unconditional emancipation. F. M. Colby.

Slave-trade: dealing in slaves; in particular, the business of capturing or purchasing human beings, transporting them to another country, and selling them as slaves.

Slavery as a status is repugnant to the principles of the modern international law. In the Congresses of Vienna, 1815, Aix-la-Chapelle, 1818, and Verona, 1822, the contracting parties agreed to unite in suppressing the slave-trade. Several states forbade their subjects to engage in it; such were Denmark, Great Britain, and the U. S. Nevertheless it may exist, if recognized by the laws of individual states, within their jurisdiction only. The traffic in slaves carried on in the ships of such states could not be restrained without their consent, expressed by treaty. Accordingly, under the influence of the agitation carried on by Zachary Macaulay, Sir Thomas Fowell Buxton, Wilberforce, and others, the British Government, in the early part of the nineteenth century, began to make treaties with a number of states for the suppression of the slave-trade. To be effective, these treaties required one of two provisions: either (1) a reciprocal right to search the merchant ships of the contracting parties, or (2) co-operation by their naval forces. Such treaties were made by Great Britain with a great variety of powers, Spain and Portugal, the chief offenders, among them. As these treaties proved ineffective, they were amended or superseded by further negotiations. Most of these conceded to British cruisers the right to search ships flying the flag of the other nationality on suspicion of being engaged in the slave-trade, with provision for trial, either by mixed courts or by a court of the defendant. Two treaties with France and the U. S. bound the parties to maintain squadrons on the coast of Africa. The gradual success of these efforts has been in its field almost complete.

It was very natural that the efforts of Great Britain to draw the U. S. into an agreement to permit a mutual right of search should have been unsuccessful, for in the earlier half of the nineteenth century the memory of British pretensions in searching U. S. ships for British seamen and then impressing them was still fresh. The first treaty which concerned the slave-trade between the two countries is that of 1814. In it (Art. X.) both parties agreed to "use their best endeavors" to bring about its abolition, but no definite plan was arranged. By several acts during 1818, 1819, and 1820 the penalties for engaging in the slave-trade were increased; authority was given for the maintenance of ships on the African station; and for all persons under the jurisdiction of the U. S. the slave-traffic was declared to be piracy, that is, to be put into the same category with piracy by statute, and visited with the same penalty. Statutory piracy does not, however, warrant arrest and trial at the hands of any state, so that these statutes alone proved insufficient, and the British Government earnestly tried to persuade the U. S. to consent to a reciprocal right of search. This the latter steadily refused. The national sentiment against it was too strong; but the detestation of the slave-trade was strong also, and led to a resolution of the House, in 1823, in favor of an international agreement making it piracy. Nothing came of this, nor of negotiations in England the next year which provided a modified right of search, but the cases to be tried in the defendant's courts. In fact, it was not until 1842 that any joint arrangement was made, and this, avoiding the reciprocal right of search, provided that each country should maintain a squadron on the African coast, the two to act in concert. Finally, in 1862, the mutual right of search within certain limits, and under conditions, was conceded. Mixed courts were established at the Cape of Good Hope, Sierra Leone, and New York. The limits were extended a little by an additional article in 1863, and in 1870 the mixed courts were abolished, the ordinary prize-courts of the two countries taking cognizance of slave-trading cases.

It has been said that the slave-traffic off the African coast has been for the most part broken up, but the vast interior is given over to it, the hunting being carried on largely by Arab adventurers, and a market being found in the Mohammedan countries in the northeastern quarter of the continent. To check this traffic the civilized powers have addressed themselves, still under the lead of Great Britain. Thus in 1877 a convention was signed between Great Britain and Egypt, by which the slave-trade into or across the latter country was prohibited, with penalties for the parties implicated; the tribal wars having the making and selling of slaves as their object were to be discouraged; and a mutual right of search was granted on the Red Sea, the Gulf of Aden, the African and Arabian coasts, and in Egyptian waters. Another treaty with Portugal, in 1879, was aimed at the slave-trade within Portuguese jurisdiction in South Africa, and in 1884–85 the Berlin Congo conference decreed the abolition of the slave-trade within the Congo Free State. To make this abolition effectual, an important "General Act" was agreed upon in 1890, the parties to it including Turkey, Persia, the Congo Free State, Zanzibar, all the European maritime powers, and the U. S. This act begins by declaring the "most effective means of counteracting the slave-trade in the interior of Africa to be"—

(1) A civilized protectorate over the administration of the African territories.

(2) The establishment of strong stations by each power in its own territory to repress slave-hunting.

(3, 4, 5) The development of the country—Central Africa—by roads, railways, steamboat service supported by fortified posts, and telegraph lines to unite them.

(6) The organization of expeditions and flying columns to protect the communications and "support repressive action."

(7) The restriction of the importation of modern firearms and ammunition throughout the entire region in which the slave-trade is carried on.

This is a most attractive programme, if it can be carried out. Without good weapons the Arabs and their slave-hunting auxiliaries would not venture to attack the native tribes. Armed boats on the great lakes and fortified stations on the great highways would break the trade up effectively, while the growth of missions, of civilization, and of civilized trade would narrow its operations. To the carrying out of this programme the signatories pledged themselves with much detail and many provisions. At sea also, along certain stretches of coast, on the Indian Ocean and off Madagascar, the powers agreed to combine to put down slave-trading in small vessels.

Finally, those of the signatory powers whose domestic institutions recognized slavery agreed to forbid the importation of slaves, their transit, their departure, and the trade in them; while Zanzibar, Persia, and Turkey have bound themselves to assist actively in the suppression of this traffic. The provisions of the act to secure all these objects run through 100 articles. THEODORE S. WOOLSEY.

Slavic Languages: a group of Indo-European languages which embraces Russian, Polish, Servian, etc. 1. Whether there ever was a unitary Slavic language is still a problem of philology. Theoretically, it is proper to speak, within the field of the Indo-European languages, of a unitary Slavic type, intimately related to the Baltic; and these two are often grouped as a Lithu-Slavic or Balto-Slavic branch of Indo-European, just as Sanskrit and Iranian are comprehended under Indo-Iranian. And the branch thus constituted undoubtedly stands in many characteristic phenomena nearer to the Indo-Iranian than to the Germanic, Celtic, Italic, or Greek. The Balts (i. e. the Lithuanians, Letts, and Prussians) have in common with the Slavs as against the remaining Indo-Europeans a richly developed vocabulary, similar formative suffixes, and noun and pronoun declensions closely related, especially in the formation of the so-called compound declension of the adjective with the pronoun stem *ja-*; e. g. τοῦ ἀγαθοῦ is in Lith. *gero-jo* (gen. of *geras*, good, and *jis*, he), in Slav. *dobra-jego*. In conjugation there are fewer points of contact, but the Lith. infin. in *-tė*, *-ti*, and the Slav. in *-ti* come close together: *dûti*, *dati*; likewise the supines in *-tum* : *tŭ* : *dûtum*, *datŭ*. In the consonant system Baltic shares with Slavic the loss of aspirates: Lat. *fero*, Gr. φέρω, Lith. *beriu*, Slav. *berą*; Lat. *fumus*, Gr. θυμός, Lith. (pl.) *dumai*, Slav. *dymŭ*; also the change of the palatal explosives to spirants somewhat as in Indo-Iranian: Gr. ἑκατόν, Lat. *centum*, Goth. *hunda-*, Lith. *szimtas* (*sz* = Slav. *š*), Slav. *sŭto*; Lat. *hiems*, Gr. χειμών, Lith. *žiema*, Slav. *zima*; Gr. γιγνώσκω, Lat. (*g*)*nosco*, Lith. *žinoti*, Slav. *znati*. In syntax may be noted as common to both the use of the genitive object in negative sentences, e. g. Lith. *nesa jis ne* (nec scit eum) *reg nej pažysta jos*; *bet jus jį pažystate*, Slav. *jako ne viditĭ jego ni znajetĭ jego*, *vy že znajete i*. Here *jos* and *jego* are objects in the genitive. (quia non videt eum vos autem eum cognoscetis)

2. The Slavic type differs from the Baltic in two marked peculiarities: (*a*) the change of diphthongs into monophthongs; (*b*) by the finely organized laws of palatalization, i. e. by the regular change of *k*, *g*, *ch* to *č*, *ž*, *š* before the palatal vowels *e*, *ē*, *ĭ*, *i*, and by the later change of *k*, *g*, *ch* to *c*, *z*, *s* before the vowels *ē*, *i* which result from *oi*, *ai*. Here follow illustrations of both these typical phenomena: (*a*) Lith. *ai* corresponds to Slav. *ê* (a long, broad sound); *baisus*, terrible: *bêsinŭ*, angry; *dailinti*, decorate: *dêlati*, carve; *mainyti* : *mêniti*, exchange; *raižyti* : *rêzati*, cut. Lith. *au* corresponds to Slav. *u* (orig. long); Lith. *ausis* : Slav. *ucho*, ear; *draugas* : *drugŭ*, friend; *jaunas* : *junŭ*, youth; *kaupas* : *kupŭ*, heap. Sometimes Lith. *au* corresponds to Slav. *y* (a deep guttural long *ŭ*); Lith. *au* is here plainly a resultant of *eu*; *krauti* : *kryti*, cover; *grauszti* : *grysti*, gnaw; *mauti* : *myti*, wipe; *raudoti* : *rydati*, moan. Lith. *ei* and *iė* correspond to Slav. *i*; *eiti* : *iti*, go; *miėlas* : *milŭ*, dear; *teisus* : *tichŭ*, still; *piėtūs* plur. dinner-time: *pišta* (from *pitja*), food. (*b*) The Slavic palatalization may be illustrated by the following parallels: Lith. *keturi* : Slav. *četyre*, four; *kibiras* : *čibĭrŭ*, jug; *kirwarpa* : worm-hole : *čirvĭ*, worm, cf. Lith. *kirmis*: Lat. *vermis* for **kvermis*; *geidauti*, yearn : *o-židati*, wait for; *gerti*, *geriu*, drink : *žrĕti* (for *žerti*), *-žirą*, devour; *sarginti*, nurse : *stražiti* (for *storžiti*), watch over; vocat. *nebage* : *nebože* (from *nebogŭ*, poor). While this form of palatalization shows itself in all the Slavic languages and dialects, and consequently is their common property, dating from the time of their linguistic unity, there has been developed in one of the Baltic languages, viz., the Lettic, after the time of the division into the three chief branches, Lithuanic, Lettic, and Prussian, a phenomenon analogous to the Slavic palatalization, so that a *c* and *dz* correspond to the Slavic *č* (from *k*) and *ž* (from *g*); e. g. Slav. (Serv.) *čitavŭ*, whole : Lett. *ceeli*, firm (Lith. *kiėtas*); Slav. *čirta*, mark : Lett. *cērtu*, cut, but Lith. *kertu*; Slav. *čirvĭ* : Lett. *cērms*, worm, but Lith. *kirmis*; Slav. *živŭ* : Lett. *dzīws*, vivus, but Lith. *gywas*. With the primitive Slavic phenomena of palatalization belongs also the change *ch* (= Gr. χ) > *š*. The Slav. *ch* is, however, itself a product of *s*. Cf. Slav. *suchŭ* : Lith. *sausas*, to which the verbum causat. is Lith. *sausinti* : Slav. *sušiti*; Lith. *dausos* plur. air : Slav. *duchŭ*, but Lith. *dausinti* : Slav. *dušiti*.

A later palatalization, but one which nevertheless falls within the boundaries of the Slavic group, is the change of *k* > *c*, *g* > *dz* (*z*), *ch* (*s*) > *s* or *ś*, which occurs in the special case where a guttural comes before an *ê* or *i*, resulting from original *ai*, *oi*. Cf. Goth. *hails*, which would be **kailas* in Lith. if it existed, and Slav. *cělŭ*, salvus; Lith. *kaina* (: Lat. *poena*) and Slav. *cêna*, price; Lith. *gailus*, sharp : Slav. *dzělŭ*, violent. This appears prominently in suffixes and case-endings or verb inflexions; nom. plur. of *stogas*, roof, Lith. *stogai* : Slav. *stodzi* from *stogŭ*; dat. sing. Lith. *rankai* from *ranka*, hand : Slav. *rącê* from *rąka*; imper.-optat. from *teka*, flow : *tĭci-tĭcête*. The commonest appearance is in the Slav. suffixes *-ĭcĭ*, *-ĭca*, *-ĭce*, *-ica*, which are used so widely as to give the impress of peculiarity to the entire body of the language. The corresponding Lith. suffixes show always *k*. Cf. Slav. *vĕnĭcĭ*, garland: Lith. *wainikis*; Slav. *junĭcĭ*, steer : Lith. *jaunikis*.

3. Another strong characteristic of the Slavic as against the Baltic type is the uniform loss of final *-s*. And as final *-ŭ* (< I.-E. *-ŏ*, *-ŭ*) and *-ĭ* (I.-E. short *-ĭ*) became silent at an early date, present Slavic word-forms often appear mutilated to the extent of the entire final syllable. Cf. Slav. *drugŭ* (now *drug*) : Lith. *draugas* (usually *draugs*); Slav. *osilŭ* (now *osel*, *osieł*, *osał*) : Lith. *asilas*; cf. also the casus obliqui, Slav. gen. sing. *nošti* (< *notji*) : Lith. *naktiės*, Slav. acc. sing. *nošti* : Lith. *naktĭ*. But as an offset to its poorer noun declension, Slavic has a fuller and clearer development of verb forms—a difference which constitutes one of the most difficult problems of philology. Cf. Lith. 2 pers. pres. *teki*, 3 pers. *teka* : Slav. *tečeši*, *tečetĭ*, pl. *tekątĭ*; Slav. aorist formation *tekŭ-tekomŭ*, *têchŭ-têchomŭ*, *tekochŭ-tekochomŭ* and imperf. *tečaachŭ-tečaachomŭ* (also *tecêchŭ-tecêchomŭ*): Lith. perf. *tekėjau* and habitual imperf. *tekėdavau*. Lith. opt. *tekėtumbei* (: supine *teketum* + *bei*) corresponds with change of category to Slav. condit. *teklŭ bi*. On the other hand, the Slavic language type lacks all except a few traces of the *s*-future : *tekėsiu* must be expressed in Slav. either by the pres. *teką* (compounded with various prepositions to complete its meaning) or by the inf. *tešti* (= *teiji*, *teći*, *teči*, *teci*) with the vb. *choštą*, will, *imamĭ*, have, or *bądą*, become. This last-mentioned distinction between the two language types is closely connected with the fine distinctions of the Slavic verb as regards the aspects of time-duration, which are not developed to the same degree in Baltic. In contrast to the Slavic use of the opt. as impv., *tĭci-tĭcête* (where *i* and *é* are parallel to Gr. opt. endings *-οις*, *-οιτε*), Lithuanian has a new formation from the true infinitive stem with *-k* : *tekėk*, *tekėkite*. A trace of the optative remains in *te-tekiė*.

4. The separation of the Slavic from the Baltic must have been many centuries before our era. Many new acquisitions of sounds and vocabulary fall in the subsequent period of separation. The lexicographical material common to Slavic and Baltic shows no great or long-continued advance in culture from the primitive Indo-European period. The common Slavic vocabulary, on the contrary, is characterized by a great wealth of words important for the history of culture, and testifies to so long a period of common development and so rich and varied a community of life that the separation of the Slavs into various branches and peoples must be a comparatively very recent matter, and a result merely of local expansion. Especially worthy of notice is the borrowing of culture-words from the Teutonic, usually

in the Gothic form, during this period of primitive Slavic unity, doubtless during its closing centuries, e. g. *kŭnędzĭ*, prince, from Goth. *kuningas*; *cêsarĭ*, emperor, from Goth. *kaisar*; *brŭnja*, coat-of-mail, from Goth. *brunjô*; *cęla*, coin, from *kinlus*; *chorągy*, flag, from Goth. *hrunga*, pole: *kolĭlŭ*, kettle, from Goth. *kalilas*; *skldędzĭ*, shilling, from Goth. *skillingas*; *šlêmŭ*, helmet, from Goth. *hilms* ($h > š : k > c$), and many others.

The undivided Slavic people, apparently with the principal designation of *Slovêne* (sing. *Slovêninŭ*), inhabited the region of the Vistula (upper and lower) and of the upper Dniester and Dnieper, extending to the outer fringe of the Carpathian Mountains. They are first mentioned in classic literature by Pliny, Tacitus, and Ptolemy under the name of *Venedæ* (Οὐενέδαι). The name *Sclavêni* (*Sclavini*) is first met with in Jordanes (who also uses *Venêlhæ*) and Procopius in the sixth century: Σκλαβηνοί. The movements of the neighboring peoples—the Germanic Bastarnians, Goths, and Herulians on the W., and the Huns, Avars, Bulgars, and Chazars on the E.—pushed the habitat of the politically unorganized Slavs sometimes to the E. and N., sometimes to the W. and S. Jordanes and Procopius still locate the mass of the Slavic people eastward of the Vistula and northward of the Danube. But they soon spread to the W. beyond the Vistula and Oder and to and across the Elbe, and also to the S. across the Danube into the regions of the Hæmus, the Adriatic, and the Alps. Their migration into Pannonia began under pressure of the Huns, but became greater under pressure of the Avars.

5. Without doubt the separation of the Slavs into several linguistic groups preceded their final dispersion and in many ways determined its directions, as the present relative positions of the Slavic peoples seem to agree entirely with the philological classification and grouping of their languages, so that the settlements of the Slavs in historic times seem simply to reproduce on a larger scale the grouping of the prehistoric Slavic microcosm; e. g. the languages of the northwestern Slavs, including the now extinct Elban and Pommeranian, the Polish, Lusatian-Servian, Čech (Czech), and Slovakian, lead to the assumption that they lived in prehistoric times in the same relative positions, but within narrower limits. In all Northwest Slavic languages, primitive Slavic $t'j > c$, $d'j > dz$ ($> z$), e. g. *svêl'ja* > *sv'ieca*, *med'ja* > *m'edza* (> *m'eza*, *meze*). Yet it can not be said that the Northwest Slavic languages form a distinct unity as contrasted with all East and South Slavic languages, a view long held, however, under the influence of Dobrowský's classification; e. g. the treatment of the nasalized vowels forms a break in this assumed Northwest Slavic unity: the Polish, Pommeranian, and Elban retained the nasalization till the latest historic times (cf. Pol. *pięć*, *mięso*, *dąb*, *ząb*; Polab. (as written) *mangsi*, *mangsee*, *jansmin*, *tielang*, *pangt*, *gunsik*, *dumb*, *gunss*, etc.), while in Lusatian-Servian and Čecho-Slovakian nasalization has disappeared since the earliest historic times. Neither can we set up a dual division into Polish-Polabian and Lusatian-Servian–Čecho-Slovakian; for prim. Slav. *borda*, beard > Pol. *broda* : Lus.-Serv. *broda* : Čecho-Slov. (as also in South Slav. dialects) *brada*, etc., while Polab. gives *or* in *korwo*, *bordzya*, *chorna*, *vorno*, *ggorch*. No more can the South Slavic languages (Slovenian, Servo-Croatian, Bulgarian) be forced into a group with the Russian dialects, for while $t'j >$ Russ. *č*, $d'j > ž$ (rarely *dž*), e. g. *sv'ěča*, *m'eža*, in the South the Bulgarians say *svešla*, *mežda* (earlier *svêšt'a*, *mežd'a*); the Servo-Croatians *sveća* (*svieća*, *svića*, *ć* = *l'* or *tj*), *megja* (*gj* = *dj*, a palatal *d* with very weak assibilation) and *meja*; the Slovenians *sveča* (also *sveća*), *meja*. Hence the assumption of an original prehistoric bifurcation of all Slavic languages can not stand. But neither will a triad succeed. We see, rather, a continuous interrelation of each two or more neighboring languages, giving rise not infrequently to transition phenomena and transition dialects, which still furnish many problems for Slavic philology. In many cases the connecting links have disappeared, as, e. g., in Eastern Germany between Polabian and Casubian, in Lower Austria and Northern Styria between Čecho-Slovakian and Slovenian, in Pannonia between various Slovenian dialects, in Dacia between Slovenian and Russian.

6. The Slavic overflow into Central and Southeastern Europe came to a close in the first decade of the sixth century. The patriarchal organization of the Slavs and their division into very small disunited tribes allowed them to make no immediate political impression on their better organized and more cultured neighbors, to whom they were hostile not only by difference of language, but also by their persistent clinging to heathenism. The so-called Bavarian geographer gives the names of over fifty-five Slavic tribes scattered in larger or smaller areas over Germany, and his list could be somewhat increased from other sources. Their Christian neighbors sought at once both to convert and to subjugate them. Missionary efforts lasted during the seventh and eighth centuries, and first bore fruit in Dalmatia, Carantania, and Pannonia. In the meantime the Slavs learned the new forms of political and national life from those around them. Samo tried in the seventh century to unite the Slavic portions of Bohemia, Saxony, Thuringia, Bavaria, and the Alps, and a strong Slavic principality, which later became a kingdom, long existed in Dalmatia. Still more powerful was a state founded in Moravia, including parts of Northern Hungary, which gave rise to an event of the utmost importance for the history of the world. In answer to a request of Rostislav, who wished to free his kingdom from ecclesiastical dependence upon the Frankish, the learned and zealous Constantine and his older brother, Methodius, were sent from Constantinople as missionaries to the Slavs. Constantine (later called Monk Cyril) founded a literary language for all the Slavs—the so-called Church Slavonic or Old Bulgarian (or Old Slovenian), which served for many centuries as the organ of the Church and of Christian civilization for more than half the Slavic race. It was written in two alphabets, the Glagolitic, still universally retained for Constantine's writings, and the Cyrillic, which arose soon after, apparently in Bulgaria, and, because of its greater simplicity and its close resemblance to the liturgical Greek uncial (while the Glagolitic is based chiefly on the cursive minuscule), displaced the earlier alphabet. With some modernization under Peter the Great, it is still the alphabet of Great and Little Russian, Bulgarian, and Servian, while the Croatian, Slovenian, Slovakian, Čech, Lusatian-Servian, and Polish use the Latin alphabet. The Glagolitic prevailed from the tenth to the twelfth centuries in all western Slavic countries (Moravia, Pannonia, Dalmatia, Macedonia, Bosnia, and Servia), but later was restricted to Northern Dalmatia, Croatia, the coast-land, Istria, and the Quarnero islands. In these lands it is still used in Old Slovenian books printed in Rome for the Catholic Church service. Toward the end of the fifteenth century it was used for public notices, laws, communion-books, and even in private correspondence, and, with the rise of Protestantism, to spread Protestant doctrine in Istria, Croatia, the coast-land, and Dalmatia.

In Slavic philology Church Slavonic plays much the same part as Gothic in Germanic philology. It has the important advantage of having received a fixed literary form 300 years earlier than any other dialect. Its oldest form, represented by monuments going back to the tenth century, shows so ancient and so transparent an organization that it frequently furnishes the key to modern Slavic problems. Its importance to philological investigation is further aided by its use of an alphabet extraordinary for its fine phonetic discriminations. The first scientific grammar was written by Abbé Joseph Dobrowský, the founder of Slavic philology, in 1822—*Institutiones linguæ slavicæ, veleris dialecti*. Other works have appeared, as follows: Alexander Vostokov, a *Razsuždenie* (consideration) of this language (Moscow, 1820—demonstrates the presence of nasalization in Church Slavonic), edition of Ostromir's *Evangelium*, the oldest dated (1075) monument (1842); Kopitar, *Glagolita Clozianus* (1837); Miklosich, *Vergleichende Grammatik der slavischen Sprachen* (of which he made Church Slavonic the basis), appearing in parts as follows: *Lautlehre* (1st ed. 1852, 2d ed. 1879), *Stammbildungslehre* (1875), *Wortbildungslehre* (at first called *Formenlehre*; 1st ed. 1856, 2d ed. 1876), *Syntax* (2d ed. 1883); Schleicher, *Formenlehre der kirchenslavischen Sprache* (1852). See also the Slavic parts of Schleicher's *Compendium* and Brugmann's *Grundriss*. To the grammar belong also the following: Leskien, *Handbuch der Altbulgarischen Sprache* (2d ed. 1886); Jagić, editions of the *Codex Assemanianus* (1865), *Codex zographensis* (1879), *Codex Marianus* (1883), articles in the *Archiv für slavische Philologie*, etc.: also the writings of the Russian savants Sreznevskij, Sobolevskij, Brandt, Fortunatov, and others. The study centering on this language has raised a whole series of questions with reference to which the scientific and grammatical treatment of the separate Slavic languages must be largely shaped, both in form and content. Especially has the question of the habitat of the Church Slavonic called forth differences of opinion that have been

reflected in the names given it. At the outset Dobrowský recognized in it a southern dialect, which he called at first Old Servian, later Bulgaro-Servian or Macedonian. Kopitar advanced the hypothesis of a Pannonian-Carantanian origin, which Miklosich followed with slight modifications. From these two scholars comes the name Old Slovenian. Šafařík defended the Old Bulgarian hypothesis, more on historical than on linguistic grounds. The name Old Slovenian is still used because in native sources the language was so called, *slověnĭskŭ* (*slovenica lingua*), but it is now known to have been a South Slavic dialect spoken somewhere in Macedonia in the ninth century, having the most points of contact not with modern Slovenian, but with Bulgarian, and some also with the present Servo-Croatian dialects. In location it probably formed a frontier between Bulgarian and Servo-Croatian; not necessarily in Northern Macedonia, however, for Constantine Porphyrogenitus speaks of Servians near Saloniea. Aside from its philological importance, Church Slavonic is indispensable for the history of mediæval literature, serving beside the Christian Greek and Latin as the third international literary language. From the tenth century to the seventeenth a wealth of patristic literature, including lives, legends, and homilies, was assiduously translated—from the tenth to the fourteenth centuries especially in the South, but later also in Russia. It was also the state language in Bulgaria, Servia, Bosnia, Russia (including Lithuania), Moldavia, and Wallachia; and while its supremacy, like that of Latin in the West, ceased with the end of the seventeenth century, yet even to-day the Russian literary language rests on centuries of Church Slavonic traditions as to forms, vocabulary, and orthography. See Russian Language.

Individual Slavic Languages.

7. The southern Slavs, who in Byzantine times migrated in larger or smaller bands into the regions of the Hæmus, the Adriatic, and the Alps, are all called by Byzantine historians (Procopius, Menander, Theophanes, Theophylactus) by the name Σκλαβηνοί, equivalent to Slav. *Slovêne*, adj. *slověnĭskŭ*, a name continually met with in all historical periods in the Slavic South. The Bulgarians were originally called *Slovêne* both by themselves and others, and their language *slověnĭskŭ*. The inhabitants of Styria, Carinthia, Carniola, and the coast around Trieste and Gorz are still called *Slovenci*, and their language Slovenian. The republic of Ragusa also, in spite of the identity of its language with the inland Servo-Croatian, held in its rich poetical literature of the fifteenth to the eighteenth centuries to the name of "Slovinian." Hence the Byzantine name Σκλαβηνοί must have designated the whole of the southern Slavs. These tribes have never attained to a political or cultural unity. In Carinthia, Styria, and Carniola they early submitted to the Germans, and their closely resembling dialects formed the basis of the present Slovenian language. The dialect of Carniola forms the basis of the literary language. Slovenian was first treated grammatically by Kopitar (1808), later by Metelko, Dainko, Murko, and more recently by Miklosich, Levstik, and Šuman. A complete dictionary is (1895) being edited by Pleteršnik.

Nearest related to the Slovenian is the language of Slavonia in the old sense of the term, that is, of the region between the Save, Drave, and Mur (including scattered areas N. of the Mur in South Hungary). It probably extended formerly much farther toward the E., but the populations driven out of the Balkan Peninsula by the Turks entered the present Slavonia in such numbers that the Old Slovenian of the former kingdom of Slavonia is now restricted to the counties of Warasdin, Kreuz (Križevci), Agram, nearly to Belovar and Wirowitic. Since the end of the seventeenth century, this region has been known as Croatia and its language as Horvatian. Its literature began with the Protestant movement, and furnished in the seventeenth and eighteenth centuries a series of important prose works (also dictionaries by Belostenec and Habdelič). It continued as a literary language until the rise of Illyrianism in Agram, after 1830, led to its displacement by the richer and more extended Servo-Croatian. As a popular dialect it still continues. It is often called the *kaj* dialect, from its use of the word *kaj* (quid?).

8. The Croatians proper and Servians extend farther south, roughly from the river Kulpa throughout Istria, the islands, the Croatian coast, Dalmatia, Montenegro, and throughout the interior (Bosnia, Herzegovina, Old Servia, Servia), and northward beyond the Save throughout Slavonia, Syrmia, and Southern Hungary. The popular language deviates more or less from the literary dialect according to locality. That of Southwestern Servia and Herzegovina, together with the Bezirk of Ragusa, is nearest in character to the literary dialect. Montenegrin offers many peculiarities in pronunciation and syntax. As a result of ecclesiastical and political separation, the Servians and Croatians, so nearly related in language, have had a very diverse historical development. Though both were originally converted by Rome, and both accepted the Slavic liturgy in the ninth century, the separation of the Church into Eastern and Western soon afterward divided them into two hostile camps, Servia holding firmly to Constantinople and to Church Slavonic, while in the west the influence of Rome in ecclesiastical and public matters constantly increased. Not only in the old Romance cities of Dalmatia, but in the independent principality of Croatia, Latin was the ruling language in Church and state, though Church Slavonic still had a limited use in private congregational matters. After the end of the fourteenth century the popular language was used with Latin characters, at first in prose works for Christian instruction, but by the end of the fifteenth century for a poetical literature which reached its richest development in Ragusa in the seventeenth century. In 1595 Faustus Verantius (Vrančić) treated the "Dalmatinian" (for so he called it) lexicographically and proved the Slavic loan-words in Hungarian. In 1604 appeared the first grammar of the "Illyrian" language by Bartholomew Kašić, and in 1649 a valuable dictionary by Jacobus Micalia. The literary life of Dalmatia spread to Bosnia in the sixteenth century—at least among Catholic adherents—and in the seventeenth and eighteenth books were printed in the popular language for circulation in Bosnia, with both the Cyrillic and Latin alphabets. The true founder of the popular language as a literary dialect for the Servians is Vuk Stef. Karadžić, who published much popular material, principally songs, in the second and third decades of the nineteenth century, and based the Cyrillic orthography on phonetic principles. Since this Servian dialect of Vuk is the same as the Dalmatian of the fifteenth to the eighteenth centuries (later used also in Bosnia), which, as above mentioned, was introduced into Agram in 1835 under the name of Illyrian, these two long separated branches have at last been united again into the Servo-Croatian literary language. Though this still preserves a dualism in name (Servian and Croatian), and in the use of different alphabets (Cyrillic and Latin), it is one in grammar and vocabulary. Vuk prepared a small grammar and an excellent dictionary (2d ed. 1852). The great *Academic Dictionary of the Croatian or Servian Language*, begun by G. Daničić (1882), is being published by the South Slavic Academy in Agram.

9. Most peculiar in its development has been the language of the Bulgarians, who borrowed their name from their Turkish conquerors, the Bulgars. They live, to the number of about 3,000,000, E. of the Servians on the lower Danube, in the Balkan and Rhodope Mountains, in Roumelia nearly as far as Adrianople, and in a large part of Macedonia. They were originally composed of seven Slovenian tribes, whose branches may have extended to the south as far as Greece, and northward as far as Eastern Pannonia and Transylvania; the resulting dialectal differences are not yet wholly obliterated. Besides the use of a post-positive article, Bulgarian has lost the true Slavic declension, replacing it by prepositions with the general case, which gives it a strange appearance in comparison with all other, even southern, Slavic dialects, with which in other ways it has many points of contact. This phenomenon probably dates back to the fourteenth century, and may have been partly due to the influence of Roumanian, in which it certainly developed much earlier. The Slavic conjugation, however, except for the loss of the infinitive, has been retained in Bulgarian in its old form, agreeing with the eastern Servo-Croatian dialects even in the formation of the future by means of the auxiliary *štă* (from *chošta*), and with all South Slavic dialects in the use of the conjunction *da* with object clauses (instead of *že iž* in Northwest Slavic, and *čto- što* in Russian). As noted above, Bulgaria was for a long time the center of Church Slavonic literary activity (under the Emperor Simeon, 927 A. D., and his immediate successors). As a result, the popular language does not appear in literature before the seventeenth century, and must be gathered from fragments found scattered through the Church Slavonic texts. The language was made known to the literary world by Vuk Stef. Karadžić and Kopitar, having been scarcely known to Dobrowský, and has been investigated

scientifically by Miklosich, Hattala, Biljarskij, Kalina, Lavrov, Drinov, Conev, and Miletič. The first dictionary was by Duvernois.

10. Characteristics common to all South Slavic languages are: (*a*) The hard pronunciation of the vowel *e*, so that the syllables *te*, *de* are as hard in sound as *ta*, *da*; (*b*) the phonetic blending of *i* and *y* into a medial hard *i* (e. g. *biti* and *byti* are homonyms; the pronoun *ti* represents both *tibi* and *tu*); (*c*) *or* and *ol* + cons. > *ra*, *la* (e. g. *grad*, *glad*), *er* and *el* + cons. > *rê*, *lê*; (*d*) the use of *r̥* (vocalic or syllabic) e. g. *nrtev*, *mrtav*. *mrtuv*, while *l̥* > Sloven. *ol* + cons. (with *l* usually silent): Servo-Cro. *u* (< carlier *ul*) : Bulg. *l̥*, e. g. Sloven. *volk* (pron. *vôk*), S.-C. *vuk*, Bulg. *vlk* (written *vlŭk*); (*e*) *ę* > *e* (sometimes pronounced very broad, and after palatals even equivalent to *a*), while *ǫ* > Sloven. *ô* (close and somewhat long): S.-C. *u* : Bulg. *ŭ* (sometimes *ă* or even *o*), e. g. Sloven. *môž*: S.-C. *muž* : Bulg. *mŭž* (*măž*, *mož*—*ž* final = *š*); (*f*) the softening influence of final *-ĭ* on *t* and *d* has disappeared, e. g. prim. Slav. *mostŭ*, *kostĭ* > *most*, *kost*, both with hard *t*.

11. The ancient line of contact between the southern and northwestern (Čecho-Slovakian) Slavs must have run originally through Pannonia along the line of Buda-Pest-Oedenburg, and along the portion of the Alps that divides Styria from Austria. It was obliterated by the founding of Ostmark and the occupation of Pannonia by the Magyars. It is noteworthy, however, that the Slovaks of Northern Hungary (along the Tatra Mountains from Moravia to beyond the boundaries of Galicia) still call their language Slovenian (*slovenský jazyk*) and themselves Slovaks (*Slovák*). The Čecho-Slovakians (Čechs, Moravians, North Hungarians) entered their present abodes either from the north through the opening of the Oder valley between the Sudetes and the Beskides, or have spread from Pannonia. They number about 7,000,000, of whom 2,000,000 are in Hungary. Their language, whose monuments date from the twelfth century, may be characterized as follows: (*a*) *e* and *i* have a softening influence (in contrast with South Slavic hard *e* and *i*), especially in Slovakian, e. g. *budete* is pronounced nearly *bud'et'e*, the dat. *ti* (*tibi*) is distinct in pronunciation from nom. *ty* (*tu*), *biti* is distinct from *byti*; (*b*) final *-ĭ* also has a softening influence, e. g. *kosť* is distinguished from *most*; (*c*) *ĭr* + cons. > *r̥* (e. g. *prst*, *srdce*, *zrno*), which is lengthened in Slovakian, e. g. *kŕmiť*, feed, *pŕliť*, burn, *pŕš*, rain, *sŕňa*, fawn; (*d*) in Čech, medial *-ŭ-* and *-ĭ-* > *-e-*, e. g. *den*: Ch. Slav. *dĭnĭ*, day, *sen* : Ch. Slav. *sŭnŭ*, somnus; (*e*) nasal *ǫ* > *u* (while *ę* + soft sound > Čech *i̯e* (lengthened to *í*), *ę* + hard sound > *a* (< *i̯a*); (*f*) the Old Slovenian vowel *ê* fluctuates between *ie* and *i̯e*. Čech *ie*, if lengthened, > *í*, and Slovak. *i̯e* tends to become *e*, e. g. Čech *pěna* (*ě* = *i̯e* short) : Slovak. *pena*; (*g*) as in all Northwest Slavic, *t'j*, *d'j* > *c*, *dz* (*z*), e. g. *svíce* : Slovak. *svieca*, *ryzý* : Slovak. *rydzi*; (*h*) as in all Northwest Slavic, the original consonant groups *dl*, *tl* are retained, e. g. *krydlo*, *mydlo* (: Russ. *krylo*, *mylo*), *pletla*, *bodla* (S. Slav. *plela*, *bola*); (*i*) epenthetic *l* is lost, e. g. *zemiak*, potato, *konopě* (Slovak. *konopa* : S. Slav. *konoplja*); (*j*) *g* > *h*, e. g. *noha*, *mnoho*, but remains in the Slovak. *druzgati*, *miazga* (*mliazga* : Sloven. *mézga*), *rázga* (Čech *rozha*); (*k*) in adjective declension *o* + *e* > *é* in all N. W. Slav. (: S. Slav. *ō* : Russ. *oe*), e. g. *dobré* : S. Slav. *dobrō* : Russ. *dobroe*. The demonstrative pronoun is *ten* instead of S. Slav. *tè- ta- taj* : Russ. *toj- tot*; likewise *jenž* instead of *iže*.

While Čech had, by the thirteenth and fourteenth centuries, developed a rich mediæval literature, literary activity among the Slovaks began among the adherents of Protestantism, who, making use of the rich Hussite and Brethren literature (in Čech), also made literary use of the Čech in preference to their own Slovakian dialect. Later, however, the claims of the Slovakian dialect were asserted under Catholic influences, with the final result that in 1850 the Slovakians adopted as their literary language the dialect recommended by Hodža and Hattala—a separation weakening to both the Slovakians themselves and to Bohemian literature, for the divergences between the two dialects were not sufficient to warrant it. Slovakian grammar has been treated by Bernolák (also author of a large dictionary), L. Štur, and Hattala. The eastern population of Moravia is almost more Slovakian than Čech as regards dialectic peculiarities, as shown by Prof. Bartoš's *Dialectologie moravská* (part i., 1886). Čecho-Slovakian literary activity (as also the scientific study of the dialects) began in Bohemia, as noted above, with such poetical works as the *Romance of Alexander* and the prolix *Legend of Catharine*. The language of these monuments is called Old Bohemian, principally because of its use of certain ancient forms (e. g. simple and *s*-aorist, and pluperfect). From the end of the fourteenth century various theological themes were treated by Old Bohemian prose-writers, beginning with Huss, and especially under the Bohemian Brethren. Huss laid the foundations of present Slavic orthography by indicating the palatals with diacritical marks over *c*, *s*, *z* (now *č*, *š*, *ž*). In 1533 and frequently thereafter appeared a grammatical publication (*Orthography and Etymology*) by Beneš Optat and Václav Philomathes. Jan Blahoslav annotated this work, and in 1571, the year of his death, finished an appendix, which was first published by H. Jireček, Vienna, 1857. After their terrible reverses at the beginning of the seventeenth century, the Bohemian people began to recover under the Empress Maria Theresa and the Emperor Joseph II., and to take up again their much-neglected language. This was the time of the beginning of Dobrowský's work. With him begins not only the comparative grammar of the Slavic languages, but also the scientific regeneration of Bohemian grammar (e. g. the correction of the orthography in several points, the division of the verb into six classes, according to formation of infinitive, etc.). After his death (Jan. 6, 1829), Bohemian study made progress chiefly in historical and dialectological directions (under Šafařík, J. Jireček, Šembera, and others) until the studies carried on by Gebauer (part i. of *Phonology*, 1894). Invaluable, even after the work completed by Kott, is the dictionary of Josef Jungmann (5 vols., 1835–39). As a result of the preponderating influence of the dialect of Prague, the language of Bohemia is subject to few dialectic variations; that of Moravia is less uniform.

12. North of the Čecho-Slovakians, and once their immediate neighbors, are the formerly powerful Lusatian-Servians or Wends, numbering now about 150,000 around Bautzen in Saxony and Cottbus in Brandenburg. Their language falls into two dialects, Upper and Lower. The German annalists, especially Thietmar of Merseburg, give many accounts of their conflicts with the Germans in the tenth to twelfth centuries. They appear under many names, apparently tribal designations, as Dalemėnei, Siusli, Chutici, Coledici, Mileieni, Lusiei, Selpuli, Sorowe, etc. Formerly they extended as far as the Poles on the E., the Polabians on the N., and the Czechs on the S., touching the Germans only on the W.; to-day they are hemmed in by the Germans on every side. The language of this people, first aroused to literary life by Protestantism (the New Testament was translated by Jaknbiea in 1548, a song-book and shorter catechism appeared in 1574), has received grammatical treatment by Tieinus (Upper Lusatian-Servian), 1679, Matthaei (Upper Lusatian-Servian), 1721, Hauptmann (Lower Lusatian-Servian), 1761, and in this century the Upper Lusatian-Servian by Seiler, Jordan, and Pfuhl, the Lower Lusatian-Servian by Mucke (*Historische und vergleichende Laut- und Formenlehre der Niedersorbischen Sprache*, Leipzig, 1891), and Zwahr (dictionary, 1847). In dialectic characteristics Lusatian-Servian is intermediate between Czech and Polish.

13. The Poles, in the earliest Slavic sources also called Ljachen, have from the earliest times dwelt E. of the Wends on the upper side of the Riesengebirge and Sudetes, on the outermost fringe of the Tatra and Beskides Mountains, and over the wide plains of the Oder and Vistula. Before the sixth century their ancestors and those of the later Polabians may have dwelt together in the present home of the Poles, which falls mostly within the original European habitat of the Slavs. The most ancient Russian chronicles mention as tribes the Poljans, Mazovšans, Ljutic, and Pommeranians; the Bavarian geographer mentions that *Lendizi*, which is the same name as the *Ljadskaja zemlja* of the Russian chronicle. The Uuislans (Vislans) and Sleenzans (Slenzans) and some others mentioned in the same authority are doubtless Poles. Formerly the Poles were neighbors to the Pommeranians on the N., the Kriwič, of White Russian stock, on the E., and the Lusatian-Servians and Polabians on the W.; but the Germanization of the Slavic territory between the Elbe and Oder brought them into contact on the N. and W. with the Germans, by whom the development of their political power was constantly repressed in those quarters. In the east, however, they developed their political and cultural supremacy at the expense of the Little and White Russians. They number at present about 13.000,000, being next to the Russians the most numerous Slavic people. Their unity of culture and language was furthered by their long political independence and religious unity.

The Polish language is characterized most strongly among all the living Slavic languages by retention of the original Slavic nasalization; cf. prim. Slav. *dąbŭ-dąba-dąbu*, Polish *dąb-dębu*; prim. Slav. *rąka-rąką-rąkŭ*, Polish *ręka-rękę-rąk*. The Polish is rich, almost too rich, in sibilants, the original Slav. groups *te-ti*, *de-di* being assibilated: *cie* (i. e. *će*), *ci* (i. e. *ći*), *dzie* (i. e. *dźe*), *dzi* (i. e. *dźi*); so also *s*, *z*, before palatal vowels become *ś*, *ź*; *siano* (i. e. *śano*) *ziemia* (i. e. *źeḿa*). Polish differs widely from Čech in the treatment of the old Church Slav. vowel *ê*, making it now *ie* (before soft sounds), now *ia* (before hard); thus *wiatr* (Čech. *vítr*, genit. *větru*), but *wierny*, *wierzyć* (Čech. *věřiti*). Polish forms from *or* + cons. and *oł* + cons. not *ra-ła*, like Čecho-Slovak. and South Slav., but *ro-ło*, like Lusatian-Servian; *er* + cons. and *el* + cons. do not yield *rê* + cons., *lê* + cons. as in Cech and South Slav., but *re* + cons., *le* + cons., e. g. Cech *březa* or *bříza*, Pol. *brzoza*. Polish has no *ŗ-*, *ļ-* sonans. In the umlaut of *ie* > *io* Polish is akin to Russian. Polish has retained *ł* (hard) and *l* (palatal), whereas Čech has in recent centuries entirely relinquished *ł*. Beside other peculiarities of the Polish is to be noted its constant accentuation of the penultimate syllable, as distinguished from Čech and Lusatian-Servian, which accentuate the first; also its lack of distinctions in quantity as contrasted with the many long syllables, notably final ones, in Čech.

14. The Casubian was regarded by Kryński, Biškupski, and Pobłocki as a dialect of Polish, but by most scholars has been more correctly regarded as the last remnant of the language of those Slavs who formerly extended throughout Pommerania and beyond the Oder to the Elbe. The Casubians of to-day (also called Slowincians or Slowiencians) are a poor fishing people around the Gulf of Dantzic and in some places in the provinces of West Prussia (Putzig, Neustadt, Karthaus, Dantzic, Berent, Konitz, Schlochau) and Pommerania (Lauenburg, Stolp, Bütov), and number over 150,000. A comparison of their language (treated by Cenowa, Hilferding, Biškupski, and others) with Polabian (as set forth by Schleicher) shows conclusively that Polabian and Pommeranian had much in common that can not be found in Polish. A most serviceable dictionary of Casubian by Ramult was published by the Cracow Academy in 1893.

15. For an account of the Russian dialects, see Russian Languages. V. Jagić.

Slavo'nia [= Late Lat., deriv. of *Sla'vus*, Slav; cf. O. Bulg. *Slovie'ninŭ*: Russ. *Slavya'ninŭ*, Slav, Slavonian; perhaps connected with O. Bulg. *slovo*, word, *slava*, glory]: a territory of Austria-Hungary, forming with Croatia a province attached to Hungary; bounded N. by the Drave and S. by the Save, and E. by the Danube. Area, 9,106 sq. miles. A branch of the Carnian Alps enters Slavonia from the W., and traverses it in its whole length, forming the watershed between the Drave and the Save, and terminating somewhat abruptly on the banks of the Danube. These mountains, which nowhere rise above 2,700 feet, are rich in copper, iron, lead, and beautiful marble, and their slopes are clothed with fine timber-yielding forests, vineyards which produce a sweet, strong, richly flavored wine, and orchards in which apples, pears, cherries, and peaches, figs, oranges, and walnuts ripen to perfection. Along the rivers extend low, rather marshy, but very fertile plains, where large crops of wheat and maize are raised and immense herds of cattle and swine reared. Of manufactures there are almost none; some linen fabrics are made from the excellent flax and hemp which are raised, but only for home use. The inhabitants, who call themselves *Slavonatz* and their country *Slavonska*, are at once warlike and dreamy, fond of music, poetry, and dancing, excelling in all kinds of horsemanship, and preferring the life of the shepherd to that of the tiller of the soil. They are deeply attached to their fatherland and proud of their nationality, and of late political ideas and passions have begun to play a conspicuous part in their lives. See Croatia.

Revised by M. W. Harrington.

Slavs [from Germ. *Sklave*, *Slave*, from the Slavic forms. See Slavonia]: a race of Indo-European relationship, characterized chiefly by their speech and constituting three-tenths of the population of Europe, and divided into three main branches—Eastern, Western, and Southern. To the first belong the Russians and Ruthenians; to the second, the Poles, the Czechs, the Slovaks, and the Wends; to the third, the Bulgarians, the Servians and Croatians, and the Slovenes. For the Slavic population of Austria-Hungary, Prussia, and Russia, see the articles on those countries.

No information is given, even by legends, as to the first appearance of the Slavs in Europe. In the fourth century they were found in great numbers in the neighborhood of the Carpathians, and that is supposed to have been one of their earliest homes. Thither point the legends of many Slavonic peoples, especially the Poles and Czechs, and thence the Slavonic settlers appear to have spread northward to the Baltic and southward to the Adriatic. The earliest authentic records of the Slavs are given by Procopius, Jordanes, Agathias, the Emperor Maurice, and other writers during the second half of the sixth century. These authors all lived in Byzantium or in Italy, and were personally acquainted only with the Southern Slavs, who dwelt on the lower Danube and spread through ancient Mœsia and Pannonia. The Northern Slavs they knew by report only. No political unity seems ever to have existed among these early Slavs, but their different bodies consolidated at various periods between the seventh and eleventh centuries into monarchies, of which most have virtually disappeared. To the early Slavs, Jordanes and some other writers give the name of Wends, by which name the Slavonic inhabitants of Lusatia are still known to their German neighbors. This designation, under various kindred forms, appears to have been applied to Slavs by foreigners, just as that of Welsh (*Wälsche*) was given by the Teutonic to the Latin-speaking peoples.

Of the ancient Slavs little information can be obtained except from the writings of Greeks, Germans, Arabs, and other foreigners. They appear to have differed but little in the various lands which they occupied, everywhere bearing the character of being a brave and hardy race, given to agriculture, and of a peaceable nature, except where they were influenced by more martial neighbors. Some modern writers suppose that the Slavs formed into clans, others that the foundation of Slavonic society was the family community. Among the Western Slavs, at least, a cluster of such communities formed a *jupa*, or district, at the head of which was a *jupan*, or chief, and in its center a *grad*, or town. The mode of life among all the Slavonic tribes was patriarchal, the father ruling his family with despotic power. Polygamy prevailed among them in heathen times, and also a kind of suttecism, but women do not seem to have occupied an altogether degraded position. Of Slavonic heathenism not much is known, but its deities appear to have been for the most part personifications of nature-forces. Vague recollections survive of Svarog, the heaven-god, answering to the Greek Ouranos, the Vedic Varuna. He appears to have given place, in some parts, to a solar deity, Dazhbog, together with whom, as the representative of the sun, a Khors is mentioned. Another solar deity was Volos or Velcs, the special protector of cattle, surviving in Christian times as St. Blasius or Vlasy. Kupalo and Garilo are supposed to have been representatives of the summer sun, the fertilizer of the earth. Fire is said to have been worshiped under the name of Ogon, answering to the Vedic Agni, and there was a wind-god, Stribog; but the chief deity of the Northeastern Slavs was Perun, the thunder-god, answering to the Teutonic Thor, and supposed to be the European representative of the Vedic Parjayna. Among the Western Slavs other deities were worshiped, such as Radigost and Sviatovit, and the three-headed Triglaf, of whose images detailed accounts are given by old writers. These Western Slavs appear to have had temples and priests, but it is doubtful whether this was the case among their Eastern brethren. Of inferior deities the memory is still preserved in the belief of the common people of all Slavonic lands in Rusalkas, Vilas, and many other supernatural beings supposed to haunt woods, waters, and pastures. The Western Slavs appear to have been the first to accept Christianity, many of the Moravians, for instance, having been converted as early as the seventh century, their religious teachings coming from the West; but the submission of the great body of Slavs dates from the mission of the Greek monks Cyril and Methodius in the ninth century. See Slavic Languages. Revised by M. W. Harrington.

Sleep [O. Eng. *slēp*: O. Sax. *slāp*: O. H. Germ. *slāf* (> Mod. Germ. *schlaf*): Goth. *slēps*; cf. Lat. *la'bi*, *lapsum*, glide, slide, fall down, whence Eng. *lapse*]: a condition of the organism, normal, and occurring generally periodically, in which there is a more or less complete suspension of consciousness and the power of voluntary motion. It is somewhat difficult to analyze the various phenomena which go to make up the condition called sleepiness. The most

prominent sensations are an impression of weight in the upper eyelids, and of a general relaxation of the muscles of the body; but there is besides an internal feeling of supineness and torpor, to describe which is by no means easy. Along with this languor there is a general obtuseness of all the senses, which increases the separation of the mind from the external world. The liveliest scenes cease to engage the attention, and the most exciting conversation no longer interests. For a time, indeed, such circumstances may dissipate the inclination for sleep, but eventually nature obtains the ascendency and consciousness is lost. Before this event there is usually yawning—a phenomenon strongly indicative of a wearied attention—the head nods and droops upon the breast, and the body assumes that position which is most conducive to muscular inactivity. The order in which the muscles lose their power is in general well marked, and bears a distinct relation, as Cabanis has pointed out, to the importance of their functions. The muscles which move the arms and legs become relaxed before those which support the head, and the latter before those which maintain the erectness of the back. This, however, is not always the case.

During sleep the respiration is slower, deeper, and usually more regular than during wakefulness. The vigor of the process is lessened, and therefore there is a diminution of the pulmonary exhalations. Owing to the general muscular torpor which prevails, mucus may accumulate in the bronchial tubes and require to be expectorated on awakening. The circulation of the blood is slower. The heart beats with more regularity, but with diminished force and frequency. As a consequence, the blood is not distributed to distant parts of the body so thoroughly and rapidly as during wakefulness, and accordingly the extremities readily lose their heat. Owing to the reduction in the activity of the respiratory, circulatory, and heat-producing functions, the temperature of the whole body falls, and coldness of the atmosphere is less easily resisted. The functions of the several organs concerned in digestion indirectly have their activity increased during sleep. The blood which is thus diverted from the brain goes, as Durham has shown, to the stomach and other abdominal viscera, and hence the quantities of the digestive juices are augmented, and the absorption of the nutritious elements of the food promoted. The urine is excreted in less quantity during sleep than when the individual is awake and engaged in mental or physical occupation, because the wear and tear of the system is at its minimum.

The nervous system continues in action during sleep, though generally with somewhat diminished power and sensibility. The reflex functions of the nerve-centers are still maintained, and thus various movements may be executed without consciousness being awakened. Somnambulism is a condition of exaltation in the functions of nerve-centers, without the controlling influence of the cerebrum being brought into action; but aside from this rather abnormal phenomenon, there are others which are entirely within the range of health. Thus, if the position of the sleeper becomes irksome, it is changed; if the feet become cold, they are drawn up to a warmer part of the bed; and cases are recorded in which individuals have risen from bed and emptied a distended bladder without awaking, as well as performing many other complicated and apparently volitional acts.

The ability to be readily roused through the senses constitutes one of the main differences between sleep and stupor. Relative to the different faculties of the mind as affected by sleep great variations are observed. It has been thought by some authors that several of them are really exalted above the standard attained during wakefulness, but this is probably a wrong view. The predominance which one or two mental qualities apparently assume is not due to any absolute exaggeration of power, but to the suspension of the action of other faculties which, when we are not asleep, exercise a governing or modifying influence. Thus, for instance, as regards the imagination, which appears to be most lively in dreams, we find that, when we carefully study its manifestations in our own persons, although there is often greater brilliancy in its vagaries, uncontrolled as it is by the judgment, the pictures to which it gives rise are usually incongruous and silly in the extreme. Even though the train of ideas excited in the dream seems to be rational and coherent, we are fully conscious on awakening that we are capable of doing much better by intentionally setting the brain in action and governing it by our will and judgment. Owing to the fact that these two faculties of the mind are incapable of acting normally during sleep, the imagination is left absolutely without controlling influence. Indeed, we are often cognizant in those dreams which take place when we are half awake of an inability to direct it.

That the imagination may in its flights during sleep strike upon fancies which are subsequently developed by the reason into lucid and valuable ideas is very probable. It would be strange if, from among the innumerable absurdities and extravagances to which it attains, something fit to be appropriated by the mind should not occasionally be evolved, and there are many instances of the starting-point of important mental operations having been taken during sleep.

As regards the memory in dreams, it is undoubtedly exercised to a considerable extent. In fact, whatever sign of activity the mind may then exhibit is based upon events the recollection of which has been retained. But there is more or less error mingled with a small amount of truth. The unbridled imagination of the sleeper so distorts the simplest circumstances as to render their recognition a matter of no small difficulty, and thus it scarcely if ever happens that events are reproduced during sleep exactly as they would be recalled by the mind of the individual when awake. Frequently, also, recent events which have made a strong impression on our minds are forgotten, as when, for instance, we dream of seeing and conversing with persons not long dead. Yet there are many instances on record of knowledge which had passed out of the mind being reacquired during sleep.

During sleep the power of bringing the judgment into action is suspended. We do not actually lose the power of arriving at a decision, but we can not exert the faculty of judgment in accordance with the principles of truth and correct reasoning. An opinion may therefore be formed during sleep, but it is more likely to be wrong than right; and no effort that we can make will enable us to distinguish the false from the true, or to discriminate between the possible and the impossible.

As regards the will, very opposite opinions are entertained relative to its activity. In the course of his remarks on sleep, Darwin repeatedly alleges that during this condition the action of the will is entirely suspended, but he falls into the singular error of confounding volition with the power of motion. Thus he says: "When by one continued posture in sleep some uneasy sensations are produced, we either gradually awake by the exertion of the volition or the muscles connected by habit with such sensations alter the position of the body; but when the sleep is uncommonly profound and these uneasy sensations great, the disease called incubus or nightmare is produced. Here the desire of moving the body is painfully exerted, but the power of moving it, or volition, is incapable of action until we are awake."

Dugald Stewart contends that during sleep the power of volition is not suspended, but that those operations of the mind and body which depend on volition cease to be exercised. In his opinion, the will loses its influence over all our powers both of mind and body in consequence of some inexplicable physical alteration in the system.

It seems, therefore, that during sleep the three great functions of the mind are differently affected. (1) Feeling, embracing sensation and emotion, is suspended in part so far as the first is concerned, but is in full action as regards the second. We do not see, hear, smell, taste, or enjoy the sense of touch in sleep, although the brain may be aroused into activity, and we may awake through the excitations conveyed to it by the special senses. The emotions have full play, unrestrained by the will, and governed only by the imagination. (2) The will or volition is entirely suspended. (3) The thought or intellect is variously affected. The imagination is active, and the memory may be exercised to a great extent, but the judgment, perception, conception, abstraction, and reason are weakened, and sometimes altogether lost.

As to the immediate causes of sleep, it was formerly almost uniformly attributed to an increase in the amount of blood in the brain, but others hold that sleep is the direct consequence of a diminished amount of blood in the cerebral blood-vessels, and that unless this diminution takes place sleep is impossible.

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series, vol. vi., 1860); Maury, *Le Sommeil et les Rêves* (Paris, 1865); Hammond, *On Wakefulness, with an Introductory Chapter on the Physiology of Sleep* (Philadelphia, 1865), and *Sleep and its Derangements* (Philadelphia, 1869); Czerny, *Untersuchung über den Schlaf* (*Prag Med. Wochensch.*, 1892, No. 4); Rosenbaum, *Warum mussen wir schlafen?* (Berlin, 1892); Weygand, *Production des Rêves* (Leipzig, 1893); Wundt, *Lectures on Human and Animal Psychology* (New York, 1894), p. 323.

Revised by J. Mark Baldwin.

Sleeper: any one of several sharks or fishes: (1) Either one of the nurse-sharks. (See Nurse-shark.) (2) In some of the West Indian islands a gobioid fish of the sub-family *Eleotridinæ*; these rarely exceed a foot in length, and are of an elongated form, with two separated dorsal fins, the first of which has six slender spines, and thoracic ventral fins, which have each a spine and five rays.

Sleep of Plants: the nocturnal condition of many plants. Many leaves assume a particular position at nightfall or when placed in a darkened room, as is notably the case with certain sorrels (*Oxalis*), clovers (*Trifolium*), sensitive plants (*Mimosa*), and other *Leguminosæ*. Many flowers close at night and open again in the morning, as of species of *Portulaca* and *Oxalis*, and the dandelion and many other *Compositæ*.

C. E. B.

Sleepy Eye: village; Brown co., Minn.; on Sleepy Eye Lake, and the Chi. and N. W. Railway; 48 miles W. of Mankato (for location, see map of Minnesota, ref. 10–D). It is in an agricultural region, and contains 6 churches, a State high school, 2 parochial schools, 6 warehouses and grain elevators, flour-mill, brewery, creamery, electric lights, a State bank with capital of $25,000, a private bank, and two weekly newspapers. The place was named in honor of Ish-a-humbak, an Indian chief who was friendly to the whites during the massacre of 1861, the name meaning "Man whose eyes have appearance of sleep." Pop. (1880) 997; (1890) 1,513; (1900) 2,046.

Editor of "Dispatch."

Sleidan, Johann, whose true name was Philippsohn: historian; b. at Sehleiden, 42 miles S. W. of Cologne, 1506; studied at Louvain and Paris and jurisprudence at Orleans; was secretary to Cardinal du Bellay, minister to Francis I., King of France (1536–41), although at Louvain he had imbibed Protestant opinions; was the representative of Francis I. at the Diet of Regensburg; led a wandering life till 1543 when he settled in Strassburg, which thenceforth was his home. He was appointed historiographer by the princes of the Smalkaldian League; represented Strassburg at the Council of Trent (1551), and on his return became Professor of Law. D. in Strassburg, Oct. 31, 1556. His fame rests upon his great history, *De statu religionis et reipublicæ Carolo Quinto Cæsare commentarii* (Strassburg, 1553–56; best ed. by Chr. C. am Ende, 3 vols., Frankfort, 1785–86), which gives a history of the Reformation from 1517 to 1556, resting on documentary evidence. It remains "the most valuable contemporary history of the Reformation, and contains the largest collection of important documents." It was translated into French (Geneva, 1557; new trans. The Hague, 1767), Italian (Florence, 1557), English (*A famouse cronicle of oure time, called Sleidanes commentaries*, etc., translated by John Daus, London, 1560; same, edited by Edmund Bohun, under title *The General History of the Reformation, etc., 1517–1556, with continuation to 1563*, 1689), and German (Frankfort, 1567, n. e. Halle, 1770–73, 4 parts). Another famous work, often reprinted, was his *De quatuor summis imperiis, Babylonico, Persico, Græco, et Romano* (Strassburg, 1556; n. e. Amsterdam, 1705; Eng. trans. *The Key of History*, London, 1627, new trans. 1695; French trans. Geneva, 1563). His *Opuscula* appeared at Hanau, 1608. See his *Life* by H. Baumgarten (Strassburg, 1878), who also edited his correspondence (*Sleidans Briefwechsel*) 1881.

Samuel Macauley Jackson.

Slemmer, Adam J.: soldier; b. in Montgomery co., Pa., in 1828. He graduated from the U. S. Military Academy July 1, 1850, and was appointed brevet second lieutenant in the artillery; first lieutenant 1854. Detailed for duty at West Point in 1855, he served as Assistant Professor of Geography and History a year, and of Mathematics 1856–59. In the latter year he was ordered to Fort Moultrie, S. C., and in 1860 was transferred to Florida, where, in 1861, he commanded the small body of U. S. troops in Pensacola harbor, occupying with them Fort Barrancas and the neighboring feeble barracks. When intelligence of the surrender of the Pensacola navy-yard to the Confederates reached him, he transferred (Jan. 10) his command to Fort Pickens, opposite, which action prevented the seizure of that important work. In May, 1862, he was attached to Gen. Buell's army, and participated in the siege of Corinth and in the subsequent movement to Louisville, Ky., and to the relief of Nashville, Tenn. He was commissioned a brigadier-general of volunteers Nov. 29, 1862, and engaged in the battle of Murfreesboro Dec. 31, where he was severely wounded and incapacitated from further active service in the field. He was promoted lieutenant-colonel Fourth Infantry Feb., 1864, and in Aug., 1865, he was mustered out of the volunteer service, and breveted colonel and brigadier-general. D. at Fort Laramie, Kansas, Oct. 7, 1868.

Sleswick: another spelling of Schleswig (*q. v.*).

Slickensides: a peculiar polished and striated surface found commonly on the wall-rocks of mineral veins or faults, and where slate, shale, coal, and other fine materials have been crumpled and folded by pressure. Not unfrequently a foreign body, such as a concretion, shell, or nut lying in an argillaceous rock of which the particles have been moved on each other with great force, shows the polished striated surface to which this name has been given.

Slidell', John: statesman; b. in New York about 1793; graduated at Columbia College 1810; settled at New Orleans, where he became a distinguished lawyer; U. S. district attorney 1829–33; member of Congress 1843–45; appointed minister to Mexico 1845, but not received by the Mexican Government; was U. S. Senator 1853–61, but withdrew in consequence of the secession of his State, which he had done much to promote. Sailing from Charleston as commissioner of the Confederate government to France, he and his associate, James M. Mason, ran the blockade and embarked at Havana on the British steamer Trent. On Nov. 8, 1861, Capt. Wilkes, of the U. S. frigate San Jacinto, stopped the Trent, seized the two commissioners, and brought them back to the U. S., where they were held prisoners at Fort Warren in Boston harbor. Bitter denunciations of the seizure appeared in the British press, and the attitude of the British Government was for the moment very threatening, but the U. S. disavowed the act of Wilkes and released the prisoners Jan. 1, 1862, thus putting an end to the difficulty. After the war Slidell settled in London, where he died July 29, 1871.

Slide-rule: an instrument for solving arithmetical problems where approximate results are sufficiently accurate. The form invented by William Oughtred (1573–1660) is best known, and the more precise one introduced by Edwin Thacher in 1885 is much used by engineers. The principle is that of logarithms, the divisions on one scale being those of the logarithms of numbers from 1 to 100, or from 1 to 1,000, while the numbers themselves are marked at the divisions of the other; by sliding one scale along the other the products and quotients of two numbers may be read off by inspection.

Mansfield Merriman.

Sli'go: county in the province of Connaught, Ireland, bordering N. on the Atlantic. Area, 721 sq. miles. The surface rises from the coast toward the E. and N. E., reaching 1,778 feet in the Ox Mountains. The western part is level, the soil mostly consisting of a light sandy or gravelly loam, interspersed with patches of bog. There are, however, districts with a deep and rich soil well adapted for tillage. Agriculture is the principal occupation, especially cattle-breeding and dairy-farming. Some coarse woolen stuffs are manufactured, and fishing is carried on. Two members are returned to the House of Commons. Pop. (1891) 98,013. Principal town, Sligo, at the mouth of the Garvogue, 137 miles by rail N. W. of Dublin, at the head of the Bay of Sligo (see map of Ireland, ref. 6–F). It has a good harbor, and exports cattle, grain, butter, etc. Sligo has a Roman Catholic cathedral and a modern town-hall. Pop. (1891) 10,110.

Slime-moulds: the *Mycetozoa* or *Myxomycetes*, a group of organisms of doubtful affinity; when referred to the animal kingdom called by the former name, when to the vegetable kingdom by the latter. They have hitherto been commonly regarded as plants, but are more probably related most closely to the rhizopods among animals. In their growing stage they consist of a naked mass of protoplasm of indefinite size and shape, and here their resemblance to the rhizopodous infusorians is evident; but in their reproductive stage they are definitely circumscribed masses of dry spores, here reminding one of some of the puff-balls

(*Gasteromyceteæ*) among the higher fungi. This latter resemblance, which is now known to be altogether superficial, caused the earlier botanists to group the slime-moulds with the higher fungi. They have been studied almost exclusively by botanists, who have written nearly all the literature relating to them, and as a consequence the treatment accorded them here is necessarily botanical rather than zoölogical.

The vegetative or growing stage of a slime-mould, known as the plasmodium (Fig. 1), varies in size from minute amœba-like masses to those as large as one's hand or larger. They may be flattish and continuous or loosely reticulated, and in consistence they vary from extreme wateriness to a considerable toughness and firmness. They are usually yellowish or reddish. Numerous nuclei are present, although not easily demonstrated.

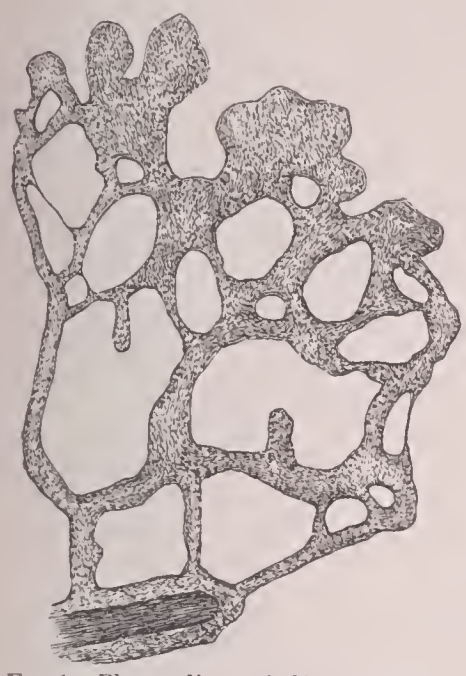

Fig. 1.—Plasmodium of *Chondrioderma difforme* (× 50).

Plasmodia are mostly saprophytic in habit, and are to be found in decaying bark and wood. They move freely with an amœboid motion, and thus come to the surface or move from place to place. Hofmeister observed the rapidity of the mass-movement of the plasmodium of *Didymium serpula* to be at the rate of about 3 mm. per minute. In this way they are able to move considerable distances during favorable (damp and quiet) weather. They are often found upon living stems and leaves, to reach which they must have moved a foot or more from the decaying matter in which they grew.

When they have reached maturity they come to the surface, and, losing water by evaporation, they divide their protoplasm into minute rounded portions, each of which secretes a wall of cellulose around itself, thus constituting a spore. At the same time the general contour of the plasmodium assumes a definite and in some cases a uniform outline which is characteristic of this stage, while its hardened boundary is known as the peridium. Internally other changes have taken place. The protoplasm usually secretes a more or less extended mass of filaments—the capillitium—which serves to give strength to the sporangium. The substance of the filaments is cellulose, or nearly allied to it, and is often incrusted or combined with lime.

Fig. 2.—*Ceratiomyxa mucida*, natural size.

The spores germinate by the bursting of their walls and the escape of the protoplasm as amœba-like bodies, each at length provided with a cilium, which grow in size and coalesce into plasmodia. At one time it was thought that this coalescing partook of the nature of conjugation in some of the green algæ (*Conjugatæ*), but this has been shown to be erroneous. It is not primitive sexuality, but the simple fusion of two or more soft masses of protoplasm.

About 400 species of proper slime-moulds have been recognized, and if some closely related forms (*Monadineæ*) are added the number will be increased by about fifty. They are classified almost entirely upon characters derived from their spore - bearing stage.

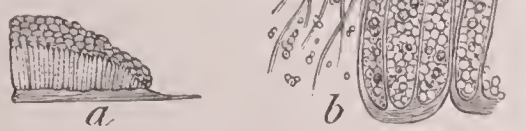

Fig. 3.—*Clathroptychium rugulosum*; natural size at *a*, enlarged at *b*.

Rostafinski in 1875 made a thorough revision of the group, and proposed an arrangement based largely upon the color of the spores. This was followed by Berlese. Zopf made many changes in the system, abandoning the color of the spores for the principal characters. Massee adopted a modification of Zopf's system. The following arrangement is based upon Schroeter's, with some changes.

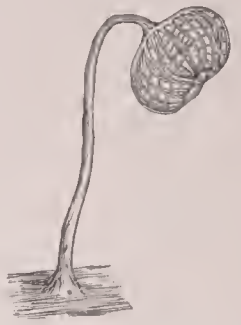

Fig. 4.—*Dictydium cernuum*, empty sporangium enlarged fifty times.

Class Myxomyceteæ. Plasmodium terrestrial and saprophytic, its surface eventually forming a membrane (peridium), its interior developing (1) spores, and mostly (2) a filamentous framework (capillitium). Spore-bearing stage ("fruit") either (1) of irregular shape, plasmodium-like (a plasmodiocarp), or (2) sporangia of uniform and regular shape, which may be (*a*) single (an orthosporangium) or (*b*) coalesced into a compound body (an æthalium). From a millimeter to many centimeters in extent.

Order Ceratiales (Ectosporeæ). Spores external.

Family *Ceratiomyxaceæ*. Spores borne singly on pedicels. The genus *Ceratiomyxa* of Schroeter (*Ceratium* of other authors) is the sole representative of this family (Fig. 2).

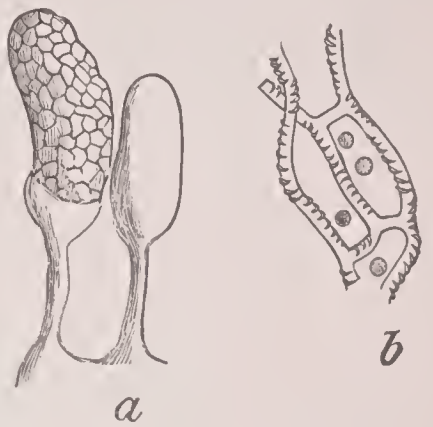

Fig. 5.—*Arcyria punicea*, at *a* enlarged twenty times; *b*, threads of capillitium, enlarged 175 times.

Order Cribrariales (Endosporeæ). Spores internal, no capillitium.

Family *Liceaceæ*. Peridium uniformly thickened (no network), when ripe irregularly torn. "Fruit" a plasmodiocarp, sporangium, or æthalium. The four genera *Licea*, *Protodermium*, *Tubulina*, and *Lindbladia* are represented by species of mostly small organisms.

Family *Clathroptychiaceæ*. Peridium with internal thickenings, the thin parts breaking away when ripe, forming irregular projections. "Fruit" consisting of numerous sessile, globose, or cylindrical sporangia coalesced into an æthalium.

Fig. 6.—Plasmodiocarp of *Hemiarcyria serpula*, enlarged six times.

Two genera—*Enteridium* and *Clathroptychium* (Fig. 3)—represent this family.

Family *Cribrariaceæ*. Peridium with internal thickenings, the thin parts breaking away when ripe, forming a network. Orthosporangia stipitate.

The two genera are *Dictydium* (Fig. 4) and *Cribraria*.

Order Trichiales (Endotricheæ). Spores internal, capillitium present, peridium or capillitium sometimes with incrustations of lime.

Family *Trichiaceæ*. Without lime (except in *Perichæna*), capillitium of tubes, free or combined into a network, the tubes mostly with rough prickly, plicate, or spirally thickened walls; no columella. "Fruit" an orthosporangium, rarely an æthalium or a plasmodiocarp.

Arcyria (Fig. 5), *Lycogola*, *Trichia*, and *Hemiarcyria* (Fig. 6) are the most common genera in the U. S.

Family *Reticulariaceæ*. Without lime, capillitium of solid filaments combined into an intricate network; columella present. Sporangia naked, many coalesced into an æthalium.

Fig. 7.—*Comatricha typhina*, enlarged five times.

The three genera are *Reticularia*, *Amaurochæte*, and *Siphoptychium*.

Family *Stemonitaceæ*. Without lime, capillitium a net of solid filaments springing from the columella. Sporangia simple.

The commonest genera are *Lamproderma*, *Comatricha* (Fig. 7), and *Stemonitis*.

Family *Spumariaceæ*. With lime in the peridium or columella (not in capillitium); capillitium a net of much-

branched threads extending from the columella to the peridium. Sporangia single or coalesced into an æthalium.

Diachea and *Spumaria* (Fig. 8) are the genera.

Fig. 8.—*Spumaria alba*, natural size.

Family *Didymiaceæ*. With lime (mostly in crystals in the outer wall of the peridium); capillitium of delicate tubes or filaments, without lime, extending from the columella or base of the sporangium to the peridium. Columella none or short, hemispherical, or orbicular. "Fruit" an orthosporangium or a plasmodiocarp.

The more important genera are *Didymium* and *Chondrioderma* (Fig. 9).

Family *Physaraceæ*. With lime in granules; capillitium a net of hyaline, thin-walled, broad tubes, usually filled with lime; columella usually wanting. "Fruit" mostly an orthosporangium, less commonly a plasmodiocarp or an æthalium.

The common genera of this large family are *Tilmadoche*, *Leocarpus*, *Physarum* (Fig. 10), *Badhamia*, and *Fuligo* (Fig. 11).

Allied to the slime-moulds proper are two other groups, the *Acrasieæ* and *Phytomyxineæ* —classes they may conveniently be called— which are to be regarded as simpler and lower than the foregoing. They may be noted as follows:

Class Acrasieæ. With no true plasmodium, the amœboid swarm-spores not fusing; saprophytic; in fruit consisting of rounded heaps of free spores.

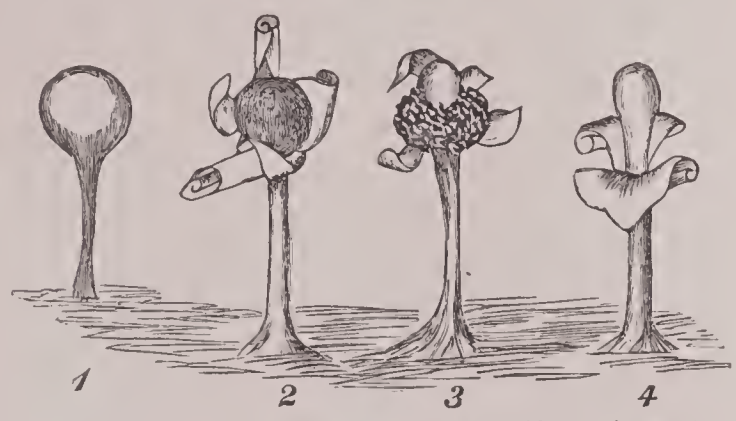

Fig. 9.—*Chondrioderma floriforme*, enlarged fifteen times: 1, unopened; 2, 3, ruptured, showing spores; 4, showing columella.

Several genera of these low organisms, falling into two groups, are known. They occur upon manure and other decaying matter.

Fig. 10.—*Physarum sinuosum*, natural size.

Class Phytomyxinæ. With a true plasmodium, parasitic in the cells of higher plants, in fruit dividing into a mass of spores. The organisms here brought together are but obscurely known. *Plasmodiophora brassicæ* (Fig. 12) occurs in the roots of cabbage, causing club-root. *Phytomyxa leguminosarum* causes the root-tubercles of clover and many other leguminous plants.

Zopf has added many other organisms to the slime-moulds, such as *Vampyrella*, *Bursulla*, *Colpodella*, *Protomonas*, *Protomyxa*, etc., whose animal nature has never been seriously doubted and whose affinities to the higher slime-moulds are evident.

Fig. 11.—*Fuligo septica*, reduced one-half.

As to their place in nature, the writer must agree with de Bary in placing them "outside the limits of the vegetable kingdom." If plants, they are so unlike all others that they must be regarded as belonging to a different genetic line. To set them off in a group by themselves would be merely an evasion of the question. Divesting one's self of prejudice and rightly estimating the value of their resemblance to and their differences from plants, one is compelled to admit that their resemblances to any plants are merely superficial (e. g. to some puff-balls), while their differences are profound. On the

Fig. 12.—*Plasmodiophora brassicæ*: I, cabbage-root, swollen, natural size; II, cells of affected cabbage, × 50; III, spores, × 620; IV, spores germinating; V, amœboid masses.

other hand, in their structure, both in the vegetative and reproductive stages, they exhibit such striking similarity to the lower protozoans that one can not avoid the conclusion that their real relationship is with these lower animals rather than with plants. Among investigators who have placed the slime-moulds outside the vegetable kingdom are the following: de Bary (1858), Haeckel (1866), Allman (1879), Kent (1880), Zopf (1887), Rolleston and Jackson (1887), Bennett and Murray (1889), Lister (1890). On the other hand, those who have devoted themselves to a study of these organisms, systematically or descriptively, generally regard them as plants—e. g. Rostafinski (1875) probably, Cook (1877), Berlese (1888), Schroeter (1889), McBride (1892), Massee (1892).

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Sling: a simple contrivance for hurling missiles, consisting of a small disk of leather pierced by a hole and suspended by one, two, or three strings, say a yard long. A stone or other missile was placed upon the leathern disk, and then whirled rapidly about for a time, when one of the strings was dropped from the hand at the proper instant, and the missile sent with great force through the air. The Greek light-armed troops in the Persian wars and afterward used the sling, often with a plummet of lead. These bullets are well known to antiquaries. They frequently bear the word ΔΕΞΑΙ, "Take this," or some similar word. The Persians, Achæans, Acarnanians, and especially the Balearic islanders, were famous slingers. The sling was also used by several half-savage peoples, as the Tahitians.

Slivinski, Joseph: See the Appendix.

Sliv'no, or **Selim'nia** (Bulg. *Sliven*): town in Bulgaria (see map of Turkey, ref. 3-D); commanding on the S. the important pass in the Balkans called the Iron Gate; carries on an active trade in wool and arms. Pop. (1893) 23,210.

Sloane, Sir Hans: physician and naturalist; b. at Killyleagh, County Down, Ireland, Apr. 16, 1660. He went to Jamaica in 1687 as physician to the Duke of Albemarle, and after his return published a work on the natural history of the island (2 vols. folio, 1707–25). Subsequently he was appointed physician-general of the British army 1719, and physician to the king 1727. He was a prominent member of the Royal Society, succeeding Sir Isaac Newton as president in 1727; most of his numerous scientific publications are embodied in the *Philosophical Transactions* of that society. He was an indefatigable collector of objects of natural history, antiquities, coins, etc., and books, and being wealthy, he was able to amass a large and very valuable museum. D. in London, Jan. 11, 1752. In accordance with the terms of his will, his museum and library were sold to the Government for £20,000—a price which was no more than equal, it was said, to the intrinsic value of the coins alone. This collection became the basis of the British Museum. H. H. S.

Sloat, John Drake: naval officer; b. in New York in 1780; entered the U. S. navy as a midshipman 1800; was engaged in the action between the United States and the Macedonian Oct. 25, 1812; served in the expedition against West Indian pirates 1824–25; was commander of the Pacific squadron 1844–46; was next placed in charge of the Norfolk navy-yard; superintended the construction of the Stevens battery at Hoboken; became commodore (retired list) July 16, 1862, and rear-admiral in July, 1866. D. at New Brighton, Staten Island, N. Y., Nov. 28, 1867.

Slocum, Henry Warner: soldier; b. at Pompey, Onondaga co., N. Y., Sept. 24, 1827; graduated at the U. S. Military Academy July 1, 1852; appointed second lieutenant of artillery; first lieutenant 1855. After a brief campaign in Florida against the Seminoles, he served in garrison at Fort Moultrie, South Carolina, until Oct. 31, 1856, when he resigned from the army to practice law at Syracuse, N. Y.; was a member of the New York State Legislature in 1859. On May 21, 1861, he was appointed colonel of the Twenty-seventh New York Volunteers, which regiment he led in the battle of Bull Run July 21. Early in August he was commissioned brigadier-general of volunteers; in September was assigned to command of a brigade in Franklin's division of the Army of the Potomac, and in the Virginia Peninsular campaign of 1862 was engaged in the siege of Yorktown and action of West Point, succeeding to command of the division May 15, on Franklin's assignment to the Sixth Corps. At the battle of Gaines's Mill, June 27, his command was sent to Porter's relief at a critical period, and rendered important service; at the battle of Glendale, June 30, it held the right of the main line, as at Malvern Hill July 1. He was made a major-general of volunteers July 4, and engaged in the second battle of Bull Run, at South Mountain, and at Antietam. In October he was assigned to the command of the Twelfth Corps, which he led at the battle of Chancellorsville and at Gettysburg, where he commanded the right wing of the army. Transferred, he served in the department of the Cumberland until Apr., 1864, when, his corps being consolidated with the Eleventh, he was assigned to the command of a division and of the district of Vicksburg. In Aug., 1864, he succeeded Gen. Hooker in command of the Twentieth Corps, which was the first to occupy Atlanta, Ga., Sept. 2. In Sherman's march to the sea he commanded the left grand division of that army. In Sept., 1865, he resigned, and resumed the practice of his profession in Brooklyn, N. Y., declining in 1866 the appointment of colonel of infantry in the regular army. He was elected to the Forty-first, Forty-second, and Forty-eighth Congresses; president of board of public works, Brooklyn, N. Y., 1876–78. D. in Brooklyn, N. Y., April 14, 1894.

Slocum, William Frederick: See the Appendix.

Sloe: the fruit of the blackthorn (*Prunus spinosa*), a small thorny plum-tree of Europe, sparingly naturalized in the eastern parts of the U. S. The black austere fruit is used for preserves, for making a factitious port wine, and for dying black. The unripe fruit yields German acacia, a substitute for gum-arabic, and the wood is made into walking-sticks. Some botanists regard the sloe as the original form of the cultivated plum. There is a double-flowered form in cultivation. Revised by L. H. Bailey.

Sloth [M. Eng. *slouthe* < O. Eng. *slwæð*, deriv. of *slāw*, slow]: any one of several species of the family *Bradypodidæ*, notable for sluggishness. The form somewhat recalls that of the *Primates* (man and monkeys) in the freedom of the members from the common abdominal integument, the length of the limbs, and especially of the fore ones, and the atrophy of the tail. The skull is oblong and compressed, with the rostral portion much abbreviated; the intermaxillary bones much reduced; malar bones disconnected from the zygomatic processes of the squamosal bones, and each with a supratemporal process; the lower jaw has a gutter-like symphysis; molar teeth $\frac{5}{4}$, simple and rounded: pelvis moderate; posterior limbs shorter than the anterior; toes in reduced numbers, two or three (fully developed) in front and three behind. The species differ considerably in other characters. All are confined to South and Central America. Numerous peculiar characters in addition to those

The sloth.

mentioned are exhibited by the skeleton, one of the most remarkable features being the number of cervical vertebræ. Almost without other exceptions (the manatees form one) mammals have seven cervical vertebræ; but in the sloths some (the *Bradypodinæ*) have as many as nine, while one (*Cholopus hoffmannii*) has only six, although its near relations (e. g. *Cholopus didactylus*) have seven. The species are ill adapted for progression on the ground, the feet being bent inward, but are admirably fitted for life in trees. Unlike all other mammals, they cling to the branches by their feet with the back downward, and thus they progress, feed, and sleep. They rarely or never voluntarily descend to the ground, but when one tree is denuded of its leaves proceed from it to a contiguous one by means of interlocking or neighboring boughs. *Bradypus* and *Arctopithecus* belong to the sub-family *Bradypodinæ*, and *Cholopus* to the sub-family *Cholopodinæ*. Revised by F. A. Lucas.

Slovak' Language: See Slavic Languages.

Slovak Literature [*Slovak* is from Slov. *Slowak*; cf. Slavonia]: the body of literary productions in the language or dialect of the Slovaks, who, with the Moravians, belong to the Czech branch of the Slavic family. The Slovaks dwell in the mountainous northwest corner of Hungary, but extend beyond the Hungarian boundary into Moravia; besides, there are oases of Slovaks all through Hungary, hemmed in and intellectually as well as politically oppressed by the Magyars. According to the census of 1880, their number was 1,855,400, more than two-thirds professing the Roman Catholic faith, the rest belonging to the Augsburg Confession.

The Slovak dialect, which according to the consensus of the most eminent Slavists exhibits an earlier form of Czech, just as Slovene is older than Servian-Croat, produced some weak specimens of literature in the Middle Ages; but the Reformation, introduced from Bohemia in the sixteenth century, interrupted a national literary development, and established Czech (in the narrow sense) as the literary language among the Slovaks. For nearly 300 years their own dialect was almost extinct; a considerable number of Slovak authors arose in the eighteenth century, but all of them employed the Czech language, as Matthew Bel (1684–1749), especially famous as historian of Hungary; Daniel Krman (d. 1740); Stephen Leška (d. 1818), editor of the first Slovak newspaper; Georg Palkovič, and others.

At the end of the eighteenth century Catholic writers originated a literature of their own in the revived Slovak dialect, as distinctly separated from the Czech language. (See Czech Literature.) Anton Bernolak especially was instrumental in the separation; he endeavored to settle definitely the Slovak language by his grammar, *Grammatica Slavica* (Pressburg, 1790; Germ. transl., Buda, 1817), and his *Lexicon Slavicum Bohemico-Latino-Germanico-Hungaricum* (6 parts, Buda, 1825–27).

The attempt to revive the old Slovak literary language

was strongly opposed by the Magyars and the Czechs alike, but Slovak literature nevertheless developed. Poets of repute were active: Holly wrote an epic on Svatopluk in twelve books in classical style and meter and a Cyrillo-Methodiad in six books. He died in 1849, just at the great outbreak of the Hungarian revolution against the house of Hapsburg. Ljudevit Štur (b. 1815; d. 1856), studied in Pressburg and Halle, wrote some German pamphlets against the Magyars as the oppressors of the Slovak people, and edited in 1845–48 the Slovak newspaper *Slovenské Novini* with the literary supplement *Orol Tatranski*. The revolution drove him from Hungary, and he fled to Vienna, where he became one of the fiercest agitators against the Magyars, while his great countryman Kossuth, entirely Magyarized, led the Hungarian revolution against Austria. By his paper and personal influence Štur raised Slovak to the standard of the literary language of his people. He also wrote in Czech a critical work on the character of Slavic popular poetry (Prague, 1853), and left a manuscript in German *Das Slaventhum und die Welt der Zukunft*, the first great Slavophil work, translated by W. Lamanskij into Russian (Moscow, 1867).

A number of other poets have gained a good reputation in Slovak literature, which seems firmly established, even if the process of Magyarization should succeed in obliterating the nationality of the people.

The most important and influential modern educator, grammarian, and framer of the Slovak language is Martin Hattala, born in 1821, at Trstená, Hungary. Originally a Catholic priest, he wrote a *Grammatica linguæ Slovenicæ* (Schemnitz, 1840), which secured for him a call as Professor of Slavic Languages to Prague. His principal merit is the elaboration of the Slovak language in phonetics, form, syntax: *Phonology of the Old and New Czech and Slovak Languages* (Prague, 1854); *Comparative Grammar of the Czech and Slovak Languages* (Prague, 1857); *Antibarbarus of the Czech Language* (Brus jazyka českého, Prague, 1877); text-books for Slovak schools, etc. His polemical writings against Schleicher, and his defense of the genuineness of the Königinhof Manuscript (*Rukopis Kralodvorský*) are noteworthy. Besides him three men eminently contributed to the definite settlement of Slovak language and literature: J. Vietorin, by his *Grammatik der slovakischen Sprache* (4th ed. by Loos, Budapest, 1876); J. Loos, by his *Wörterbuch der slovakischen, ungarischen und deutschen Sprache* (Budapest, 1871); and Šembera, by his excellent treatment of Czech-Slovak dialectology (*Základové dialektologie česko-slovenske*, Vienna, 1864).

The chief collections of Slovak popular poems are by Šafařik (2 vols., Pest, 1823–27); Kollar (2 vols., Buda, 1834–35; *Narodnie Zpievanky*); and by the Slovak Matica (suppressed by the Magyars) *Sborník Slovenských národních piesní* (Collection of Slovak National Songs, 2 vols., 1870–74).

HERMANN SCHOENFELD.

Slove'nian Language: See SLAVIC LANGUAGES.

Slovenian Literature: the literature produced by that branch of the Slavic family which inhabits the southern portion of Carinthia and Styria, all Carniola (except the great German speech-island around Gottschee), Görz and Gradiska, a small part of Istria, the region around Radkersburg in Hungary and around Cividale in Italy—total population (1895), about 1,300,000.

This literature is most closely related to that of the Servo-Croats. It is written in a language the oldest form of which is held by some of the greatest and most authoritative scholars—Kopitar, Miklosich, Daničić and Jagić—to be the mother language of Palæo-Slavonic, as preserved to us. Great zeal has been exhibited in fixing the grammatical structure of the language. This labor has been performed by scholars like Kopitar, Metelko, Murko, Janečić, Lewstik, and, best of all, Šuman (*Slovenska slovnica*, Klagenfurth, 1884).

The only literary monument of Old Slovenian is the liturgical manuscript of Freising (Bavaria). It is in Latin script, and belongs to the tenth century (ed. by Kopitar in *Glagolita Klozianus*, Vienna, 1836). Then, until the middle of the sixteenth century, there was nothing that can be classed as literature. With the Reformation literary interest revived. The Carinthian reformer Primus Truber (1508–86) and his associates translated the New Testament into Slovenian in 1557. The first complete edition of the Bible on the Protestant side appeared first in 1584 in Tübingen. Other spiritual and church books, too, were composed by Truber, but he was driven into exile, and the incipient reformatory movement suppressed by the counter-reformation. Literary activity again practically ceased until the end of the eighteenth century. Only meager grammatical and bibliographical work was produced. The first Slovenian grammar appeared in 1584, the first dictionary in 1592.

Toward the end of the eighteenth century, however, self-consciousness began to awaken among the Slovenes, as well as in the entire South Slavonic world, stimulated especially by the longing for liberty and by the Roman Catholic Church. On the Catholic side a complete Bible translation, pre-eminently by Japel and Kumerdey, was issued 1791–1802. Secular literature, too, began to flourish; Valentin Vodnik (1758–1819) was its founder. When Carinthia was incorporated into the Illyrian provinces by Napoleon and belonged to France (1810–14), he published his *Ilirja oživlena* (Illyria revived), which cost him his position as inspector of schools when Austria regained her provinces. He also wrote valuable poems (*Pesni*, 3d ed. Laibach, 1869), and edited the first Slovenian newspaper (1797–1800). The greatest modern Slovenian poet, however, is Francis Preširn (1800–49); his poems are mostly lyrics (complete edition, *Pesmi Franceta Preširna*, Laibach, 1866; German trans. by Samhaber, *Preširenklänge*, Laibach, 1880).

Since the middle of the nineteenth century national life has steadily developed, and the political revival has been accompanied by an increase of literary productions of a varied character. Levstik, Valjaveč, and Stritter are very good national poets. The Matica Slovenska (Slovenian Literary Society) is the center of the literary movement. The periodical *Ljubljanski Zvon* (The Laibach Bell) is the great organ in which the national productions mostly appear.

The principal collections of Slovene folk-song are *Slovenske pesmi krajnskago naroda* (5 vols., Laibach, 1839–44); *Narodne pešni ilirske* (Styria, Carinthia, West Hungary), by Stanko Vrac (Agram, 1839); *Volkslieder aus Krain*, trans. by A. Grün (Count Auersperg), Leipzig, 1850; *Cvetje slovenskega naroda*, by A. Janečić (Klagenfurth, 1852). See Child, *Ballads*.

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Slows: See MILK-SICKNESS.

Sloyd: See MANUAL TRAINING.

Slug [from M. Eng. *slugge*, slothful; cf. Eng. *slack*, *slouch*, and *sluggard*]: any one of various naked terrestrial molluses, mostly members of the family *Limacidæ* (see PULMONATA). The name is sometimes applied to other molluses, and occasionally, but wrongly, to certain insects which occur as pests in gardens and greenhouses.

The red slug.

Slug-worms, popularly but incorrectly called **Slugs**: the larvæ of certain of the saw-flies (*Tenthredinidæ*), belonging to the *Hymenoptera*. They are slug-like in form. In the U. S. the pear, rose, vine, raspberry, walnut, linden, and other trees are infested with the larvæ of species of *Selandria*, which are often very destructive. Decoctions of tobacco or quassia, whale-oil soap, a weak solution of carbolic acid, and petroleum are among the substances recommended for showering shrubs and trees infested with slug-worms. For small trees and shrubs hand-picking is generally sufficient.

Smalcald: See SCHMALKALDEN.

Small, ALBION W.: See the Appendix.

Small, JOHN: soldier; b. at Strathardle, Scotland, in 1726; served in the Scotch brigade, in the Dutch service, in the pursuit of the Jacobites of Scotland 1747, at Ticonderoga 1758, at Montreal 1760, and in the West Indies 1762; was in the battle of Bunker Hill; raised a corps of Highlanders in Nova Scotia, the Eighty-fourth Battalion, known as the "Royal Emigrants," which he commanded as major in the campaigns of New Jersey and Pennsylvania; became lieutenant-colonel 1780, lieutenant-governor of Guernsey 1793, and major-general 1794. D. at Guernsey, Mar. 17, 1796.

Small-arms: the projectile arms which since the invention of gunpowder have replaced the bow and arrow and cross-bow. The original firearms, bombards, were not portable, and it was not until the early part of the fifteenth century that lighter pieces came into use; even these, at first, required for their transportation and service several men, and were fired in the field from a tripod and from the fortress walls on a rest. Of such guns the Duke of Orleans was reported to possess 4,000 in 1411; three years later they were employed at the siege of Arras, and in 1471 a number were introduced into England by some Flemings that accompanied Edward IV. on his return from Flanders in that year. These hand-cannon, as they were called, could be carried by two men, had a straight stock of wood about 3 feet long, and were fired by a match applied on top of the breech.

The first improvement was the removal of the vent to one side and the addition of a pan to hold the priming; a sight on the breech was also added. The trigger of the cross-bow suggested to the English a similar arrangement for bringing the lighted match to the priming; the gun, after this modification, was called a matchlock.

In Italy and Spain successive improvements received the names of hacquebutte, arquebuse, and mousquet; the stock was made curved, permitting aim to be taken from the shoulder instead of firing from the chest as formerly, and the weight was reduced to about 15 lb. The former tripod had now been replaced by a forked rest which the soldier carried as a cane. Grose, in his *Military Antiquities*, describing the English musketeer, says: "He had besides the unwieldy weapon itself his coarse powder for loading, in a flask; his fine powder for priming, in a touch-box; his bullets in a leathern bag, with strings to draw to get at them; whilst in his hand were his musket-rest and his burning match, and when he had discharged his piece he had to draw his sword in order to defend himself." In the Spanish army the mousqueteers wore a broad belt across the breast to which wood cases containing the proper charge of powder were attached; also a ball-pouch and a priming-flask. Six yards of slow-match for firing was wound about the stock. At the battle of Pavia the Spanish had a force of 2,000 arquebusiers and 800 mousqueteers, whose fire proved decisive in determining the issue of the battle, the balls readily penetrating the best armor of the knights.

Fig. 1.—Mousqueteer of 1525.

In the wheel-lock, snaphance, firelock, and finally the flintlock, names each marking an advance in design or construction, the match was replaced by some arrangement of flint and steel; the last-named piece was adopted by France in 1671, an example followed by all other nations within twenty years. In the flintlock the weight was brought down nearly to that of the modern rifle; in other respects too it marked the top wave of progress, and without material improvement remained during 150 years the arm of the infantry soldier, until early in the nineteenth century the invention of the percussion-cap, made of practical value about 1820, led to the gradual substitution in the next two decades of the percussion-musket.

Up to this date military small-arms were smooth-bores, and fired spherical balls between one-half and nearly three-fourths of an inch in diameter, and while the rifling principle had been known and used for many years, it was not introduced for soldiers until early in the nineteenth century; to these rifles was then applied the percussion-cap. The breech-loading principle was also made a partial success for military arms at the same time, and some few soldiers were armed with them. In Prussia, where the needle-gun had been adopted, the issue began in 1841. Used with great success in the war with Austria in 1866, its merits were generally acknowledged, and in a few years different breech-loaders replaced in every country the muzzle-loading rifle, the change being induced not merely by the qualities of the arms themselves, but in consequence of the introduction of the metallic cartridge, which, combining the cap, powder, and bullet in one receptacle, also served as a gas-check and prevented leakage at the breech, the main defect at first of the new guns.

Fig. 2.—Hall's breech-loading musket, patented 1811.

In the U. S. the first successful breech-loader was invented by Hall in 1811. Two years later he proposed its manufacture on the principle, which had previously failed in France, of interchangeable parts, and in 1817, a board of officers reporting favorably, he was employed to superintend at the U. S. arsenal, Harper's Ferry, the establishment of the necessary machinery and the manufacture of the gun. The system of interchangeable parts has since prevailed in the U. S. and has been adopted in Europe, but the arm itself met with only a qualified success. Part of the cavalry was armed with the carbines, but upon the death of the inventor in 1844 their manufacture was discontinued.

In 1854 Congress made an appropriation for breech-loading rifles, and a board of officers recommended those of Sharps and Symmes for trial. Three years later another board reported in favor of the Burnside rifle, an opinion confirmed by a third board in the following year, but without recommending the adoption of the arm for service.

The civil war caused a suspension of experiments, all the energies of the ordnance department being then given to the production in sufficient quantities of the arms then in use. From Government and private factories and from abroad nearly 4,000,000 small-arms were obtained, including nineteen varieties of breech-loading carbines and eight of rifles, those of Burnside, Sharps, Maynard, and Henry (the latter a magazine-arm) being the best known.

Fig. 3.—Springfield.

Fig. 4.—Remington locking rifle, model 1871.

Fig. 5.—Russian Berdan.

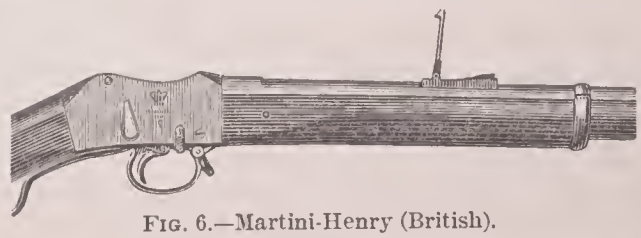

Fig. 6.—Martini-Henry (British).

Fig. 7.—Mauser (German).

After the war, boards of officers were convened in 1866,

1869, and 1872; they mentioned favorably the Peabody, Remington, Sharps, and Springfield, and finally recommended the adoption of the latter arm.

The same decade witnessed the adoption abroad of arms that remained for nearly twenty years in the hands of troops, and which, while differing in many particulars, can be placed in two general classes dependent upon the method of breech-closure—viz., by a hinged block and by a sliding bolt. Of the first class the Remington, the Springfield of the U. S., and the Martini-Henry of Great Britain, and of the second class the Mauser of Germany and Berdan of Russia, are the best known. As these, with those of other countries, marked the highest development of the single-loading rifled breech-loader, their principal features are given in the accompanying table.

TABLE I.—SMALL-ARMS OF DIFFERENT NATIONS, 1874.

NATION.	Name of gun.	When adopted.	Caliber, inch.	WEIGHT OF—				Initial velocity, foot-second.
				Gun, pounds.	Bullet, grains.	Powder, grains.	100 cartridges, pounds.	
Austria	Werndl	1874	0·421	9·88	386	77	7·83	1,410
Belgium	Albini	1867	0·433	9·85	386	77	9·05	1,367
Denmark	Remington	1870	0·450	9·08	386	60	8·75	1,300
France	Gras	1874	0·433	9·25	386	81	9·52	1,465
Germany	Mauser	1871	0·433	9·76	386	77	9·25	1,410
Great Britain	Martini-Henry	1871	0·450	8·75	480	85	11·07	1,362
Holland	Beaumont	1871	0·433	9·59	336	66	8·57	1,328
Italy	Vetterli	1870	0·410	9·04	316	61	7·50	1,445
Russia	Berdan.	1871	0·421	9·23	370	78	8·62	1,400
Sweden	Remington	1867	0·473	9·35	370	66	7·68	1,312
Switzerland	Vetterli	1874	0·410	10·34	316	56	6·75	1,425
Turkey	Peabody	1874	0·450	8·50	480	85	11·07	1,360
United States	Springfield	1873	0·450	8·68	405	70	8·75	1,350

Since 1885 there has been a great improvement in small-arms, the most important being the substitution of magazine-arms for the single-loaders (see MAGAZINE-GUNS), the decrease in the caliber of the barrel, and the adoption of smokeless powder in place of the powder formerly used.

As magazine systems were gradually developed the necessity of meeting the increased expenditure of ammunition with an augmented supply of cartridges became evident, but as the soldier's load was already at the limit considered practicable, this could only be accomplished by diminishing the weight of a single round, and that only by decreasing the diameter of the bullet and consequently of the bore of the rifle. This has resulted in the adoption in different countries of calibers between 0·315 and 0·256 inch, a decrease that probably has not yet reached its limit.

When gunpowder was used in these small bores, the fouling soon became excessive, unduly impairing the accuracy of fire. To overcome this trials were made which have led to the introduction of the so-called SMOKELESS POWDERS (*q. v.*). Many of these powders have been successfully developed and are in general use; their range of chamber-pressure varies from 14 or 15 tons per square inch, as with the powders used in the French Berthier and the Schmidt, to 20 tons in the Belgian Mauser and 21 tons in the German infantry rifle. This necessitates a strength and stiffness in the breech-mechanism of the new rifles that the old arms did not require, and also a corresponding increase of strength in the barrel. The modern barrels are therefore generally made of a superior grade of steel and of a little greater thickness of metal. Being of less interior diameter and also somewhat shorter, their weight, as compared with the old, has been diminished. With the augmented pressure also comes a great gain in the initial velocity, necessitating, in order to secure steadiness of flight for the bullet, a more rapid twist to the rifling, which now makes in all the new guns one turn in about 8 or 10 inches, instead of 18 to 24 inches as formerly. The majority of the barrels are rifled with four grooves (though some have only three and others six or seven), of a depth varying in the different countries from 0·003 to 0·006 inch, and more frequently of a width two or three times that of the lands.

As leaden bullets fired with high velocities through such barrels will not follow the rifling, but will strip and override the lands, it became necessary that the surface of the projectile be made of some harder metal; but to retain the high specific gravity of the lead, with the consequent ability of the ball better to overcome the resistance of the air, the greater portion of the bullet is made of a lead slug and then coated or jacketed with a covering, about 0·02 inch thick, of some harder metal, as steel, copper, nickel, or German silver. These bullets have a length of about four calibers, are without the cannelures or lubricant of the lead ball, and weigh on the average about 220 grains.

The weights of the smokeless powder-charges vary with the particular powder, averaging about 30 to 40 grains.

The penetration of the bullet at all distances has been increased by the alteration in its shape, by its harder surface, and also, except at the extreme ranges where the air-resistance has overcome much of the velocity, by its more rapid initial movement. At the shorter ranges, 200 to 300 yards, protection is now obtained by about 0·2 inch of steel plate and about 0·3 inch of wrought iron. The penetration into earth at these distances is about 25 inches, into pine about 30 inches. As they have not been used to any extent in warfare their effect upon the living human body is yet to be fully determined; probably if striking no bone the bullets will inflict wounds on three or four men in file, but wounds less serious than those from the heavier lead ball.

With the greater number of the modern guns and powders the velocities are about 2,000 feet per second, running up for the smaller calibers, as the new guns of Italy, Holland, Roumania, and Norway, to about 2,300 feet per second. This gives a dangerous space in front of the muzzle of fully 600 yards, a maximum even exceeded by the extremely reduced calibers just mentioned, and a flatness of trajectory at all ranges compensating for errors when estimating the distance of the objective that would produce a miss with the old weapons.

The recoil is less than half that of the old single-loader.

The sights on all modern military arms are designed primarily for use in battle, rather than on the target-range; they are strong and simple in construction, with an open leaf that allows an unobstructed view when aiming, and generally without any arrangement giving drift or windage correction. The lowest adjustment is 300 meters (or yards), the leaf for that range being turned down on the base. Above that, on the leaf, the graduations are placed only for 100-meter (or yards) intervals, and with many of the sights it is impossible to obtain any closer adjustments than given by these limits, the slide engaging in notches that occur only at the graduation-marks. These latter generally extend up to 1,800 or 2,200 yards.

For the familiar triangular bayonet all nations except Russia have substituted knives with blades from 9 to 12 inches long and about an inch wide. The guards are short and usually straight, the handles of wood and steel, and about 4 inches long. The weights of the complete bayonets are from 8 to 15 oz.

The heat produced by discharge is much in excess of that formerly evolved; the barrels can not be freely handled after ten or twenty shots have been quickly delivered. To overcome this difficulty, the Germans have enveloped the barrel in a metallic case, and the Swiss have covered it with wood until it appears entirely surrounded by the forestock, but most of the other countries have limited the wooden hand-guard to the space back of the rear sight or else extending it only as far forward as the lower band. The latter provision is probably the best, affording all the protection required when firing or when carrying the piece afterward.

The breech-block of the single-loader has been replaced by a bolt having a sliding and generally also a turning movement. When closed it sustains the shock of discharge; moving it extracts the empty cartridge-case and recocks the piece for firing. In all countries these arms are also magazine-guns, that for the U. S., Fig. 8, having been chosen in

FIG. 8.—U. S. magazine rifle, model 1892.

the autumn of 1892. This arm was selected only after an examination lasting nearly two years, careful consideration being given not only to the rifles used by the troops of Austria, Belgium, Denmark, Great Britain, France, Germany, Japan, Portugal, Roumania, Russia, and Switzerland, but also to those presented by the leading gun-inventors of the U. S. and Europe. The rifle finally chosen was the invention of Capt. O. Krag, director of the royal small-arms factory at Kongsberg, Norway, and E. Jörgensen, an armorer there employed.

The accompanying table gives the rifles and their ammunition forming (1895) the infantry armament of various countries.

TABLE II.—SMALL-ARMS OF DIFFERENT NATIONS, 1895.

NATION.	Name of gun.	Type.	Magazine.	Cartridges in magazine.	BARREL.		GROOVES.				WEIGHT.				Kind of powder.	Initial velocity.
					Length, inches.	Caliber, inch.	Number.	Depth, inch.	Width in terms of lands.	Twist, inches.	Gun, pounds.	Bullet, grains.	Powder, grains.	100 cartridges as carried, pounds.		
Argentiua ...	Mauser, 1891.....	Repeater.	Ceutral..	5	29·1	0·301	4	0·003	2¾	9·84	8·8	211	41	6·30	Smokeless....	2,120
Austria.....	Mannlicher, 1888.....	"	"	5	30·1	0·315	4	0·008	1¼	9·84	10·1	235	40	7·16	Schwab-Rubiu	2,060
Belgium	Mauser, 1889.....	"	"	5	30·7	0·301	4	0·005	2¼	9·84	8·8	216	43	6·41	Wetteren.....	2,170
Bulgaria.....	Mannlicher, 1888.....	"	"	5	30·1	0·315	4	0·008	1¼	9·84	10·1	235	40	7·16	Smokeless....	2,060
Chili.....	" "	"	"	5	30·1	0·315	4	0·008	1¼	9·84	10·1	235	40	7·16	"	2,060
Denmark	Krag-Jörgensen, 1889	Cut-off...	"	5	32·9	0·315	6	0·006	2	11·81	9·5	235	76	7·00	Black.....	1,770
France.....	Lebel, 1886.....	"	Tubular..	8	31·5	0·315	4	0·006	2	9·49	9·3	231	46	6·15	Poudre B	2,050
"	Berthier, 1891.....	Repeater.	Central..	4	.....	0·301	4	0·006	2	9·45	8·5	205	33	6·30	Smokeless....	2,130
Germany	Model, 1888.....	"	"	5	29·1	0·311	4	0·005	3	9·45	8·5	226	38	6·83	Nobel.....	2,050
Great Britaiu	Lee-Speed, 1891.....	Cut-off...	"	10	30·2	0·303	7	0·004	5	10·00	9·4	214	66	6·50	Black; Cordite	1.830
Holland.....	Mannlicher, 1892.....	Repeater.	"	5	31·1	0·256	4	0·006	*	7·87	9·1	161	30	5·43	Smokeless....	2,300
Italy.....	Carcano, 1892.....	"	"	5	28·8	0·256	4	0·006	.....	7·87	8·5	170	34	6·00	Ballistite.....	2,320
Japan.....	Murata, 1887.....	Cut-off...	Tubular..	8	29·6	0·315	4	0·004	Equal.	11·00	9·0	238	36	6·69	Smokeless....	1.850
Norway.....	Krag-Jörgeuseu, 1893	"	Central..	5	31·1	0·256	4	.....	.....	7·87	8·7	156	35	....	"	2,300
Portugal.....	Kropatschek	"	Tubular..	8	32·3	0·315	4	0·004	Equal.	11·00	10·2	245	70	7·70	Black.....	1,760
Roumania ...	Mannlicher, 1891.....	Repeater.	Central..	5	28·6	0·256	4	.....	*	7·87	8·7	165	36	5·43	Smokeless....	2,260
Russia	Mouzin, 1891.....	"	"	5	.....	0·300	4	.....	.....	9·00	9·5	213	33	6·12	Kazan factory	2,100
Spain.....	Mauser, 1892.....	Cut-off...	"	5	.....	0·276	4	0·005	1⅛	9·8	8·6	173	38	....	Smokeless....	2,280
Switzerland..	Schmidt, 1889.....	"	"	12	30·7	0·295	3	0·004	*	10·63	10·4	215	30	6·53	P. C., 1889.....	1,920
Turkey	Mauser, 1890.....	Repeater.	"	5	28·4	0·301	...	.....	.....	.....	8·8	213	41	6·34	Smokeless....	2,110
Uuited States	Model, 1892.....	Cut-off...	"	5	30·0	0·300	4	0·004	3	10·00	8·7	220	37	5·86	Wetteren.....	2,000

* Nearly equal.

These pieces mark the culmination of a progress extending over forty years, beginning with a small-arm that could deliver about two shots per minute and had a range of about 200 yards. Twenty years later, the muzzle-loading smooth-bore having given place to the rifled breech-loader, the number of shots and the effective range were increased tenfold; and then the small-caliber magazine-rifle succeeded, with a range of about 4,000 yards and capacity in expert hands of firing nearly forty shots per minute. STANHOPE E. BLUNT.

Smalley, GEORGE WASHBURN: journalist; b. at Franklin, Mass., June 2, 1833. He graduated at Yale 1853; studied at the Harvard Law School, and practiced law at Boston until the outbreak of the civil war, when he became war correspondent for *The New York Tribune*; he became a member of its editorial staff in 1862. In 1866 he reported for the *Tribune* the Austro-Prussian war. In 1867 he took up his abode in London, and his letters formed a familiar and popular feature of the *Tribune's* foreign correspondence until 1895, when he became the U. S. correspondent of the London *Times*. H. A. BEERS.

Smalley, JOHN, D. D.: clergyman; b. at Lebanon (now Columbia), Conn., June 4, 1734; graduated at Yale College 1756; was ordained minister of the Congregational Church at New Britain, Conn., 1758. D. at New Britain, June 1, 1820. He was a prominent teacher of theology and a noted divine of the New England school. He published several collections of sermons; among them, those on *Natural and Moral Inability* (1769). Revised by G. P. FISHER.

Small Fruits: a term applied in the U. S. to the strawberry and various fruits which grow upon bushes, as raspberries, blackberries, gooseberries, and currants. Omitting the strawberry, the term corresponds with bush-fruits, used in England. Grapes and mulberries, and even cherries, are sometimes improperly classed with the small fruits.

Smallpox [*pox* = *pocks*, pustules], or **Vario'la** [Mod. Lat., dimin. of Lat. *va'rius*, various, diversified]: a specific, contagious eruptive fever, characterized by the development of papules, vesicles, and pustules, and the formation of persistent pitted scars. Smallpox was unknown to the early Greek writers on medicine, but is mentioned in the oldest books of India—the Vedas. The Vedas describe inoculation with the secretion of the smallpox pustule as producing a mild form of the disease, and thereby preventing its occurrence in the dangerous natural form. The first accurate description of smallpox is that by an Arabian medical writer of the ninth century—Rhazes. Smallpox was known in Europe in the sixth century, and in the sixteenth century it was carried by the Spaniards to America. It was most intelligently studied, and its treatment admirably described, by Sydenham and Morton in England, in the seventeenth and eighteenth centuries.

The manifestations of smallpox are general illness, violent pains in the back and head, high temperature, followed in three or four days from the onset by an eruption of papules (pimples), which in about four days more become vesicles, and then pustules. The pustules may break down into ulcers, which destroy the entire thickness of the skin, and when healed leave pits of scar-tissue, which may never be obliterated, and which have an appearance that can not be mistaken. There are two forms of smallpox, which are not only distinct in appearance but quite different in severity. The first is called the discrete form; the second the confluent form. In discrete smallpox the pustules are separate and distinct; in confluent smallpox the pustules run together, and form larger and more serious ulcers than are found in the discrete form. Confluent smallpox is of a very severe type, or perhaps it would be better to say that severe attacks of smallpox are likely to have confluent lesions of the skin. The general symptoms of smallpox are a sense of illness, often a chill, elevation of temperature, eruption of papules, a moderate fall of temperature, the development of pustules accompanied by a second rise of temperature, after which the symptoms depend upon the progress of the disease toward death or recovery.

The papules of smallpox usually appear first on the face, and especially on the chin, and afterward on the neck and chest; later on the body and the extremities. The eruption occurs not only on the skin, but also on the mucous membrane of the respiratory and digestive apparatus, where it is of the vesicular type. It is found in the nose, in the mouth, in the throat, in the larynx, and elsewhere, producing symptoms dependent upon the situation and severity of the local conditions. Delirium often occurs in smallpox, and especially in that grave form called hæmorrhagic or "black" smallpox, which is very much like what is known as spotted fever (cerebro-spinal meningitis). Like all contagious diseases, smallpox has what is called a period of incubation, following the time of exposure to the contagium and preceding the time in which there are recognizable evidences of the disease. The length of this period is variously estimated at from seven to twenty-one days. Smallpox is both contagious and infectious; that is, it may be derived from direct association with a person having the disease, or by contact with articles which have been on or about a person suffering with smallpox. The disease has appeared after articles used by the sick have been handled, even after these articles had been removed to a long distance, and after a long time had elapsed. The nature of the smallpox contagium is absolutely unknown; no disease-germ peculiar to smallpox has ever been discovered, although it has been most diligently sought after. Apparently the disease is contagious in all its stages, and it is undeniable that some peculiar virus which is capable of being transferred by the air may give rise to it; unborn children have developed the disease, showing that it is transmissible through the blood of a mother. Previous to the introduction of processes of VACCINATION (*q. v.*), smallpox was one of the most dreaded of diseases, and in Europe millions of persons lost their lives from its ravages. Since the general use of vaccination, and probably partly on account of advancing intelligence and improved hygienic conditions among all classes of society, the ravages of smallpox have diminished to such an extent that only at long intervals and in few localities does

it appear in the form of an epidemic. The treatment of smallpox is principally what is called symptomatic, that is, addressed to the individual conditions incident to the disease. Violent medication has been entirely abandoned. The patient is isolated, given digestible food, plenty of water, and cool and antiseptic applications are made to the skin. CHARLES W. DULLES.

Smallwood, WILLIAM: soldier; b. in Kent co., Md., about 1732; raised a battalion of Marylanders 1776, which he commanded as colonel, and half of which perished in the battle of Long Island under another commander; was engaged in the battle of White Plains; was appointed brigadier-general Oct. 23, 1776; accompanied Gen. Sullivan in the Staten Island expedition 1777; raised a new battalion of militiamen from the Western Shore of Maryland, and led it at the battle of Germantown; was made major-general Sept. 15, 1780; was with Gates in his Southern campaign, but left after the defeat at Camden, refusing to serve under Steuben; was member of Congress 1785, and Governor of Maryland 1785–88. D. in Maryland, Feb. 14, 1792.

Smalt: See COBALT.

Smart, BENJAMIN HUMPHREY: grammarian and metaphysician; b. in England about 1785; was for more than fifty years from 1815 a successful teacher of elocution in London; was a voluminous writer upon grammar, logic, rhetoric, and metaphysics, in which last department he claimed to "assert, correct, and carry onward the philosophy of Locke." Among his works were *A Grammar of English Pronunciation* (1810); *Rudiments of English Grammar Elucidated* (1811); *A Grammar of English Sounds* (1813); *Practical Logic* (1829); *Accidence of Grammar*, *Principles of Grammar*, *Manual of Rhetoric and Logic*, *The Practice of Elocution*, and *Historico-Shakspearian Readings*, the five latter being issued as a complete series in 1858; *Outlines of Sematology* (1831), with a *Sequel* (1837) and an *Appendix* (1839), the three works being issued together as *The Beginnings of a New School of Metaphysics* (1839); *The Way out of Metaphysics* (1844); *The Metaphysicians, a Memoir of Franz Carvel, Brushmaker, and of Harold Fremdling, Esq.* (1857); *Thought and Language* (1855); and *An Introduction to Grammar on its True Basis* (1858). Smart also published in 1836 a *Pronouncing Dictionary*, based upon that of John Walker, issued an epitomized edition of the same in 1840, and an *Appendix* in 1846 (revised editions 1860), which figure among the authorities upon pronunciation most frequently cited in the later editions of Webster's and Worcester's dictionaries. D. about 1872. Revised by B. I. WHEELER.

Smart, CHRISTOPHER: poet; b. at Shipbourne, Kent, England, Apr. 11, 1722; educated at Pembroke College, Cambridge, where he became a fellow 1745; settled in London as a writer, becoming intimate with Pope, Johnson, and Garrick; was noted for improvidence and a convivial disposition, which made him the inmate of an insane asylum and later of the king's bench prison for debtors, where he died May 18, 1770 or 1771. He translated the *Works of Horace* into English prose (2 vols., 1756), and into verse (1767); published *The Hilliad, an Epic Poem* (1753), being a satire on Sir John Hill, noted for his quarrels with Fielding and with the Royal Society, and *The Parables of Christ done into Verse* (1765); but his most remarkable production was the *Song to David*, written in a madhouse, published in 1763, and reprinted in full in Chambers's *Cyclopædia of English Literature*. See *With Christopher Smart*, in Browning's *Parleyings with Certain People of Importance*.
Revised by H. A. BEERS.

Smart, HENRY: organist and composer; b. in London, Oct. 26, 1813; after studying law took up music; in 1831 was organist of the parish church of Blackburn, and there composed his first important work, an anthem. In 1836 went to London, where he remained, playing, teaching, and composing. His works include an opera, *Bertha* (1855); cantatas, *The Bride of Dunkerron*, Birmingham festival, 1864; *King René's Daughter* (1871), *The Fisher Maidens*, both for female voices; and an oratorio, *Jacob*, Glasgow festival, 1873. D. July 6, 1879. D. E. HERVEY.

Smeaton, JOHN: civil engineer; b. at Austhorp, near Leeds, England, May 28, 1724; invented in 1751 an instrument for measuring a ship's progress; made several valuable inventions in hydraulic machinery, for which he received the Copley medal (1759); was noted as the builder of the Eddystone lighthouse (1756–59), an account of the construction of which he published (1791); constructed Ramsgate harbor (1749–74), the Forth and Clyde Canal, and many other important improvements. D. Oct. 28, 1792.

Smectym'nuus: a name compounded of the initials of the authors of a celebrated tract entitled *An Answer* (1641), written in reply to Bishop Hall's *Episcopacy by Divine Right Asserted* (1641). The names of its five writers are Stephen Marshall, Edmund Calamy, Thomas Young, Matthew Newcomen, and William Spurstowe.

Smeerenberg: See the Appendix.

Smell, Organ of: See HISTOLOGY (*Organs of Special Sense*).

Smelt [in allusion to the cucumber-like odor of the typical species]: a small salmoniform fish belonging to the genus *Osmerus*, or a related genus, of the family *Argentinidæ*, and esteemed as food. These fishes have the teeth of the lower jaw stronger than those of the upper, and fang-like ones on the vomer and front of the tongue, and normally inhabit salt water. *Osmerus eperlanus* is the European species; *O. mordax*, the eastern North American, known also as frost-fish; *O. thaleichthys*, the California smelt. *Hypomesus pretiosus* is the surf-smelt of California and northward. The silver-sides (*Atherinidæ*), structurally very unlike the *Argentinidæ*, are also loosely called smelts, as the California *Atherinopsis californiensis*. Among other fishes locally and improperly known by the name are the cyprinoid *Hybognathus regius*, the spawn-eater, and the Pacific tomcod.

Smelting [from M. Dutch *smelten*: O. H. Germ. *smelzen* (> Mod. Germ. *schmelzen*), melt; cf. Gr. μέλδειν, melt, but probably not akin to Eng. *melt*]: in the more extended use of the term the entire process of reducing metals from their ores by fusion; in a more limited sense those particular metallurgical processes in which an ore or a product of other operations, such as roasting, treatment with acids, etc., is finally reduced to pure metal or some intermediate product. The fusions are conducted in shaft-furnaces, reverberatory furnaces, or crucibles. Metals ready for use or sale may be produced from ores by a single smelting operation, as iron; or they may require a series of smeltings, alternated with roastings, as copper when made from sulphuretted ores. The smelting process may be simply reducing, or oxidizing and reducing, or may be designed to volatilize certain bodies, to oxidize others, and to reduce still others. Charcoal, coke, and anthracite are the fuels generally used in shaft-furnaces and for heating crucibles, and bituminous coal and wood for reverberatory furnaces; but peat, gas obtained from different materials in special generators and peculiarly constructed fireplaces, natural gas, petroleum, and waste gases from furnaces are used.

To remove earthy matters and foreign oxides, and to facilitate the collection of the reduced metals, slags are produced, and, according to the nature of the effect to be obtained and the substance to be removed by scorification, the charges are so constituted as to yield more or less acid or basic slags by judicious mixture of the ores treated or by addition of various fluxes. Sometimes it is desirable to liberate some sulphur to combine with the metals and form a *matte* or *regulus*, and then iron pyrites is added. The general products of smelting are slag and metal, or slag and *matte*, or sometimes all three at once. The slags may have to be subjected to a reducing smelting to obtain the metal retained in them, the metal to an oxidizing and scorifying smelting to purify it, and the matte to Bessemerizing, to an oxidizing smelting, or, after roasting, to a reducing and scorifying smelting, during which some metals are partly removed by volatilization, as antimony, arsenic, and zinc; others by oxidation and scorification, as iron, zinc, and tin, while the desired metal is obtained in a nearly pure state or as a concentrated matte.

Shaft-furnaces are mainly employed for reducing fusions with coke, charcoal, and anthracite, although by a proper construction, good management of fluxes, and preparation of the ores, etc., a partial oxidizing action can be produced. The fusion is almost invariably effected by the aid of a blast. Reverberatory furnaces, with wood, coal, natural or producer gas, or petroleum, are generally used for oxidation; a very effective reducing action can also be obtained in them by excluding the air and keeping the hearth full of reducing gases. In crucibles the results of smelting depend entirely on the nature of the charge, oxidation and scorification being produced by certain fluxes: reduction by adding carbonaceous matters; scorification alone by using a simple

flux like borax; precipitation by adding metallic iron or some substance which will yield iron by reduction; sulphurization by adding metallic sulphides, or alkaline sulphates with a reducing agent and a simple flux.

Revised by C. Kirchhoff.

Smer'dis (in Gr. Σμέρδις): brother of Cambyses, who, because envious of the strength of Smerdis, sent him back to Susa from Egypt. Shortly afterward Cambyses, having dreamed that Smerdis was seated on the royal throne, sent and had him put to death secretly. A rebellion broke out in Susa because of the tyranny of Cambyses, who was still absent in Egypt, and the brother of the governor of the royal palace, because he resembled much the dead Smerdis, was declared to be the real Smerdis, and proclaimed king. In haste Cambyses began the journey home to defend his throne, but he died on the way, and though the nobles soon discovered the fraud that had been practiced on them, still the false Smerdis was able to hold the throne for seven months. He was finally murdered by the nobles, who elected Darius Hystaspis king. J. R. S. Sterrett.

Smet, Peter John, de: missionary; b. at Termonde, Belgium, Dec. 31, 1801; was trained in the seminary at Mechlin; sailed with five fellow students to the U. S. in 1821; became a Jesuit; assisted in founding the University of St. Louis, Mo., 1828; in 1838 was sent to labor with the Pottawattomies, on Sugar creek, and in 1840 was transferred to the Flathead mission, in the Rocky Mountains. Father de Smet acquired a singular power of restraint over nearly all the Indian tribes, from the Sioux westward. He became procurator of the Indian missions, several times visited Europe in behalf of his missions, and wrote several works in French and English, among them *Letters and Sketches, and Residence in the Rocky Mountains* (Philadelphia, 1843); *Oregon Missions and Travels over the Rocky Mountains in 1845–46* (New York, 1847); *Western Missions and Missionaries* (1863), and many letters published in the *Annals* of the Roman Propaganda. He was a chaplain in the Utah expedition. D. in St. Louis, May 23, 1872.

Revised by S. M. Jackson.

Smew: a merganser, *Mergellus albellus*, inhabiting the northern parts of the Old World. It is distinguished by the short narrow bill (considerably shorter than the head), whose margins are beset with short approximated lamellæ. In the male the ground-color is white (whence one of the popular names, white nun); black pervades around and in front of the eyes, at the occiput under the crest, at the front of the back, on the tail, and on the wings, but the scapulars and middle wing-coverts, as well as secondaries and tertials, are white; in the female the head is of a reddish brown; the length is about 17 inches. Like its relatives, it is an excellent swimmer and diver. It makes a nest near the water, and lays therein from eight to ten eggs. T. G.

Smilax [= Lat. = Gr. σμῖλαξ, yew. also (with distinguishing adjectives) a kind of bean, a kind of bindweed]: a large genus of monocotyledonous plants of the sub-family *Smilaceæ* and family *Liliaceæ*. They consist of herbaceous or shrubby plants, generally more or less climbing, with reticulated leaves and bisexual or polygamous flowers, a six-parted perianth, six stamens, a free three-celled ovary, with one or several seeds in each cell, three stigmas, and a roundish berry. There are about 200 known species scattered over the globe, though most numerous in the temperate and tropical parts of Asia and America. True sarsaparilla and China root are among the products of the genus, the former from *S. officinalis*, *S. papyracea*, and *S. syphilitica*, of the West Indies and South America, and the latter from *S. china* of Japan, China, and the East Indies. The U. S. has numerous species, none of them important. The so-called China brier is the most widely known of them. It is very frequent in the southern parts of the U. S., and extends northward to New Jersey. It has large, tuberous, brownish-red root-stocks, which contain a considerable amount of starch. Formerly the Seminoles used the root-stocks for food in times of scarcity, either separating the starch or cooking the whole root. At present a kind of beer is made from them with molasses, parched corn, and sassafras. Several plants of this genus are fine in hothouse and garden culture. The related climbing plant which under the name of smilax is cultivated by florists is the *Myrsiphyllum asparagoides*. It comes from the Cape of Good Hope, and is more closely allied to the asparagus. It has a fine thread-like stem, sometimes 20 feet long, and elegant, strongly colored leaves which do not easily fade. Revised by Charles E. Bessey.

Smiles, Samuel: author; b. at Haddington, Scotland, in 1812; educated for the medical profession; practiced some years as a surgeon at Leeds; became editor of the Leeds *Times*; was secretary to the Leeds and Thirsk Railway 1845–52, and to the Southeastern Railway 1852–66. Among his numerous works are *Self-Help, with Illustrations of Character and Conduct* (1860); *Workmen's Earnings, Strikes, and Savings* (1861); *Lives of the Engineers, with an Account of their Principal Works* (4 vols., 1861–65); *Character* (1871); *Thrift* (1875); *The Huguenots in England and Ireland* (1868); *The Huguenots in France after the Revocation of the Edict of Nantes* (1874); *Life of a Scotch Naturalist* (1876); *George Moore, Merchant and Philanthropist* (1878); *Life of Robert Dick, Geologist and Botanist* (1878); *Duty, with Illustrations of Courage, Patience, and Endurance* (1880); *Men of Invention and Industry* (1884); *A Publisher and his Friends: John Murray* (1891); *Jasmin, the Barber-poet* (1891); *Josiah Wedgewood* (1894). Most of his works have been republished in the U. S.

Smiley, William Henry: See the Appendix.

Smillie, George Henry: landscape-painter; son of James Smillie (1807–85), engraver; b. in New York, Dec. 20, 1840; pupil of James M. Hart; National Academician 1882; member of the American Water-color Society. Studio in New York.—His brother, James David, also a landscape-painter, was born in New York, Jan. 16, 1833; studied under his father; became a National Academician 1876; member American Water-color Society. Studio in New York.

Smirke, Robert, R. A.: painter; b. at Wigton, near Carlisle, England, in 1752; was brought up to the business of a painter of coach-panels; was admitted as a student at the Royal Academy 1771; became an academician 1791, his presentation picture being *Don Quixote and Sancho Panza*; painted many scenes illustrating the Bible, Milton, Thomson, and *The Arabian Nights*; was one of the contributors to Boydell's *Shakspeare*, and brought out a magnificent edition of his daughter Mary's translation of *Don Quixote*, with 74 engravings (4 vols., London, 1818). D. in London, Jan. 5, 1845.

Smirke, Sir Robert, R. A.: architect; eldest son of Robert Smirke; b. in London, England, in 1780; educated as an architect in England and on the Continent; was gold medalist at the Royal Academy 1799; published *Specimens of Continental Architecture* (1806); was architect of the new Covent Garden theater 1808–09, of the mint 1811, the post-office 1823–29, the Union, United Service, and Carlton clubs, most of them being examples of the so-called classical school, and built many other important private and public edifices. His fame rests chiefly upon the British Museum, built by him at intervals from 1823 to 1847. He was knighted 1831, and was thirty years treasurer of the Royal Academy. D. at Cheltenham, Apr. 18, 1867.

Smirke, Sydney, R. A.: architect; son of Robert Smirke; b. in England, 1799; studied architecture; gained the gold medal of the Royal Academy 1819; assisted his brother in designing the Oxford and Cambridge University Club-house in Pall Mall, London, 1835–37; superintended the restoration of the Temple church, of which he published an account (1842); in 1847 succeeded his brother as architect to the British Museum, in which capacity he built the reading-room 1855, the Roman, Assyrian, and other galleries, and was the architect of several other public edifices and of many splendid country-seats. His last achievement was the new Royal Academy in Burlington House, begun 1867 and completed 1874. He was chosen R. A. 1860; became Professor of Architecture at the Academy 1861, and its treasurer 1862; subsequently trustee of that institution and of the Soane Museum. D. Dec. 11, 1877.

Smith, Adam: economist and philosopher; b. at Kirkcaldy, Fifeshire, Scotland, June 5, 1723. His education was carried forward in the grammar school of Kirkcaldy, the University of Glasgow, and Baliol College, Oxford, with a view to his taking orders in the English Church. In Glasgow he gave chief attention to mathematics and natural science, but at Oxford he turned to the study of languages, and took especial pains to master English. Abandoning all thought of the clerical office, he returned to his native place, and in 1748 took up his residence in Edinburgh. There he first came before the public, delivering lectures on rhetoric and belles-lettres under the patronage of Lord Kames. In 1751 he was made Professor of Logic in the University of Glasgow, and the following year became Professor of Moral

Philosophy in the same institution. He resolved the science of morals into four parts, and accordingly discussed in his lectures, first, natural theology; second, ethics; third, justice with reference to specific rules and precepts; and fourth, political expediency as affecting the honor, power, and prosperity of the state. His lectures were delivered extemporaneously, and were, for both matter and style, very popular. His first published work was the *Theory of Moral Sentiments*, issued in 1759. It called forth a high encomium from Hume, and brought Smith at once a wide reputation. Incidentally, this publication led to his being selected, four years afterward, to accompany the young Duke of Buccleugh on his travels. He carefully improved the opportunity thus presented to become acquainted with the internal policy of other states, and to confer with distinguished economists on the Continent. He returned to England in 1766, and for ten years lived with his mother in partial retirement at Kirkcaldy. There he devoted himself to the earnest study of subjects which had occupied his attention for nearly twenty years. The result was given to the world in 1776 in his great work entitled *An Inquiry into the Nature and Sources of the Wealth of Nations.* Many principles laid down in that work were no doubt derived from the French economists, but the completeness of their compilation and the clearness with which they are set forth in this treatise fairly entitle Adam Smith to be regarded as the father of modern political economy. His book will continue to be, as it has been hitherto, a standard of reference. Smith's biographer thus defines the main feature of this work: "Its great object is to demonstrate that the most effectual plan for advancing a people to greatness is to maintain that order of things which nature has pointed out, by allowing every man, as long as he observes the rules of justice, to pursue his own interest in his own way, and to bring both his industry and his capital into the freest competition with those of his fellow citizens." After residing two years in London, he was appointed a commissioner of customs for Scotland, and removed to Edinburgh, where he spent the remainder of his life. In 1787 he was elected lord rector of the University of Glasgow. D. in Edinburgh, July 17, 1790. After his decease most of his manuscripts were destroyed, as he had directed, but a few were published in 1795 under the title *Essays on Philosophical Subjects.* Revised by J. Mark Baldwin.

Smith, Alexander: poet; b. at Kilmarnock, Scotland, Dec. 31, 1830; was pattern-designer for a lace-factory at Glasgow; published a volume of poems, *A Life Drama* (1853), which attracted great attention; was appointed secretary of the University of Edinburgh 1854; wrote *Sonnets of the War*, along with Sydney Dobell (1855); *City Poems* (1857); *Edwin of Deira* (1861); and the prose works *Dreamthorp* (1863); *A Summer in Skye* (1865); *Alfred Hagart's Household* (1866); and *Miss Oona McQuarrie* (1866). D. at Wardie, near Edinburgh, Jan. 5, 1867. Smith has been classed with Bailey, the author of *Festus*, and others of "the spasmodic school" satirized in Aytoun's *Firmilian.* A *Memoir* by P. P. Alexander was published along with a posthumous volume of miscellanies entitled *Last Leaves* (1868). Revised by H. A. Beers.

Smith, Andrew Jackson: soldier; b. in Bucks co., Pa., Apr. 28, 1815; graduated at the U. S. Military Academy; appointed in the army a second lieutenant of the First Dragoons July, 1838, of which regiment he became major in May, 1861 (known as the First Cavalry Aug., 1861), and July, 1866, colonel of the Seventh Cavalry. Prior to 1861 he served almost continually with his regiment on the frontier. In Oct., 1861, he was commissioned colonel of the Second California Cavalry, and Mar. 17, 1862, a brigadier-general of volunteers. He was engaged in the assault of Chickasaw Bluffs (Dec. 27–29, 1862), and later in the assault and capture of Arkansas Post (Jan. 11, 1863). In command of a division of the Thirteenth Army-corps, he took part in the siege and assaults of Vicksburg and in the subsequent capture of Jackson, Miss. In the Red river campaign he commanded the force (composed of detachments of the Sixteenth and Seventeenth corps) which captured Fort De Russy, and was engaged in the battle of Pleasant Hill. Next ordered to Missouri, he aided in driving Price from that State, then was called to re-enforce Gen. Thomas at Nashville, and engaged in the battle of Nashville and pursuit of Hood's army. Recalled to Gen. Canby's command in Feb., 1865, he commanded the Sixteenth Corps in the reduction and capture of Mobile, Ala. In Jan., 1866, he was mustered out of the volunteer service, and in May, 1869, resigned his commission in the regular army. The brevets of colonel, brigadier-general and major-general were bestowed on him for gallantry at Pleasant Hill, La., Tupelo, Miss., and Nashville, Tenn. He was reappointed colonel of cavalry Jan. 22, 1889, by act of Congress and retired. D. Jan. 30, 1897.

Smith, Buckingham: bibliographer and historian; b. on Cumberland island, Ga., Oct. 31, 1810; graduated at the Cambridge Law School 1836; was elected to the territorial legislature at Florida; was secretary of legation at Mexico 1850–52, and at Madrid 1855–58; and subsequently settled in Florida, where he was a judge and a member of the State Senate. He made special and important researches in Mexican history and antiquities, Indian philology, and the early Spanish expeditions in North America. Besides aiding Bancroft, Sparks, and Parkman in their researches, he edited translations of the *Narrative of Cabeza de Vaca* (1851); *Letter of Hernando de Soto and Memoir of Hernando de Escalante Fontaneda* (1854); and translated, with copious notes, *Narratives of the Career of Hernando de Soto in the Conquest of Florida* (1868). In 1864 he published *An Inquiry into the Authenticity of Documents concerning a Discovery of North America claimed to have been made by Verrazano.* D. in New York, Jan. 5, 1871. A portion of his library was secured for the New York Historical Society. Herbert H. Smith.

Smith, Charles Emory, LL. D.: journalist; b. at Mansfield, Conn., Feb. 18, 1842; graduated at Union College in 1861; became editor of the Albany *Express* in 1865, of *The Albany Journal* in 1870, and of the Philadelphia *Press* in 1880. He was president of the New York State Press Association in 1874, and U. S. minister to Russia 1890–92. In Apr., 1898, he was appointed Postmaster-General.

Smith, Charles Ferguson: soldier; b. in Philadelphia, Pa., Apr. 24, 1807; graduated at the U. S. Military Academy in 1825, entering the army as a lieutenant of artillery. From 1829 to 1842 he served at the Military Academy in various capacities. In the Mexican war, as captain of artillery, he served with distinction, and received the brevets of major, lieutenant-colonel, and colonel. Appointed lieutenant-colonel of the Tenth Infantry in 1855, he commanded the Red river expedition in 1856, engaged in the Utah expedition in 1857–61, for a time was in command of the department of Utah, and was in command of the city and department of Washington Apr. 10–28, 1861. On Aug. 31, 1861, he was appointed a brigadier-general of volunteers, and ordered to Kentucky. In September he became colonel of the Third Infantry. In the operations about Forts Henry and Donelson he acquired a high reputation. In the fight for the possession of the latter stronghold he led the division which had held the left of the investing lines of the Union army, and which stormed and captured all the high ground on the Confederate right, which commanded Fort Donelson. Gen. Smith was then selected to command the movement up the Tennessee, and on Mar. 21 was promoted to be major-general of volunteers. D. at Savannah, Tenn., Apr. 25, 1862.

Smith, Charles Forster: professor of Greek: b. in Abbeville co., S. C., June 30, 1852; educated at Wofford College, Harvard and Leipzig Universities; Ph. D., Leipzig, 1881; Professor of Greek and German, Wofford College, 1875–79; Assistant Professor Ancient Languages, Williams College, 1881–82; Professor of Modern Languages, Vanderbilt University, 1882–83; Professor of Greek, Vanderbilt University, 1883; Professor of Greek, University of Wisconsin, 1894; author of *Thucydides: Book III. and Book VII.* of College Series of Greek Authors; vice-president American Dialect Society 1891.

Smith, David Eugene: See the Appendix.

Smith, Sir Donald Alexander, D. C. L.: member of Canadian Parliament; b. in Morayshire, Scotland, in 1821, and educated there. He was for many years in the service of the Hudson Bay Company, and is resident governor and chief commissioner of that corporation in Canada; is president of the Bank of Montreal, and a director of the Canadian Pacific Railway. He was appointed a member of the Executive Council for the Northwest Territories in 1870; represented Winnipeg and St. John in the Manitoba Assembly 1871–74; Selkirk in Dominion Parliament 1871–78; and Montreal West in that body 1887–95. He was knighted in 1886. Neil Macdonald.

Smith, Edmund Kirby: soldier; b. at St. Augustine, Fla., May 15, 1824; graduated at the U. S. Military Acad-

emy in 1845, and entered the army as brevet second lieutenant of infantry. In the war with Mexico he distinguished himself, and was breveted first lieutenant and captain for gallantry at Cerro Gordo and Contreras. From 1849 to 1852 he was Assistant Professor of Mathematics at West Point. Transferred to the Second Cavalry in 1855 with the rank of captain, he served on frontier duty, and was severely wounded in a fight with the Comanche Indians in Texas, May 13, 1859. In Jan., 1861, he became major of his regiment, but resigned Apr. 6; was soon after appointed a brigadier-general in the Confederate army, and served under Gen. Joseph Johnston in Virginia. At the battle of Bull Run, July 21, 1861, he arrived on the field with Elzey's brigade toward the close of the action, but was soon disabled by a shot, when Elzey assumed command. Made major-general in 1862, he was transferred to East Tennessee, and placed in command of that department. Under Bragg he led the advance in the invasion of Kentucky; he routed the Union forces at Richmond, Ky., Aug. 30, and advanced to Frankfort. Promoted to the grade of lieutenant-general, he was engaged at the battle of Perryville, Oct. 10, and in the battle of Murfreesboro, Dec. 31, 1862–Jan. 3, 1863. He was soon after made general, and in command of the Trans-Mississippi department, opposing Banks in the Red river campaign, and engaged in the battle of Jenkins's Ferry, Apr. 30, 1864. He was the last to surrender the forces under his command, May 26, 1865. He filled the positions of president Pacific and Atlantic Telegraph Company 1866–68, president Western Military Academy 1868–70, chancellor of the University of Nashville, Tennessee, 1870–75; and Professor of Mathematics in the University of the South from 1875 till his death at Sewanee, Tenn., Mar. 28, 1893.

Revised by JAMES MERCUR.

Smith, ELI, D. D.: missionary; b. at Northford, Conn., Sept. 15, 1801; graduated at Yale College 1821, at Andover Seminary 1826; went to Malta as superintendent of a missionary printing establishment 1826; traveled with Dr. Anderson through Greece 1829, and with Dr. Harrison G. O. Dwight, of Constantinople, through Armenia, Georgia, and Persia 1830–31—a tour which resulted in the establishment of the important Armenian and Nestorian missions of the American Board; visited the U. S. and published *Missionary Researches in Armenia* (2 vols., Boston, 1833); settled at Beyrout 1833; accompanied Dr. Edward Robinson in his geographical explorations of Palestine, to which he largely contributed, 1838 and 1852; revisited the U. S. 1839 and 1845; introduced an elegant font of Arabic type, cast under his supervision at Leipzig, for the mission press, 1839, and was engaged from 1847 upon a new translation of the Bible into Arabic, completed by Dr. C. V. Van Dyke. D. at Beyrout, Jan. 11, 1857. Revised by G. P. FISHER.

Smith, ELIZABETH OAKES (*Prince*): author; b. at Cumberland (then North Yarmouth), Me., Aug. 12, 1806; resided from infancy in Portland, Me.; married there in 1823 Seba Smith, editor and humorist, whom she aided in his journalistic enterprises; obtained a considerable local reputation as a writer of prose and verse, but never appeared publicly as an author until after the loss of her husband's fortune in 1839; settled in New York 1842. Her contributions to the magazines were partially collected in several volumes, of which the best known was *The Sinless Child and Other Poems* (1843). She also published two tragedies, *The Roman Tribute* and *Jacob Leisler* (1853); *Riches without Wings* (1838); *The Western Captive* (1850); *Woman and her Needs* (1851); *The Newsboy* (1855); *The Two Wives* (1870); *Kitty Howard's Journal* (1871); and other books. She lectured before lyceums, occasionally preached, and was a prominent advocate of woman's rights. D. at Hollywood, N. C., Nov. 8, 1893. Revised by H. A. BEERS.

Smith, ERMINNIE ADELLE (*Platt*): scientist; b. at Marcellus, N. Y., Apr. 26, 1837; educated at Mrs. Willard's seminary at Troy, N. Y.; married Simeon H. Smith, of Jersey City, in 1855; while educating her sons in Europe studied in Germany mineralogy, geology, crystallography, and other branches of science; also visited and investigated the amber-fisheries on the coast of the Baltic Sea. She was the first woman elected fellow of the New York Academy of Sciences, and the first woman appointed an officer in the American Association for the Advancement of Science, being at the time of her death secretary of the section of anthropology. In 1880 Mrs. Smith became one of the salaried members of the bureau of ethnology, Smithsonian Institution, and was detailed to study the language, customs, myths, and peculiarities of the Iroquoian Indians. She spent two summers among the Tuskaroras in Canada, who adopted her as a member of the tribe, and compiled an Iroquois-English dictionary. In 1885 she was appointed by Gov. Abbett commissioner of the department of woman's work to represent the State of New Jersey at the New Orleans Exposition. D. in Jersey City, June 9, 1886. J. W. POWELL.

Smith, FRANCIS HENNEY, A. M.: soldier; b. at Norfolk, Va., Oct. 18, 1812; graduated at the U. S. Military Academy in 1833, and entered the army as a brevet second lieutenant of artillery; second lieutenant Nov. 30, 1833. In 1836 he resigned from the army, and in 1837 was appointed Professor of Mathematics at Hampden-Sidney College, Virginia. Upon the organization of the Virginia Military Institute at Lexington, Va., in 1839, he was appointed its superintendent and principal professor (of mathematics), the duties of which positions he performed until Jan. 1, 1890. Emeritus professor until his death. Soon after the outbreak of the civil war the professors and assistants went into the Confederate army, and Smith, as colonel of a Virginia regiment, was stationed at the city of Norfolk and in command of the fort on Craney island. The institute was subsequently reopened. He was the author of various educational works. D. at Lexington, Mar. 21, 1890.

Smith, FRANCIS HOPKINSON: landscape-painter and author; b. in Baltimore, Md., Oct. 23, 1838. He is by profession a civil engineer, and has built a number of public works, some for the U. S. Government. As a painter he is self-taught, paints principally in water-color, and is a member of the American Water-color Society. He is an accomplished writer of fiction and descriptive articles, and well known as an illustrator. His water-colors of scenes in Venice are freely and cleverly painted. W. A. C.

Smith, Sir FRANCIS PETTIT: inventor; b. at Hythe, England, Feb. 9, 1808; constructed in 1834 a model of a steam-vessel to be propelled by a screw driven by a spring; made a larger boat on the same principle, which he successfully tested in the English Channel 1837; constructed for the British navy the screw steamer Archimedes of 237 tons, 90 horse-power (finished 1840), the success of which led to the rapid introduction of screw-vessels into the navy and the mercantile marine. He was knighted in 1871. D. in London, Feb. 11, 1874.

Smith, GEORGE: Assyriologist; b. in London, England, Mar. 26, 1840. He became interested in Assyriology by having to engrave some cuneiform signs for publication. Appointed to a position in the Assyrian department of the British Museum he rapidly became, by his industry, insight, and remarkable memory one of the greatest promoters of Assyriology. In connection with Sir Henry Rawlinson he edited vols. iii.–iv. of *The Cuneiform Inscriptions of Western Asia* (1870, 1875), a monumental work. In 1872 he discovered among the clay books in the British Museum fragments of a story of the Deluge similar to the biblical version. *The Daily Telegraph* newspaper then sent him to Nineveh to make further search for clay books in the ruins of Asshurbanipal's palace. This expedition was successful, and was followed by two others for the museum. On the third expedition he died of fever at Aleppo, Aug. 19, 1876. The Deluge story proved to be part of a great poem written on twelve tablets. The whole was published, so far as recovered, in *The Chaldæan Account of Genesis*, of which there have been several editions. His other works are *Assyria, from the Earliest Times till the Fall of Nineveh* (London, 1875); *Assyrian Discoveries* (1875), an account of his own travels and researches; *The Assyrian Eponym Canon* (London, 1876); *History of Babylonia*, ed. by A. H. Sayce (1877); *History of Sennacherib*, ed. by A. H. Sayee (London, 1878), a work similar to the *History of Asshurbanipal*; and numerous articles in the *Transactions of the Society of Biblical Archæology*, etc. D. G. LYON.

Smith, GEORGE ADAM, D. D.: clergyman and author; b. in Calcutta, India, Oct. 19, 1856; was educated at the University and New College, Edinburgh, and the Universities of Tübingen and Leipzig; traveled twice extensively in Egypt and the Holy Land; was assistant in Brechin Free church 1880; in charge of the chair of Hebrew in Free Church College, Aberdeen, 1880–82; first minister of Queen's Cross church, Aberdeen, 1882–92; since 1892 Professor of Hebrew and Old Testament Exegesis in Free Church College, Glasgow. Dr. Smith has published *The Book of Isaiah* in *The Expositor's Bible* (London and New York, vol. i.,

1888; 7th ed. 1894; vol. ii., 1890; 3d ed. 1894); *The Preaching of the Old Testament to the Age* (London and New York, 1893); *The Historic Geography of the Holy Land* (London and New York, 1894); with Bartholomew, the Scottish cartographer, *Historical Atlas of the Holy Land* (1895); and many articles for reviews. C. K. Hoyt.

Smith, Gerrit: philanthropist; b. at Utica, N. Y., Mar. 6, 1797; son of Peter Smith, a proprietor of vast tracts of land in Central and Northern New York; graduated at Hamilton College 1818; took up his residence at Peterboro, Madison co., N. Y., devoting himself to the management of his great landed estate; became a member of and liberal contributor to the Colonization Society 1825, but withdrew from it 1835, when he connected himself with the American Anti-Slavery Society, of which he was thenceforth one of the leading members; was elected to Congress 1852, but resigned after a single session; was a liberal contributor to the Free-soil campaign in Kansas; gave pecuniary aid to John Brown 1859 when preparing the attack on Harper's Ferry, though, it is believed, without a knowledge of that project; was nominated for Governor of New York in 1840 and in 1858, at the latter time on a platform of abolition and prohibition; joined Horace Greeley in signing the bail-bond of Jefferson Davis 1867; wrote, printed, and distributed many pamphlets on slavery and other reforms, built a non-sectarian church at Peterboro, in which he sometimes preached. D. in New York, Dec. 28, 1874. Author of *Speeches in Congress* (1855); *Sermons and Speeches* (1861); *The Religion of Reason* (1864); *The Theologies* (1866); and *Nature the Base of a Free Theology* (1867). See his *Biography*, by Frothingham (New York, 1878).

Smith, Goldwin, LL. D., D. C. L.: author; b. at Reading, England, Aug. 13, 1823; educated at Eton and at Oxford, where he graduated in 1845, and became a fellow of University College in 1847; called to the bar in 1847, but never practiced law. In 1850 he was appointed by the Government assistant secretary of the royal commission on the state of Oxford University; was secretary of the second Oxford commission; a member of the popular education commission in 1858; Regius Professor of Modern History in Oxford University 1858–66, and Professor of English and Constitutional History in Cornell University 1868–71. He ably championed the cause of the U. S. Government during the civil war; visited the U. S. in 1864 to deliver a series of lectures, and was given the degree of LL. D. by Brown University. In 1871 he removed to Toronto, Canada; was for a time a member of the senate of Toronto University; edited *The Canadian Monthly* 1872–74, and subsequently founded *The Week* and *The Bystander*, the latter of which is not now published. Since his removal to Canada he has persistently advocated the annexation of that country to the U. S. In addition to numerous magazine articles he has published the following among other works: *Lectures on the Study of History* (1861); *Irish History and Irish Character* (1861); *The Empire* (1863); *Three English Statesmen* (1867); *Cowper* (English Men of Letters Series, 1880); *A Trip to England* (1888); *Jane Austen* (Great Writers' Series, 1890); *Canada and the Canadian Question* (1891); *The Moral Crusader, William Lloyd Garrison* (1892); *The United States* (1893); *Bay Leaves: Translations from the Latin Poets* (1893); *Essays on Questions of the Day* (1894); and *Guesses at the Riddle of Existence* (1896).

Smith, Green Clay: soldier; b. at Richmond, Ky., July 2, 1830; served as a volunteer in the Mexican war, gaining the rank of lieutenant of cavalry; graduated at Transylvania University 1850, and at Lexington, Ky., Law School; became a lawyer at Covington; was a member of the Kentucky Legislature 1861, and a decided Union man; became colonel of the Fourth Kentucky (Union) Cavalry Mar., 1862, and brigadier-general of volunteers June, 1862; resigned Dec. 1, 1863; was a member of Congress 1863–66; a delegate to the Baltimore convention 1864; Governor of Montana Territory 1866–68; entered the Baptist ministry, and was ordained in 1869. Presidential candidate on the Prohibition ticket 1876. D. in Washington, D. C., June 29, 1895.

Smith, Gustavus Woodson: soldier; b. in Scott co., Ky., Jan. 1, 1822; graduated from the U. S. Military Academy July 1, 1842; appointed to the Engineer Corps, and for two years engaged in the construction of fortifications of New London harbor; Assistant Professor of Engineering at West Point 1844–46; commanded the sappers, miners, and pontoniers during the siege of Vera Cruz and during the subsequent operations of the war with Mexico, receiving the brevets of first lieutenant and captain for gallantry at Cerro Gordo and Contreras. He was principal Assistant Professor of Engineering at West Point 1849–54, when he resigned from the army. He was subsequently employed in the construction of various Government buildings and in the iron-works of Cooper & Hewitt at Trenton, N. J. In 1858 he became street commissioner of New York city; early in 1861 he entered the Confederate army, and in August was appointed a major-general. On May 31, 1862, Gen. Johnston having been severely wounded that day at Fair Oaks, Gen. Smith succeeded to the temporary command of the Army of Northern Virginia, and subsequently commanded at Petersburg, Va. In 1864–65 he was commander of the State forces of Georgia, and was captured at Macon, Ga., Apr. 20, 1865. From 1866 to 1870 he was in charge of the Southwest Iron Company's works at Chattanooga, Tenn., and from 1870 to 1876 was insurance commissioner of Kentucky. D. in New York, June 24, 1896. He was the author of many works on life-insurance and on Confederate battles and leaders.

Smith, Hannah: author; b. at Wellington, Shropshire, England. Under the pseudonym of *Hesba Stretton* she has been a prolific author of novels and stories, including *Jessica's First Prayer* (1866); *The Clives of Burcot* (1867); *Paul's Courtship* (1867); *Hester Morley's Promise* (1878); and *Bede's Charity* (1882). H. A. B.

Smith, Henry Boynton, D. D., LL. D.: theologian; b. at Portland, Me., Nov. 21, 1815; graduated at Bowdoin College 1834; was a tutor there 1836–37, and again 1840–41, between which periods he studied theology at Andover, Bangor, Halle, and Berlin; was pastor of the Congregational church at West Amesbury, Mass., 1842–47; Professor of Mental and Moral Philosophy at Amherst College 1847–50; was Professor of Church History in Union Theological Seminary, New York, 1850–54, and of Systematic Theology 1854–74; after that professor emeritus; was moderator of the General Assembly of the (New School) Presbyterian Church 1863–64; delivered at the meeting of that body at Dayton, O., an address on *Christian Union and Ecclesiastical Reunion*, which was directed toward that union with the "Old School" Church which was afterward consummated, and for which he prepared an essay on the doctrinal basis, *The Reunion of the Presbyterian Churches* (1867); was appointed delegate in 1867 to the meeting of the Evangelical Alliance in Amsterdam, for which he prepared a report *On the State of Religion in the United States*; was the founder and editor of *The American Theological Review* (1859–71), consolidated with *The Presbyterian Review* in 1862, and united with *The Princeton Review* in 1872; aided Prof. R. D. Hitchcock in the *Life, Character, and Writings of Edward Robinson* (1864). He published in 1859 a *History of the Church of Christ, in Chronological Tables* (folio); was translator in part, and editor, of Gieseler's *Church History* (4 vols., 1859–63; vol. v. published posthumously in 1880); editor of revised translations of Hagenbach's *History of Christian Doctrine* with large additions (2 vols., 1861–62), and Stier's *Words of the Lord Jesus* (1864–65). D. in New York, Feb. 7, 1877. In that same year his friend Dr. Prentiss edited a collection of his discourses and essays entitled *Faith and Philosophy*. In 1881 his *Memoirs* appeared, edited by his wife, and a briefer biography, by his pupil Prof. Lewis French Stearns, appeared in Boston, 1892. Another pupil, Prof. William S. Karr, of Hartford, edited his *Apologetics* (1882), his *Introduction to Christian Theology* (1883), and his *System of Christian Theology* (1884).
Revised by S. M. Jackson.

Smith, Sir Henry George Wakelyn, usually known as Sir Harry Smith: soldier; b. at Whittlesea, Cambridgeshire, England, in 1788; entered the army as second lieutenant in the rifle-brigade in 1805; served as assistant quartermaster-general in the campaign of Waterloo; commanded a division in the Kaffir war 1834–35; was appointed adjutant-general to the forces in India 1839; was distinguished at the battles of Gwalior and Maharajpur, being knighted for the latter service 1844; took a prominent part in the war against the Sikhs in the Punjaub; was sent to the relief of Ludhiana, and took Aliwal at the point of the bayonet Jan. 28, 1846, capturing sixty-seven guns; re-enforced Lord Gough in time to enable him to win the decisive battle of Sobraon, Feb. 10, 1846; received the thanks of Parliament on the proposal of the Duke of Wellington, and was made a baronet; became governor of the Cape of Good Hope 1847; conducted the Kaffir war of 1851–52, and was made lieutenant-general 1854. D. in London, Oct. 12, 1860.

Smith, Hoke: lawyer and journalist; b. at Lincolnton, Lincoln co., N. C., Sept. 2, 1855; son of H. H. Smith, a native of New Hampshire, and for several years a professor in the University of North Carolina; educated at the University of Georgia; went to Atlanta 1872 to study law; also taught school at Waynesboro, Ga.: admitted to the bar at Atlanta 1873; canvassed Northern Georgia 1877, urging the removal of the State capital from Milledgeville to Atlanta; organized and became president of the Atlanta *Evening Journal* Company 1887; made the paper very popular in the State through his advocacy in its columns of a low tariff. Was Secretary of the Interior 1893–96.

Smith, Horace: humorist and poet; b. in London, England, Dec. 31, 1779; became a member of the Stock Exchange, in which business he acquired a fortune; was associated with his brother James in writing for several periodicals and in the production of a celebrated volume of poetical parodies entitled *Rejected Addresses* (1812); was author of numerous novels which had but moderate success, and of an anonymous volume of humorous prose sketches, *The Tin Trumpet* (1836). A collection of his poems was published at London in 1846. D. at Tunbridge Wells, July 12, 1849. A selection from the poetical works of both brothers, including the *Rejected Addresses*, and accompanied by a *Memoir*, was published by Epes Sargent (New York, 1857).

Smith, Horace: See the Appendix.

Smith, James: signer of the Declaration of Independence; b. in Ireland about 1720; was taken to Pennsylvania by his parents, who settled on the Susquehanna 1729; was educated at the College of Philadelphia; became at first a surveyor near Shippensburg, afterward a lawyer at York; raised in 1774 the first volunteer company in the State for the purpose of resistance to Great Britain; was a member of the convention called to consider the expediency of abstaining from importing English goods, and one of the committee to prepare instructions for the representatives; published an *Essay on the Constitutional Power of Great Britain over the Colonies in America*, which gave a powerful impulse to the Revolution; was elected to the Continental Congress 1775–78; signed the Declaration of Independence, and was elected to the General Assembly of Pennsylvania 1780. D. at York, July 11, 1806. He was a man of great wit, and his odd gestures and drawling utterance added to the effect of his droll speeches.

Smith, John: adventurer; b. at Willoughby, Lincolnshire, England, in Jan., 1579; spent four years of his early manhood in military service in the Netherlands; was afterward, according to his own account, engaged in wars against the Turks in Hungary and Transylvania, but there is reason to believe that his wonderful adventures in the East are wholly or in part fictitious. Returning to England, by way of Barbary, he was induced by Capt. Bartholomew Gosnold to take part in the colonization of Virginia (1606), then being carried into effect, and brought to bear with such effect his military renown upon the directory of the "London Company" that his name was placed on the secret list of seven persons appointed members of the council. During the long voyage to Virginia (1607) Smith was placed under arrest on an accusation of sedition, and, though liberated on arrival at Jamestown, Va., where the colony was located, he was excluded from his place in the council. He accompanied Capt. Newport in his voyage of exploration up James river as far as the present site of Richmond; was on their return admitted as a member of the council; took part in the disturbance which resulted in the removal from office of Wingfield, the president of the colony, against whom he successfully brought a suit for slander; was intrusted with the command of several expeditions into the interior, partly for the purpose of exploration, but chiefly with the object of obtaining food. He repressed with severity the projects of some of the settlers to return to England; upon which charge he caused Capt. George Kendall to be condemned and executed. Upon one of these expeditions, in Dec., 1607, Smith was taken prisoner, and detained for some time, though kindly treated by the Indian chieftain Wahunsenacawh (incorrectly called by many writers the "emperor" Powhatan). The famous incident of the preservation of his life by Pocahontas (or Amonate) was related of this captivity, but there is little doubt that the whole adventure is fictitious. On being carried back to Jamestown by the Indian chieftain, Smith was tried by his fellow councilors for the death of two of his companions, said to have been killed by the Indians through his imprudence, and was condemned to be executed the next day, but his life was saved by the opportune arrival of Capt. Newport with re-enforcements and provisions. In the following year Smith made two extended surveys of Chesapeake Bay and its tributary waters, of which he made a map; became president of the council Sept., 1608; had several skirmishes with hostile Indians, who at one time meditated the destruction of Jamestown. His departure from Virginia, to which he never returned, took place in Sept., 1609, and was attributed by himself to his having been burned by an explosion of gunpowder, but another account states that he was sent to England a prisoner. In 1614 he explored with two ships fitted out by some London merchants a large portion of the North American coast, to which he gave the name of New England, and of which he formed a tolerably accurate map, and made a handsome profit by fishing and fur-trading. In 1615 he undertook another voyage to New England for the purpose of founding a colony, but was captured by a French man-of-war and taken to Rochelle. Afterward he claims to have been engaged in "sea-fights for the French against the Spaniards," and to have experienced several remarkable adventures. About 1616 he received the title of admiral of New England, and was thenceforth much engaged in promoting American colonization by means of a series of publications on America, written either by or for him, in which romantic versions of his career in many lands were put forth; but many of the details are contradicted by conclusive proofs, and his several books and pamphlets are not consistent with one another upon some important points. D. in London, June 21, 1631, and was buried in the choir of St. Sepulchre's church. Under the name of *Thomas Watson*, Smith sent from Virginia *A True Relation of such Occurrences and Accidents of Note as hath happened in Virginia, etc.* (London, 4to, 1608), which was printed in black letter, accompanied by a map, and is the earliest tract published on the subject. It was reprinted, with an introduction and notes, by Charles Deane (Boston, 1867). He was also author of *A Map of Virginia, with a Description of the Country, the Commodities, the People, Government, and Religion, etc.* (Oxford, 1612); *A Description of New England, or the Observations and Discoveries of Captain John Smith (Admiral of that Country) in the North of America in the Year of our Lord 1614, etc.* (London, 1616; reprinted in vol. vi., 3d series of the *Collections* of the Massachusetts Historical Society, and in Force's *Tracts*; *New England's Trials, etc.*, 1620 and 1622); *The Generall Historie of Virginia, New England, and the Summer Isles* (1626)—a work including the substance of its predecessors; two treatises on seamanship (1626 and 1627); *The True Travels, Adventures, and Observations of Captain John Smith in Europe, Asia, Africa, and America from 1593 to 1629, etc.* (1630); and *Advertisements for the Unexperienced Planters of New England, etc.* (1631; reprinted at Boston, 1865); and was engaged at the time of his death upon a *History of the Sea*, no part of which has been preserved. The *Generall Historie* and *True Travels* were republished together at Richmond (2 vols., 1829). A *Letter of John Smith to Lord Bacon*, written in 1618 to recommend to the chancellor's attention the fisheries of New England, was first printed in the New York *Historical Magazine* for 1861. There are biographies by George S. Hillard (in Sparks's Series, vol. ii.), W. G. Simms (1846), and George C. Hill (1858). Much light was thrown upon his career by the Hakluyt Society's publication of Strachey's *History of Travails into Virginia Britannia* (1849) from the original MS., and by Charles Deane's notes to his edition of Wingfield's *Discourse of Virginia* (Boston, 1859), in which publications the falsity of the Pocahontas legend was first exposed. In Bryant and Gay's *Popular History of the United States* (vol. i., 1876) judicious use has been made of the materials above mentioned.

Revised by C. K. Adams.

Smith, John Lawrence, M. D., M. N. A. S.: chemist; b. near Charleston, S. C., Dec. 17, 1818; graduated at the University of Virginia, and at the Medical College of the State of South Carolina 1840; acted as civil engineer on the Charleston and Cincinnati Railroad; pursued his professional studies in France and Germany; began in 1844 the practice of medicine at Charleston, S. C., where he delivered lectures on toxicology; mining engineer (1846–51) to the Turkish Government; aided in the development of cotton-growing in Asia Minor; was instrumental in the discovery of deposits of emery and corundum in the U. S.; invented in 1851 the inverted microscope; was elected in that year

Professor of Chemistry in the University of Virginia; removed to Louisville, Ky.; became a professor in the Medical University of that city; was U. S. commissioner to the Universal Exposition of Paris (1867), Vienna (1873), and Philadelphia (1876); was in 1872 president of the American Association for the Advancement of Science; was a member of the National Academy of Science and of numerous associations; received from the Emperor Napoleon III. the cross of the Legion of Honor; was author of a report to the U. S. Government on *The Progress and Condition of Several Departments of Industrial Chemistry* (1867), as seen at the Paris Exposition, and *Mineralogy and Chemistry* (Louisville, 1873). D. in Louisville, Ky., Oct. 12, 1883.

Smith, John Pye: clergyman and author; b. at Sheffield, England, May 25, 1774; studied at the Independent Academy at Rotherham; became a Dissenting (Independent) minister, and in 1800 resident classical tutor in the theological academy at Homerton; exchanged that post in 1813 for the divinity tutorship, which he filled until 1843; was again classical tutor, and also principal, from the latter date until 1850. For forty-three years he was pastor of the Gravel Pits Chapel, Homerton; took great interest in science, and was elected a fellow of the Royal Society. D. at Guildford, Surrey, Feb. 5, 1851. He was the author of *The Scripture Testimony to the Messiah* (2 vols., 1818–21); *The Mosaic Account of the Creation and Deluge illustrated by the Discoveries of Modern Science* (1837); *Scripture and Geology* (1839); and other works. See *Memoirs of the Life and Writings of John Pye Smith*, by J. Medway, 1853.

Smith, John William: legal writer; b. in London, England, Jan. 2, 1809; educated at Trinity College, Dublin; began practice as a special pleader 1831, and was called to the bar at the Inner Temple May 3, 1834; was made a revising barrister in 1840. He was gifted with a remarkable memory, and powers of nice discrimination and lucid exposition. D. in London, Dec. 17, 1845. Besides a *Compendium of Mercantile Law* (1834) and *A Selection of Leading Cases in Various Branches of the Law* (2 vols., 1837–40; 9th ed. 1889), which are of the highest authority, he wrote *An Elementary View of the Proceedings in an Action at Law*, *Law of Landlord and Tenant*, and other less important works. See *Memoirs* in *Blackwood's Magazine* (Feb., 1847), *Law Magazine* (Feb., 1846), and *Albany Law Journal* (Dec., 1872).

F. Sturges Allen.

Smith, Joseph, Jr.: Mormon prophet; b. at Sharon, Vt., Dec. 23, 1805; removed while a child, with his parents, to Palmyra, N. Y., where he grew up almost without education, leading an idle and rather disreputable life. According to his own account, he began to have visions at the age of fifteen, and on Sept. 21, 1823, the angel Moroni appeared to him, announcing that God had a work for him to perform, and that buried in the earth in a certain spot a few miles distant was a record inscribed upon gold plates, giving an account of the early inhabitants of America and of their fate; and with this record would be found a kind of spectacles through which alone the writing could be read. Four years after, the angel placed the plates in his hands, together with the spectacles. Smith described the plates as being about 8 inches long, 7 wide, and connected by rings so as to form a volume about 6 inches thick. The plates were inscribed on both sides with hieroglyphic characters in a language no longer extant, but which he was able to decipher and understand by the use of the miraculous spectacles, which he called the Urim and Thummim. Smith professed to have dictated in English the contents of these plates to Oliver Cowdery, who acted as his amanuensis, the plates themselves mysteriously disappearing as they were successively transcribed. The manuscript thus prepared was printed at Palmyra in 1830 under the title, *The Book of Mormon, an Account written by the Hand of Moroni upon Plates taken from the Plates of Nephi. By Joseph Smith, Jr., Author and Proprietor*; and to it was prefixed a certificate signed by Cowdery and two others to the effect that they had seen and handled the plates. Subsequently, all three of the witnesses fell out with Smith, and declared the whole matter to be a hoax. Smith had been joined by Sidney Rigdon, a printer by trade, who had also aspired to found a new religion, and the two gained a small body of followers, and in 1831 went to Kirtland, O., where they built a temple and set up a fraudulent bank. They were driven away by the citizens in 1838. Smith had in the meantime fixed upon a place in Missouri as the site of his New Jerusalem, and here his adherents had begun to gather; but becoming obnoxious to the surrounding inhabitants, they abandoned their settlement, and took refuge in Hancock co., Ill., where in 1840 they established themselves in a fine location at the bend of the Mississippi, calling their new home Nauvoo; the town increased so rapidly that in six years the population numbered 15,000. Here Smith soon began to put forth, as occasion demanded, a succession of new revelations, among others one establishing polygamy as an essential feature of the Church of the Latter-Day Saints, and combining in his own person all civil, military, municipal, and sacerdotal authority. A newspaper was set up to oppose him; the presses were destroyed by Smith and his adherents May 6, 1844; warrants were issued for his arrest and that of his brother Hyrum and some others; they refused to obey the writs; the State militia were called out; the Mormons armed themselves, and a conflict was imminent. The Governor of Illinois at length induced the Smiths to surrender and submit to trial, guarantying their personal safety in the interval. They were committed to jail at Carthage, the county-town, and a guard was placed for their protection. On the evening of May 27 a mob assembled, dispersed the guard, and began firing into the door and window of the jail. Hyrum Smith was shot dead; Joseph returned the fire with a revolver until his charges were exhausted, when he endeavored to make his escape by the window, but was shot in the attempt, and fell dead to the ground. See Mormons and Rigdon, Sidney. Revised by S. M. Jackson.

Smith, Joshua Toulmin: author; b. in Birmingham, England, May 29, 1816; educated in the public schools of Birmingham; devoted himself to the Scandinavian languages and literature, in which he became proficient; resided in the U. S. 1837–42; published at Boston his *Northmen in New England, or America in the Tenth Century* (1839), which was chiefly a translation from the *Antiquitates Americanæ* (1837); devoted himself, on his return to England, to the study of constitutional and Old Saxon law; was called to the bar 1849; wrote several able legal treatises, especially *The Parish, its Obligations and Powers, its Officers and their Duties* (1854); illustrated in several publications the antiquities of Birmingham, and undertook the preparation for the Early English Text Society of a *History of English Guilds*, a work of immense labor, which, as well as a projected *History of Birmingham*, was left incomplete at the time of his death, which occurred at Lancing, Sussex, Apr. 28, 1869. The *History of English Guilds*, edited by his daughter, Lucy Toulmin Smith, appeared in 1870.

Smith, Judson, D. D.: clergyman; b. at Middlefield, Mass., June 28, 1837, graduated at Amherst College 1859, and at the Oberlin Theological Seminary 1863. He was Professor of Latin in Oberlin College 1866–70, and of Ecclesiastical History in Oberlin Theological Seminary 1875–84. In 1884 he was made a secretary of the A. B. C. F. M., Boston, Mass. He is the author of two volumes of historical lectures (privately printed) and of various articles in reviews and other journals, and since 1882 has been one of the editors of the *Bibliotheca Sacra*. G. P. Fisher.

Smith, Munroe, J. U. D.: professor of Roman law; b. in Brooklyn, N. Y., Dec. 8, 1854; A. B., Amherst, 1874; LL. B., Columbia, 1877; studied at Berlin, Leipzig, and Göttingen Universities 1877–80 (J. U. D., Göttingen); lecturer on Roman Law, Columbia College, 1880–91; Professor of Roman Law and Comparative Jurisprudence since 1891; instructor in history 1880–83; Adjunct Professor of History 1883–91; contributor to *Johnson's Universal Cyclopædia*, *The Nation*, etc., and managing editor *Political Science Quarterly* 1886–93. C. H. Thurber.

Smith, Nathan Ryno, M. D., LL. D.: surgeon; b. at Cornish, N. H., May 21, 1797; graduated at Yale College 1817; took the degree of M. D. at New Haven 1823; was Professor of Anatomy and Surgery in the University of Vermont in 1825; on the organization of the Jefferson Medical College in Philadelphia, became the Professor of Anatomy, but in 1827 accepted the chair of Surgery in the University of Maryland; in 1838 became Professor of Practical Medicine in the Transylvania University, Lexington, Ky.; in 1840 returned to the University of Maryland; invented a method of lithotomy, an excellent suspensory apparatus for fractured inferior extremities, and wrote *Surgical Anatomy of the Arteries* (1832) and other medical works. D. in Baltimore, Md., July 3, 1877. Revised by S. T. Armstrong.

Smith, Richard Somers: soldier and educator; b. in Philadelphia, Pa., Oct. 30, 1813; graduated at the U. S.

Military Academy July 1, 1834; assigned to the Second Infantry as brevet second lieutenant, but served on topographical duty until 1836, when he resigned to follow the profession of civil engineering. In 1840 he was reappointed in the army, with rank of second lieutenant of infantry; first lieutenant 1846; transferred to the Fourth Artillery 1848. He was Assistant Professor of Drawing at the Military Academy 1840–55; resigned from the army, and was Professor of Mathematics and Drawing in the Brooklyn Polytechnic Institute, which position he retained until 1859. From 1859 to 1861 he was a director of the Cooper Union; on May 14 of the latter year he re-entered the army, with rank of major, and was assigned to the Twelfth Infantry. He served on mustering and disbursing duty until the latter part of 1862, when he rejoined his regiment, and was engaged in the battle of Chancellorsville May 2–4, 1863. Soon after this (May 30) he relinquished his commission to accept the presidency of Girard College, Philadelphia, and held that position until 1868. He was Professor of Civil Engineering in the Polytechnic College of the State of Pennsylvania 1868–70; Professor of Mathematics 1870–73; and 1873–77 at the head of the department of drawing at the U. S. Naval Academy at Annapolis. In 1857 Columbia College conferred upon him the degree of A. M. He was the author of *A Manual of Topographical Drawing* (Philadelphia, 1854) and *Manual of Linear Perspective* (1857). D. at Annapolis, Md., Jan. 23, 1877.

Smith, Richmond Mayo, Ph. D.: economist; b. at Troy, O., Feb. 9, 1854; A. B., Amherst College, 1875; studied at the Universities of Berlin and Heidelberg 1875–77; assistant in history, Columbia College, 1877–78; adjunct professor 1877–83; Professor of Political Economy and Social Science, Columbia College, since 1883; member of the National Academy of Science; honorary fellow Royal Statistical Society; member of the International Statistical Institute; author of *Statistics and Economics* (1888); *Emigration and Immigration* (1890); and numerous magazine articles.

Smith, Robert: mathematician; b. in England in 1689; took orders in the Church of England; succeeded his cousin and friend, Roger Cotes, as Professor of Astronomy at Cambridge 1716; edited Cotes's works with commentaries; published *A Complete System of Optics* (2 vols., 1738) and *Harmonics, or the Philosophy of Musical Sounds* (1749), and succeeded Bentley as master of Trinity College 1742. D. at Cambridge, Aug., 1768. By his will he left £2,000 to Trinity College and £2,500 to the university for the support of the astronomical professorship and the maintenance of two annual prizes (since called the Smith prizes) for proficiency in mathematics and natural philosophy.

Smith, Robert: brother of Gen. Samuel Smith; b. at Carlisle, Pa., Nov., 1757; served as a volunteer at Brandywine; graduated at Princeton 1781; studied law, which he practiced with distinction at Baltimore; was for some years a member of the Maryland Legislature; was Secretary of the Navy in the cabinet of President Jefferson 1802–05, Attorney-General Mar.–Dec., 1805, and Secretary of State under President Madison 1809–11; was for several years president of the American Bible Society and of the Maryland Agricultural Society, and provost of the University of Maryland. Author of an *Address to the People of the United States* (1811). D. in Baltimore, Nov. 26, 1842.

Smith, Robert Barnwell: See Rhett.

Smith, Robert Payne, D. D.: clergyman and author; b. in Gloucestershire, England, Nov., 1818; graduated with honors at Oxford 1841; took orders in the Church of England; became sub-librarian of the Bodleian Library, Oxford, 1857; canon of Christ Church and Regius Professor of Divinity, Oxford, 1865; Dean of Canterbury, in succession to Henry Alford, 1871. He published (in Latin) a *Catalogue* of the Syriac MSS. in that library; edited and translated from the Syriac the *Commentary* of Cyril of Alexandria on Luke (1858); translated from the same language the *Ecclesiastical History* of John of Ephesus (1860); commenced in 1868 for the delegates of the Clarendon Press a *Syriac Lexicon*, based on that of Castell (10th fasciculus 1895); is author of *The Authenticity and Messianic Interpretation of the Prophecies of Isaiah vindicated in a Course of Sermons preached before the University of Oxford* (1862); *Prophecy a Preparation for Christ* (1865), being the Bampton lectures for that year; *Exposition of the Historical Portions of the Writings of Daniel* (1886); and the commentary on Jeremiah in the series known as *The Speaker's Commentary*, on Isaiah in the *Commentary* of the Society for the Promotion of Christian Knowledge, on Samuel in *The Pulpit Commentary*, and on Genesis in *Bishop Ellicott's Commentary*. He visited the U. S. as a delegate to the general conference of the Evangelical Allianee in Oct., 1873. He was a member of the Old Testament revision eompany. D. Apr. 1, 1895.

Revised by S. M. Jackson.

Smith, Samuel: soldier; b. at Lancaster, Pa., July 27, 1752; removed in childhood to Baltimore; was some years in his father's counting-house; became a captain in Smallwood's Maryland regiment Jan., 1776: participated in the battles of Long Island, Harlem, and White Plains, and in the retreat through New Jersey; beeame major in Gist's battalion Dec. 10, 1776, and lieutenant-colonel 1777; was at the attack on Staten Island and at the battle of Brandywine; was placed by Washington in command of Fort Mifflin, which he gallantly defended from Sept. 26 to Nov. 11, when he was severely wounded and forced to remove to the Jersey shore; received the thanks of Congress and an elegant sword; was at Valley Forge and at the battle of Monmouth, after which he resigned his commission in the army, but continued to serve as colonel of militia; was a member of the Maryland constitutional eonvention 1776; member of Congress 1793–1803 and 1816–22; U. S. Senator 1803–15; and again 1822–33, serving much of the time as chairman of the finance committee, and occasionally as president *pro tempore* of the Senate; was major-general of militia at the defense of Baltimore against the British 1814; quelled a formidable mob in 1835, and was thereupon elected mayor. D. in Baltimore, Apr. 22, 1839.

Smith, Samuel Francis, D. D.: author and editor; b. in Boston, Mass., Oct. 21, 1808; graduated at Harvard 1829; studied theology at Andover Seminary; became a Baptist clergyman 1832; edited *The Baptist Missionary Magazine* at Boston 1832–33; was a prominent contributor to Dr. Lieber's *Encyclopædia Americana*; was pastor of a church at Waterville, Me., and Professor of Modern Languages in Waterville College 1834–42; pastor at Newton, Mass., 1842–54; edited *The Christian Review* 1842–49, and for many years was editor of the publications of the Baptist Missionary Union. He published (with Rev. Baron Stow) *The Psalmist* (1843); edited a volume of *Lyric Gems* (1844); wrote a *Life of Rev. Joseph Grafton* (1845); and is author of many well-known songs and hymns, including *My Country, 'tis of Thee* and *The Morning Light is Breaking*. On Apr. 3, 1895, he was given a very enthusiastic reeeption in Music Hall, Boston, and in many parts of the country the public-school children observed the day by singing his famous song. D. suddenly in Boston, Mass., Nov. 16, 1895.

Smith, Samuel Stanhope, D. D., LL. D.: educator; son of Rev. Dr. Robert Smith (1723–93); b. at Pequea, Pa., Mar. 16, 1750; graduated at Princeton 1769; was edueated at, and became a teacher in, his father's classical academy, pursuing meanwhile the study of theology; was tutor at Princeton 1770–73; was ordained to the Presbyterian ministry 1774; labored as a missionary in Western Virginia; was the first president of Hampden-Sidney College 1775–79; became Professor of Moral Philosophy at Prineeton 1779, also Professor of Theology 1783; vice-president of the college 1786, and president 1795; was a member of the committee appointed to draw up a system of government for the Presbyterian Church 1786; was an eloquent and effective pulpit orator and distinguished for courtly manners; published *An Essay on the causes of the Variety of Complexion and Figure of the Human Species* (Philadelphia, 1787); *Sermons* (Newark, N. J., 1799); *Lectures on the Evidences of the Christian Religion* (Philadelphia, 1809); *Lectures on Moral and Political Philosophy* (2 vols., Trenton, N. J., 1812); and *Comprehensive Views of Natural and Revealed Religion* (New Brunswick, N. J. (1815); completed the *History of the United States* (Philadelphia, 1816–17) begun by his brother-in-law, Dr. David Ramsay, and published a number of separate sermons and discourses. He married a daughter of his predecessor, Dr. Witherspoon; resigned the presidency on aceount of ill health 1812. D. at Princeton, Aug. 21, 1819. Two volumes of his *Sermons* were published posthumously in Philadelphia, 1821, preceded by a brief memoir.

Revised by S. M. Jackson.

Smith, Seba: journalist and humorist; b. at Buckfield, Me., Sept. 14, 1792; graduated at Bowdoin College 1818; became a journalist at Portland, editing successively the *Argus*, *Family Recorder*, and *Daily Courier*; married Miss Elizabeth Oakes Prince 1823; won a wide reputation as a

humorist by his *Letters of Major Jack Downing* (1833); lost his property 1839; settled in New York 1842; devoted himself successfully to literature, as did also his wife (see SMITH, ELIZABETH OAKES): published *Dewdrops of the Nineteenth Century* (1846); *My Thirty Years out of the Senate* (1859): *Powhatan, a Metrical Romance* (1841); *New Elements of Geometry* (1850); and *Way Down East, or Portraitures of Yankee Life* (1855); besides a vast number of uncollected verse and prose essays which appeared in various periodicals. D. at Patchogue, L. I., July 29, 1868.

Revised by H. A. BEERS.

Smith, SYDNEY: clergyman and author; b. at Woodford, Essex, England, June 3, 1771; was educated at Oxford, where in 1792 he became a fellow of New College; resided a few months in Normandy, where he mastered the French language, and in 1794 became curate of a lonely parish on Salisbury Plain. In 1796 he went to Edinburgh, where he remained five years, officiating in an Episcopal chapel; became intimate with Brougham, Jeffrey, and other brilliant young men, who in 1802 started *The Edinburgh Review*, Smith acting as original editor and contributing seven articles to the first number. Soon after this he went to London, where he became a popular preacher, and in 1804–06 delivered courses of lectures on moral philosophy, contributing also to *The Edinburgh Review* until 1827. In 1806 he was presented with the living of Foston-le-Clay, in Yorkshire, worth £500 a year, but situated in a desolate region. In 1809 he went to Heslington, near York, leaving Foston in charge of a curate, hoping to exchange it for a more desirable benefice. Not succeeding in this, he returned in 1814, built a comfortable rectory, in which he lived until 1828, when the chancellor, Lord Lyndhurst, appointed him canon of Bristol, and gave him the rectory of Combe-Florey. In 1831 he was made resident canon of St. Paul's, upon which he took up his abode in London, where he passed the remainder of his life in the discharge of his official duties, in literary labor, and in the pleasures of society, in which he was a great favorite for his wit and rare conversational powers. D. in London, Feb. 22, 1845. Among his most characteristic productions are his *Letters on the Subject of the Catholics, to my brother Abraham, who lives in the Country, by Peter Plymley* (1807–08; published anonymously), which had a large share in bringing about Roman Catholic emancipation. He published several volumes of sermons, many occasional discourses, and political and social essays. His early lectures on moral philosophy were edited by Francis Jeffrey, and published under the title *Elementary Sketches of Moral Philosophy* (1849). Several volumes of selections from his various works have appeared, the best of which is *Wit and Wisdom of Rev. Sydney Smith*, accompanied by a biographical sketch and notes, by Evert A. Duyckinck (1856). His memoirs have been written by his daughter, the wife of Sir Henry Holland (1855). Also see *Life and Times of Sydney Smith* (London, 1884), by Stuart J. Reid.

Smith, Rev. WALTER C.: See the Appendix.

Smith, WILLIAM: geologist; b. at Churchill, Oxfordshire, England, Mar. 23, 1769; in the practice of his profession as mineral surveyor was led to notice and make maps of the succession of geological strata; he published a *Tabular View of the Order of the Strata, and their Imbedded Organic Remains, in the Neighborhood of Bath* (1799); *Mineral Survey, or Delineations of the Strata of England and Wales* (1815, with sixteen colored maps); *Strata identified by Organized Fossils* (1816–19); *Stratigraphical System of Organized Fossils* (1817); issued between 1819 and 1824 no less than twenty-one colored geological maps of English counties; delivered lectures in most of the provincial towns of England; superintended the model farm of Sir John V. B. Johnstone at Hackness, Yorkshire, 1828–34; received from the Geological Society of London the first Wollaston medal for his important discoveries, and in his later years received a pension of £100 a year. He discovered and was first to apply the principle of the classification and correlation of formations by means of their contained fossils, and has hence been called "the father of English geology." D. at Northampton, Aug. 28, 1839. Revised by G. K. GILBERT.

Smith, Sir WILLIAM: editor and author; b. in London, England, May 20, 1813; graduated in London University; studied law at Gray's Inn, but never practiced; was for some years Professor of Greek, Latin, and German in the Independent colleges of Highbury and Homerton, and on their consolidation as New College, St. John's Wood, accepted the professorship of the Greek and Latin Languages and Literature; became classical examiner in the University of London in the year 1853, and editor of *The Quarterly Review* in 1867. He is widely known by his exeellent series of classical dictionaries, having published those upon *Greek and Roman Antiquities* (1840; 2d ed., enlarged and revised, 2 vols., 1891), *Biography and Mythology* (1849), and *Geography* (1852–57), as well as by his *Dictionary of the Bible* (1860–63) and *Dictionary of Christian Antiquities.* He prepared numerous classical schoolbooks, an *English-Latin Dictionary* (1870), a *Biblical and Classical Atlas* (1875), and a series of *Students' Manuals* of ancient and modern history, etc. He was knighted in 1892. D. Oct. 7, 1893. Revised by A. GUDEMAN.

Smith, WILLIAM ANDREW, D. D.: preacher and educator; b. at Fredericksburg, Va., Nov. 29, 1802; became a preacher of the Methodist Episcopal Church South; in 1846 became president of Randolph-Macon College; in 1866 resigned, and after serving as pastor two years became president of Central College; was a leading member of every General Conference from 1832 to 1866; was appointed at the General Conference of 1866 one of the commissioners on the part of the Southern Church to settle the property question with the Northern Church; wrote *Lectures on the Philosophy and Practice of Slavery* (Richmond, 1860), which may be considered as the fullest and ablest presentation of the pro-slavery view of the question. D. at Richmond, Va., Mar. 1, 1870. Revised by A. OSBORN.

Smith, WILLIAM FARRAR: soldier; b. at St. Albans, Vt., Feb. 17, 1824; graduated at the U. S. Military Academy July 1, 1845; appointed brevet second lieutenant of topographical engineers; served as Assistant Professor of Mathematics at West Point, on several surveys, and on lighthouse-construction duty; in July, 1861, was appointed colonel of the Third Vermont, and was engaged in the first battle of Bull Run on the staff of Gen. McDowell. Commissioned brigadier-general of volunteers (Aug. 13), he served in the defenses of Washington until Mar., 1862, and in the Virginia Peninsular campaign of 1862; promoted to be major-general of volunteers July 4, 1862, he led his division in the Maryland campaign, at South Mountain, and Antietam. In Nov., 1862, he was assigned to the command of the Sixth Corps, and engaged at Fredericksburg; transferred to Ninth Corps Feb., 1863. In Oct., 1863, he became chief engineer of the department of the Cumberland and in November of the division of the Mississippi. In Mar., 1864, he was confirmed as major-general of volunteers, and in May assigned to the Eighteenth Corps; on special duty under orders of the Secretary of War Nov., 1864–Dec., 1865. In Nov., 1865, he resigned his volunteer commission, and in Mar., 1867, his commission as major of engineers in the regular army. He was breveted from lieutenant-colonel to major-general; president of the International Telegraph Company 1864–73; appointed police commissioner New York city 1875; president of the board Dec., 1875–Mar., 1881; civil engineer in service of the U. S. since 1881; by act of Congress of Feb., 1889, reappointed major U. S. army, and was retired Mar. 1, 1889.

Smith, WILLIAM LOUGHTON, LL. D.: b. in Charleston, S. C., 1758; educated in England and Switzerland; returned to Charleston in 1783; was a member of Congress 1789–97; an able supporter of the administration of Washington and Adams, and an active opponent of Jefferson, against whom he published a pamphlet; was minister to Portugal 1797–1800, and to Spain 1800–1801. D. in South Carolina in 1812. Author of a volume of *Speeches*, published in London 1794, an *Address* (1794) to his constituents on the difficulties pending with England, a *Comparative View of the Constitutions of the States* (Philadelphia, 1796), and various other political pamphlets.

Smith, WILLIAM ROBERTSON, D. D., LL. D.: theologian and Orientalist; b. at Keig, Aberdeenshire, Scotland, Nov. 8, 1846; studied at Aberdeen, Edinburgh, Bonn, and Göttingen; was appointed Professor of Hebrew in the Free Church College at Aberdeen in 1870; made an extensive journey in Arabia in 1879–80, which he described in a series of exceedingly interesting letters to *The Scotsman.* In 1881 he was removed from his office by an extraordinary act of the General Assembly on account of his critical views of the Old Testament published in the *Encyclopædia Britannica.* In 1883 he was appointed Professor of Arabic in the University of Cambridge; in 1886 librarian to the university, but exchanged the position for the Adams Arabic professorship in 1889, succeeding William Wright. He was associated with

Prof. T. S. Baynes in editing the *Encyclopædia Britannica* from 1881 till Prof. Baynes's death (1887), when he became sole editor, and finished the work the next year. He was extraordinarily learned and versatile. D. at Cambridge, Mar. 31, 1894. Besides numerous contributions to scientific journals, he published *The Old Testament in the Jewish Church* (London, 1881; 2d ed. 1892); *The Prophets of Israel, and their Place in History to the Close of the Eighth Century B. C.* (1882); *Kinship and Marriage in Early Arabia* (1885); *The Religion of the Semites* (1889; new ed. 1894).

Revised by S. M. Jackson.

Smith, Sir William Sidney: sailor; b. at Westminster, England, in 1764; entered the navy at the age of twelve as midshipman under Lord Rodney; was captain in the Swedish service in the naval war with Russia, and received a Swedish order of knighthood for gallantry in action; served with distinction under Lord Hood at Toulon Dec., 1793; was taken prisoner by the French at Havre 1796, and confined two years in the Temple, Paris, whence he escaped 1798; was given command of a squadron in Turkish waters the same year; captured a French flotilla at St. Jean d'Acre Mar. 16, and successfully defended that fortress against Napoleon May, 1799; proceeded to Egypt; negotiated the treaty of El Arish Jan., 1800; was wounded at the battle of Alexandria 1801; destroyed the Turkish fleet at Abydos 1807; was knighted 1815; became admiral 1821, and lieutenant-general of marines 1830. D. in Paris, May 26, 1840. See his *Life*, by Sir John Barrow (London, 1848).

Smith College: an institution for the higher education of women, at Northampton, Hampshire co., Mass. It was founded in 1871 by Miss Sophia Smith, of Hatfield, Mass., who bequeathed funds to furnish women—in her own words—"with means and facilities for education equal to those which are offered in our colleges for young men," with the ultimate purpose that a woman "may be better qualified to enjoy and do well her work in life, whatever that work may be." Rev. L. Clark Seelye, D. D., LL. D., elected in 1873, has been the only president of the college since its foundation. The college was opened for students in 1875, and the first class numbered fourteen. The curriculum comprises three courses—classical, literary, and scientific—each occupying four years. The institution has also schools of music and art, the course in the former requiring three years and in the latter four years for completion. The college is entirely unsectarian in management and instruction, but students and teachers meet daily for worship, and the study of the Bible is a part of the course. The buildings number eighteen. They comprise College Hall (assembly hall, lecture-rooms, reference library, and offices), Lilly Hall of Science, music hall, Hillyer art gallery (with studios and extensive collections), observatory, botanical plant house, alumnæ gymnasium (the gift of the graduates), president's house, and ten dwelling-houses for students. These buildings are clustered toward the front of the grounds, which stretch a considerable distance in the rear and are ample for outdoor exercise and recreation. The faculty, inclusive of the president, number (1900) seventy-four; undergraduates, 1,131.

E. A. Grosvenor.

Smith's Falls: post-village; Lanark County, Ontario, Canada; on Rideau Canal, and on the Canadian Pacific Railway, at the junction of the Perth Branch (see map of Ontario, ref. 2–H). The chief industry is the manufacture of stoves and agricultural implements. Pop. (1891) 3,864.

Smithson, James: scientist; b. in England about 1765; was a natural son of Hugh Smithson, first Duke of Northumberland; was educated at Oxford, graduating in 1786 under the name of Lewis Macie; was chosen a fellow of the Royal Society in the following year; devoted himself to science, especially in the fields of chemistry and mineralogy, and published many papers in the scientific periodicals. He was a friend and associate of many of the most learned men of his day, not only in Great Britain, but upon the Continent. He lived usually in Paris, where he was an intimate of Arago, and was a familiar figure in the scientific circles of other European capitals. Sometime between 1791 and 1803 he took the name of Smithson. D. in Genoa, Italy, June 27, 1829. For an account of his munificent bequest to the U. S. and its employment in the maintenance of a national scientific institute, see Smithsonian Institution.

Smithsonian Institution: an establishment in Washington, D. C., for the advancement of learning under the patronage of the Government of the U. S., organized in 1846. Its founder was James Smithson (see Smithson, James), whose will was found to contain the following clause in relation to a residuary bequest: "I bequeath the whole of my property to the United States of America, to found at Washington, under the name of the Smithsonian Institution, an establishment for the increase and diffusion of knowledge among men." It is almost certain that he knew Joel Barlow in Paris, and very probable that he was familiar with his plan for a realization of Washington's project for a great national institution of learning in the Federal city. The phrase "an institution for the increase and diffusion of knowledge" occurs in Washington's farewell address (Sept. 19, 1796).

In 1835 the U. S. legation in London was notified that his estate, amounting in value to about £100,000, was held in possession of the accountant-general of the British court of chancery.

As soon as the facts became public great opposition to the acceptance of the gift arose in Congress. Eminent statesmen, led by Calhoun and Preston, argued that it was beneath the dignity of the U. S. to receive presents, and that the donor was seeking immortality for too moderate an equivalent. The acceptance of the gift was ardently advocated by others under the leadership of ex-President John Quincy Adams. Richard Rush was finally appointed agent to prosecute the claim. He proceeded to London, entered suit in the court of chancery in the name of the President of the U. S., and, owing to the generous tolerance of the British authorities, brought the matter to a conclusion in less than two years. The decision was favorable. The legacy was received by Mr. Rush in the form of 104,960 sovereigns, which were delivered by him Sept. 1, 1838, to the Philadelphia mint, and immediately recoined into U. S. money, producing $508,318.46, the first installment of the legacy. This

Smithsonian Institution, Washington, D. C.

was soon after increased to $515,169, and in 1867 by a residuary legacy of $26,210.63 to $541,379.63, the total sum derived from the founder's beneficence, which by careful management had been in 1867 increased to $650,000. At one time in the early history of the institution a large portion of its fund was in certain State bonds which became worthless: Congress appropriated money to make good the loss, and the permanent fund is held as a deposit at 6 per cent. in the U. S. treasury.

During the eight years that passed before any use was made of the money public opinion had an opportunity to shape itself, and the organization in Washington in 1840 of the National Institution (afterward the National Institute), which was intended by its promoters to become the nucleus for the development of Smithson's idea, gave opportunity for much experimental study in administration. The National Institute, which was for two or three years the largest and most active scientific society on the continent, developed many features which were ultimately adopted for the Smithsonian Institution and experimentally demonstrated that others were impracticable. It languished and died soon after the organization of the Smithsonian Institution, which it had hoped to incorporate with itself.

Administration.—The Smithsonian Institution was formally established by the act of Congress approved Aug. 10, 1846. As defined in the act of establishment it is composed of the President of the U. S., who is presiding officer *ex officio*, the Vice-President, the members of the cabinet, and the chief justice, and the "establishment" thus constituted is made responsible for the duty of "the increase and diffusion of knowledge among men."

In addition to the "establishment" the act provides for a "board of regents," by whom the business of the institution is administered, and which is composed of the President of the U. S., the chief justice of the Supreme Court, three members of the Senate, three members of the House of Representatives, and six citizens appointed by joint resolution of the Senate and House of Representatives, no two of whom may be from the same State, though two must be residents of the District of Columbia.

The presiding officer of the regents is the Chancellor, whom they elect from their own number. This position is customarily held by the Chief Justice. The executive officer is the secretary of the institution, who is also elected by the regents. The duties and responsibilities of the secretary are such as in other institutions usually belong to the office of director, but the name of "secretary" is that which in Washington designates the highest grades of executive responsibility. The secretary makes all appointments on the staff of the institution, is responsible for the expenditure and disbursement of all funds, is the legal custodian of all its property, and *ex officio* its librarian and the keeper of its museum. He presents to the regents an annual report upon the operations, expenditures, and conditions of the establishment, which is transmitted by the board to Congress for publication. By special act of Congress of 1884 an acting secretary is provided in case of the absence or disability of the secretary, the designation being left with the chancellor of the institution. There is at present but one assistant secretary, who is in charge of the National Museum.

The annual meeting of the regents is held in January; their executive committee of three members meets quarterly.

The first meeting of the board of regents took place Sept. 7, 1846, and before the end of the year the policy of the regents was practically determined upon, for, after deciding upon the plan of the building now occupied, they elected to the secretaryship Prof. Joseph Henry, and thus approved his plan for the organization of the institution which had already been submitted to them. Eminent alike as a man of science and an administrator, Henry for more than thirty years directed the activities of the organization.

Objects of the Institution.—These as defined by Henry are, first, to increase knowledge by original investigations and study either in science or literature; and, second, to diffuse knowledge not only through the U. S., but everywhere, and especially by promoting an interchange of thought among those prominent in learning in all nations. No restriction is made in favor of any one branch of knowledge.

The leading features of the plan of Prof. Henry were, in his own words, "to assist men of science in making original researches, to publish them in a series of volumes, and to give a copy of them to every first-class library on the face of the earth." Probably there is not a scientific investigator in the U. S. to whom a helping hand has not at some time been extended by the institution, and the hand has often reached across the Atlantic. Books, apparatus, and laboratory accommodation have been supplied to thousands, and each year a certain number of money grants have been made. Not less important has been the personal encouragement afforded and advice given in the tens of thousands of replies written each year in response to inquiries.

Publications.—The publications of the establishment, which are regularly distributed to about 4,000 institutions, are as numerous as those of a great publishing-house, and are practically all given away. In addition to the annual report, which contains in its appendix articles of popular interest in regard to scientific progress, there are two series printed at the cost of the Smithson fund: (1) The *Smithsonian Contributions to Knowledge*, 28 volumes in quarto, containing nearly 15,000 pages and many fine plates. (2) The *Smithsonian Miscellaneous Collections*, in 35 octavo volumes, aggregating about 22,000 pages. Besides these there are the series of *Bulletins* of the National Museum, 50 in number, beginning in 1875; the *Proceedings* of the National Museum, including already 1,100 separate papers, embraced in 17 annual volumes, beginning with 1878; the *Annual Reports* of the Bureau of Ethnology, beginning in 1879 and forming a series of 12 illustrated volumes in royal octavo; and the *Bulletin* of the bureau, of which 26 numbers have appeared. The value of the books distributed since the institution was opened can not be much less than $1,000,000, estimating at standard publishers' rates.

In return for its own publications, and by purchase, the institution has received the great collection of books which form its library, and which is one of the richest in the world in the publications of learned societies. This includes more than 300,000 titles, the greater portion of which, by permission of Congress, have been placed in the National Library at the Capitol, where they are kept by themselves as the Smithsonian Deposit. The working libraries of the National Museum and the Bureau of Ethnology are distinct from the general Smithsonian Library, and separately administered.

System of Exchanges.—The Smithsonian system of international exchanges, begun in 1852, had for its object the free interchange of scientific material between scientific institutions and investigators in the U. S. and those in foreign lands, and its results have affected beneficially the libraries of most of the learned institutions in America. In 1867 Congress assigned to the institution the duty of exchanging fifty copies of all public documents for similar works published in foreign countries. Finally, in 1889 a definite treaty, made previously at Brussels, was formally proclaimed by the President of the U. S., wherein the U. S. Government, with a number of others, undertook the continuation of the exchange service on a more extensive basis. Out of this has grown the Bureau of International Exchanges, for the maintenance of which Congress partially provides by annual appropriation. From 1852 to 1893 the Smithsonian exchange service handled 1,175,000 packages. The number of correspondents upon its lists is about 24,000.

The National Museum.—The Smithsonian is by law the custodian of the National Museum, of which the secretary of the institution is the legal keeper. This museum is supported entirely by the Government, but previously part of its maintenance was from the Smithson fund. It is the only lawful place of deposit of "all objects of art and of foreign and curious research, and all objects of natural history, plants, and geological and mineralogical specimens, belonging, or hereafter to belong, to the U. S., which may be in the city of Washington in whosesoever custody." The nucleus of these collections consists in the specimens brought home by the Wilkes and other early exploring expeditions, but for many years the museum was supported entirely at the expense of the Smithson fund, and a considerable portion of the collections is the property of the institution. See NATIONAL MUSEUM OF THE UNITED STATES.

Bureau of Ethnology.—The Bureau of American Ethnology is an outgrowth of activities begun in the early days of the history of the institution, and has for its object the investigation of the languages, habits, customs, and classification of the North American Indians. In 1879 a special appropriation was made by Congress for this work, which is (1895) still in progress under the direction of Maj. John W. Powell, who has been the director of the bureau from the start. With the aid of a well-trained staff, he has rescued from destruction a vast amount of important material in regard to the early inhabitants of the continent, priceless

not only to students of American ethnology, but in the study of mankind as a whole.

Astrophysical Observatory.—Under the immediate direction of the present secretary an astrophysical laboratory has been established, in which important investigations upon the constitution of the sun are being carried on.

The National Zoölogical Park established by Congress in 1890, under the direction of the institution, occupies a tract of 166 acres, on Rock creek, 2 miles N. of the center of the city. The grounds are nearly twice as extensive as those of any other zoölogical park, and are possessed of admirable natural advantages, but the appropriations for the development of the park have not been sufficient to allow of any satisfactory progress.

The American Historical Association is by law affiliated with this institution, and transmits its annual reports to Congress through the secretary.

The institution supports a table at the International Zoölogical Station in Naples for the benefit of American naturalists.

An important feature of the institution's work has been its participation in the various expositions. It was represented at Philadelphia in 1876, Berlin 1880, London 1883, New Orleans 1885, Cincinnati 1889, Madrid 1892, and Chicago 1893, and on each occasion received awards of the most commendatory nature.

There is an assembly-hall in the museum building, in which meetings of scientific bodies of national scope are held. There the National Academy of Sciences holds its annual meeting every April, and the American Historical Association its December meeting. Here also each year a course of popular scientific lectures is delivered under direction of the scientific societies of Washington.

The office of secretary has been held by three men: Joseph Henry, elected in 1846, Spencer Fullerton Baird, in 1877, and Samuel Pierpont Langley, in 1888. Each in addition to his general administrative work in the institution has made some feature of the general plan peculiarly his own. Secretary Henry, besides establishing the general policy of, gave especial attention to, the publications, the system of international exchanges, the library, and the development of that great system of meteorological observation and weather prediction which has since been transferred to another department of the Government, and now constitutes the Weather Bureau.

Secretary Baird continued the development of the museum, which had been under his special charge during his twenty-seven years of service as assistant secretary, secured the erection of the new museum building, gave much attention to explorations, and carried on, in connection with his special work as U. S. commissioner of fisheries, a most extensive biological investigation of the waters of North America.

To Secretary Langley is due the establishment of the National Zoölogical Park, and of the astrophysical observatory, and a new system of encouragement of original research in the physical as well as in the biological sciences. Under his administration also important donations and bequests have been added to the permanent fund of the institution. The limit of $1,000,000, which may by law be permanently deposited in the U. S. treasury at 6 per cent., has nearly been reached, and Congress has recognized the authority of the institution to receive and administer other funds, beyond the above-named limit, thus making it possible for it to undertake the administration of financial trusts for any purpose within the scope of its general plan, preserving in connection with each fund the name of the person by whom it was established. This privilege has already been accepted by several benefactors. The Hodgkins fund, derived from the gift of Thomas G. Hodgkins, is being thus administered, in addition to the Hodgkins medal, which is to be awarded from time to time for important discoveries in regard to atmospheric air. The Avery fund, the bequest of Robert P. Avery, provides for special investigations in the fields of magnetism, electricity, etc.

Buildings.—The building occupied by the institution and bearing its name is an ornate structure of Seneca brownstone, occupying a prominent place in the Mall which extends from the Capitol to the Washington Monument—in a square known as the Smithsonian Grounds. It was planned by James Renwick, Jr., and was in construction from 1847 to 1855. The temporary wooden structure occupied by the astro-physical observatory stands in the rear of the Smithsonian building, and the National Museum building, of brick, 325 feet square, is at its eastern end. The Bureau of Ethnology occupies rented quarters in the city, and the offices of the Zoölogical Park are in the park grounds.

G. Brown Goode.

Smith'sonite: the mineral *zinc carbonate* ($ZnCO_3$), named after Smithson, who was the founder of the Smithsonian Institution. It crystallizes in rhombohedrons of glassy luster, white when pure, with the hardness of apatite, and density when pure and normal = 4·455 at 0°; Naumann and Levy both give 4·45. It occurs abundantly at Lancaster, Pa., near Bethlehem, Pa., and at Perkiomen, Pa.

Smith-Stanley, Edward Geoffrey: See Derby.

Smock, John Conover: See the Appendix.

Smoke [O. Eng. *smoca*: Dutch, *smook*: Germ. *schmauch*. Perh. cf. Gr. σμύχειν, smolder]: the product of an imperfect combustion. If coal, which is chiefly composed of carbon, hydrogen, nitrogen, and oxygen, be burned perfectly, the result will be carbonic acid, steam, and nitrogen, which substances will escape through the chimney-top and blend with the atmosphere under the form of invisible and incombustible gases and vapor. But as the combustion of coal in the way in which it is generally burned is very imperfect, inflammable gases and vapors and large quantities of fine particles of carbon issue together with the above substances, form soot and black and brown smoke, contaminate the air, and cause a considerable loss of fuel. As coal-smoke is a great nuisance, and in large towns and manufacturing districts even a serious evil, much attention has been paid to the matter of burning it. This is attended with great practical difficulties, arising from the necessity of preventing the smoke from cooling and of supplying the combustible gases and vapors with the necessary amount of oxygen in order to make them burn with flame; but these difficulties are nevertheless not greater than may be generally overcome, as they have been in many single cases. See Combustion.

Smokeless Powders: explosives acting without the production of smoke. They may be divided into three classes: 1. Those composed of cellulose nitrate, either the insoluble or soluble variety, or both. 2. Those composed of the constituents of 1 mixed with nitroglycerin or other organic nitrates. 3. Those composed of the constituents of 1 mixed with nitro-derivatives of hydrocarbons, such as pieric acid and the picrates. Each of these varieties may contain oxidizing agents like barium or potassium nitrates and retarding agents such as tannin or lycopodium.

Among the best-known and most successful of these powders are of the first class indurite, used by the U. S. navy, and B. N., used by the French; of the second class ballistite, used by the Italians, and cordite, used by the British; and of the third class Peyton powder.

These powders are more or less smokeless because the products of their combustion are wholly gaseous, whereas 55 per cent. of the products of the combustion of ordinary gunpowder is finely divided solids. This property of smokelessness is the feature of these powders which has attracted the widest popular attention; but though it is a desirable property, and one which has modified strategy and tactics, the most valuable property common to these powders is the high velocities which they impart to projectiles and which greatly exceed those which it is possible to secure with black gunpowder.

In order not to endanger the gun it is essential that the pressure developed by the burning powder shall be within prescribed limits. The best powder is that one which gives the maximum initial velocity with the minimum chamber pressure; which gives uniform results when used under uniform conditions; and which undergoes no change, either chemical or physical, under the exposure incident to the military and naval service. The best record thus far reported for any powder is from the firing trials of indurite made at Indian Head proving-ground, Maryland, when 26 lb. of this powder, fired in the 6-inch service-gun, imparted to a 100-lb. projectile an initial velocity of 2,469 feet per second, while it exerted but 13·96 tons pressure on the gun. Repeated rounds gave remarkably uniform results. See Explosives.

Charles E. Munroe.

Smolensk': government of European Russia, S. W. of Moscow, and traversed by the Dwina, which runs to the Gulf of Riga, and the Dnieper, which flows to the Black Sea. Area, 21,638 sq. miles, consisting generally of extensive plains interspersed with morasses. The climate is cold, but healthful; the soil is fertile and well cultivated, yielding

large crops of rye, the principal product, and of hemp and flax. Tobacco and hops are also cultivated. On its extensive pastures large numbers of fine cattle are raised, while its vast forests, abounding with game, furnish a large amount of valuable timber. Much attention was formerly paid to the raising of bees, and honey and wax were exported. Copper, iron, and salt are found in considerable quantities. Its manufactures are unimportant. Pop. (1897) 1,550,973.

Smolensk: town; capital of the government of Smolensk, Russia; on the Dnieper; 250 miles W. S. W. of Moscow (see map of Russia, ref. 7-D). It is surrounded by massive walls, that are rapidly falling into decay, and has a magnificent cathedral, an episcopal palace, monasteries, several good educational institutions, including a military school, manufactures of linen, carpets, leather, and soap, and a considerable export trade in grain and flax. Pop. (1897) 46,889.

Smollett, Tobias George: novelist; b. at Dalquhurn House, Cardross, Scotland, in 1721; lost his father in early childhood; was educated at Dumbarton school by the care of his grandfather, Sir James Smollett, of Bonhill, a member of the Scottish Parliament; studied also at Glasgow, where he served an apprenticeship to a surgeon; went to London at the age of nineteen, carrying a tragedy entitled *The Regicide*, which he unsuccessfully offered to the theatrical managers; accepted the position of surgeon's mate in the navy; participated in the unfortunate expedition against Cartagena 1741; resided for some time in Jamaica; returned to England 1746; married in 1747, Miss Anne Lascelles, whom he had known in Jamaica; published in 1748 with great success his first novel, *The Adventures of Roderick Random*, in which he made good use of his West Indian experiences; visited Paris 1750; published *The Adventures of Peregrine Pickle*-(4 vols., 1751); after endeavoring to obtain medical practice at Bath, settled at Chelsea 1753, in which year he wrote *The Adventures of Ferdinand, Count Fathom*; published a translation of *Don Quixote* (1755); issued *A Compendium of Authentic and Entertaining Travels* (7 vols., 1757), in which he embodied his own experiences at Cartagena; edited for some time a Tory organ, *The Critical Review*; was fined and imprisoned three months for a libel on Admiral Knowles (1759); wrote in fourteen months a *Compleat History of England, deduced from the Descent of Julius Cæsar to the Treaty of Aix-la-Chapelle* (4 vols., 1757–58), to which he subsequently added a *Continuation from 1748 to 1760* (4 vols., 1763), of which the later volumes have been often reprinted as a supplement to Hume; translated *Gil Blas* (4 vols., 1761); wrote in prison his *Adventures of Sir Launcelot Greaves* (1762); edited *The Briton*, a newspaper in defense of Lord Bute (1762–63); aided Thomas Francklin and other writers in bringing out a translation of the *Works of Voltaire* (37 vols., 1761–70); made a journey through France and Italy 1763–66, which furnished materials for a work of *Travels* (2 vols., 1766); satirized Bute and the elder Pitt in his *Adventures of an Atom* (1769); went for his health to Italy 1769, and wrote on the journey *The Expedition of Humphrey Clinker* (3 vols., 1771), his best novel. D. at Monte Novo, near Leghorn, Italy, Sept. 17, 1771. Smollett ranks with Richardson and Fielding as one of the standard novelists of the eighteenth century, founders of the English school of prose fiction. He was greatly influenced by Cervantes, Le Sage, and the whole group of Spanish "rogue" or *picaro* novelists. His stories are narratives of low life, travel, and broadly comic adventure, vigorous and racy, but coarse to the verge of brutality. In the persons of Commodore Trunnion, Jack Rattlin, Tom Bowling, and other nautical characters he introduced into fiction the now familiar figure of the British tar. Many complete editions of his novels and poems have been published. Biographies were written by Dr. Robert Anderson (1796), Dr. John More (1797), Thomas Roscoe (London, 1840; New York, 1857), and D. Hannay (Great Writers' Series, 1887). Revised by H. A. Beers.

Smolt: See Salmon.

Smuggling [like Germ. *schmuggeln*, from Low Germ. *smuggeln*; connected with root *smug-* of Germ. *schmiegen*, snuggle up to, and O. Eng. *smūgan*, creep]: the (statutory) offense either of bringing into a country articles entirely prohibited, or of defrauding the customs revenue by secretly importing goods upon which duties are laid without paying such duties or without paying the full amount required by law. In Great Britain the offense includes the exporting of goods with like intent, and (as often defined) the introduction of any articles into consumption without paying the duties chargeable upon them. As the whole subject of the customs revenue is the creature of statute, the offenses which consist in its evasion or violation are also of a statutory origin. In Great Britain and Ireland smuggling is especially restrained by the Customs Laws Consolidation Act of 1875 (39 and 40 Vict., c. 36).

Smuggling in the U. S.—In the U. S. the regulation of this offense belongs exclusively to the jurisdiction of the national legislature and judiciary, being included in the power of Congress to regulate all foreign commerce. The body of the existing law is contained in the *Rev. Stat. of the United States*, especially in tit. xxxiv., chap. 10, §§ 3058 to 3094 (although some provisions are scattered through other chapters relating to the imposition and collection of duties), and in the *Supp. of the Rev. Stat. of the United States*, p. 32, *seq.*, where smuggling is defined as "the act, with intent to defraud, of bringing into the United States, or, with like intent, attempting to bring into the United States, dutiable articles without passing the same, or the package containing the same, through the custom-house, or submitting them to the officers of the revenue for examination."

Penalties.—The following penalties may be enforced for various acts which are collectively embraced in the general description of smuggling: (1) The guilty person is liable to a fine of not more than $5,000 and not less than $50, or to imprisonment for not more than two years, or to both. (2) The goods fraudulently introduced or attempted to be introduced are to be seized, and, if condemned by the court, are to be forfeited and sold. (3) The vessel in which the goods are thus imported may be likewise seized, condemned, and forfeited if the owner or managing agent was consenting to and guilty of the offense. (4) Any vehicle, conveyance, team, beast, etc., by means of which goods are wrongfully brought into the country by land may also be seized and forfeited; but no such conveyances belonging to and used by common carriers, whether persons or corporations, are liable to forfeiture unless the owner, superintendent, or agent in charge is consenting or privy to the illegal importation. (5) Various pecuniary penalties may be visited upon the owners or masters of vessels for certain specific violations of the law, such as resisting or hindering the revenue officers and the like; which penalties are made liens upon, and may be summarily enforced against, the vessels themselves. Cases involving any of the foregoing forfeitures or pecuniary fines are reported to the proper U. S. district-attorney, and it is his duty to prosecute the delinquent or to procure a condemnation of the property in the national courts.

Detection of Smuggling.—The customs officers are clothed with very large powers in order to detect and punish any fraudulent importation or concealment, or failure to pay the full duties required by the law. They may board and search all vessels lying in port, and all those bound to the U. S. while not more than 4 leagues from the coast. They may also search all persons coming into the country, all trunks, boxes, or other baggage, papers, envelopes, all conveyances and means of transport, stores, warehouses, and other buildings—in short, all places or things where the goods themselves or the evidence of their wrongful importation may possibly be concealed. Finally, by means of an order of the court they may obtain an inspection of the books of account and business papers of merchants and others suspected of or charged with the wrongful non-payment of duties. When the property seized is condemned and sold, the proceeds, after paying the costs and expenses, are distributed, part to the U. S., part to the principal customs officers of the district, and part to the informer if there was any distinct from the officer himself who detected the offense and procured the seizure. Revised by F. Sturges Allen.

Smuts [: Germ. *schmutz*, dirt; Dutch, *smet*]: the *Ustilagineæ*, an order of minute parasitic fungi principally attacking the higher plants, and often producing serious injuries to farm and garden crops (Fig. 1). In some portions of England they are known as dust-brands. They consist of slender, branching, colorless threads, which grow through the tissues of their hosts, following the intercellular spaces, or actually penetrating and even filling the cell-cavities. After a period of growth, the threads produce spores in great numbers, forming dark, dusty masses, which have suggested the popular name of these organisms.

No sexual organs are known in any of the smuts, and it is probable that in this group of plants the structural degradation due to excessive parasitism is so great that these organs have been lost. This degradation is shown in the soft-

walled cells composing the filaments, and also in the distorted and irregular spore-bearing masses (Fig. 2) which may be

Fig. 1.—Smut on Indian corn, reduced one-half.

regarded as crushed and distorted spore-sacs (*asci*). The spores arise within these crushed masses as rounded bodies,

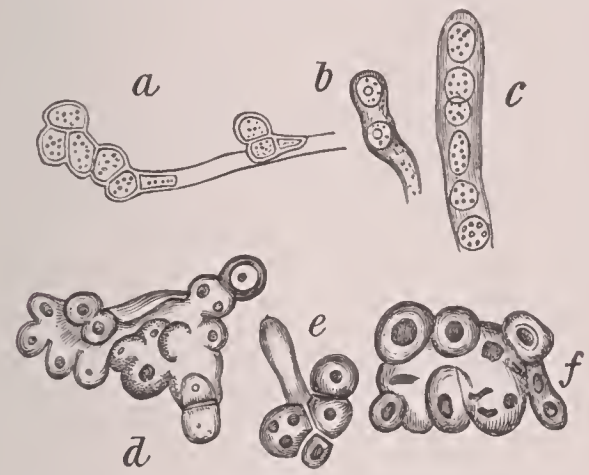

Fig. 2.—Formation of spores: *a b c*, in *Ustilago maydis*; *d e*, *U. antherarum*; *f*, *U. flosculosorum*, magnified 900 times.

which soon acquire a dark-colored, thick, smooth, or roughened wall. At maturity the spores are set free by the deliquescence of the cell-walls of the spore-bearing masses. In a few cases the spores are borne singly, and rarely they appear to be in little distorted ascus-like cells (Fig. 2, *c*).

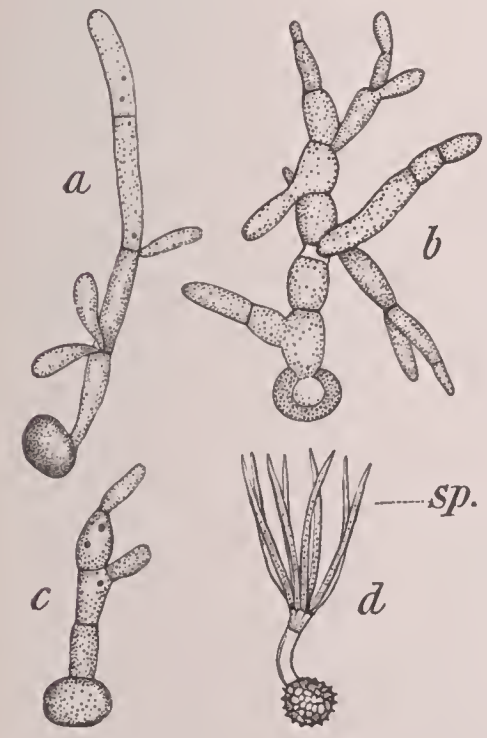

Fig. 3.—Germination of smut spores: *a*, *Ustilago avenæ*, × 1,000; *b*, *U. tritici*, × 800; *c*, *U. hordei*, × 700; *d*, *Tilletia tritici*; *sp.*, the sporidia, × 200.

The production of spores usually takes place in those parts of the parasite which have penetrated the flowering or fruiting portions of the host, and which as a consequence are generally much distorted (Fig. 1). The spores are distributed by winds, after the rupture of the epidermis of the host and the escape of the surplus moisture.

Germination takes place by the protrusion of a short filament (Fig. 3) known as the *promycelium*, upon which are borne minute spores (the *sporidia*), which are so minute that they may readily be dispersed by the wind. The parasite gains access to the embryo host plant by penetrating the tender walls of the epidermal cells, and it appears that in many, if not all, cases it is impossible for such penetration to take place when the host has made a considerable growth.

The smuts are divided by Schroeter into two families, as follows:

I. *Ustilaginaceæ*, with septate promycelium, bearing lateral sporidia. About 150 species, nearly all of which (143) belong to the genus *Ustilago*.

Wheat Smut (*U. tritici*), called also the "loose smut" of wheat, injures the heads of unripe wheat by destroying the kernels, and turning them into black dusty masses of spores (Fig. 4). The spores are very small (about 5·5 by 6·5μ), ovoid or elliptical, and minutely verruculose.

Oat Smut (*U. avenæ*) affects unripe heads of the cultivated oat, destroying them before the ripening of the crop. The spores are larger than the preceding (about 7μ or 6·5 by 8μ), globose or ovoid, and faintly verruculose.

Barley Smut (*U. hordei*) likewise destroys the unripe heads of barley. The spores are nearly of the same size as in the oat smut (about 7μ), globose and smooth.

Fig. 4.—Head of wheat affected by *U. tritici*, reduced to one-half natural size.

The three foregoing species have generally been confounded under the name of *U. carbo*, or *U. segetum*, but investigations by Jensen, confirmed by Kellerman, prove them to be distinct. These experimenters have found that these smuts may be greatly reduced by immersing the grains for eight to fifteen minutes in water heated to 56° C. (133° F.), then drying before sowing.

Maize Smut (*U. maydis*) is parasitic upon Indian corn, causing swellings and distortions of the kernels (Fig. 1), and sometimes, also, similarly affecting the staminate flowers, and even the leaves and stems. The spores are large (8 to 13μ), globose and echinulate.

Other species occur on sorghum (*U. sorghi*), foxtail grass (*U. neglecta*), and many other grasses, sedges, knotweeds, etc.

II. *Tilletiaceæ*, with non-septate promycelium, bearing terminal sporidia. About 170 species, distributed among 9 genera, of which the principal are *Tilletia* (33 species), *Entyloma* (41), *Urocystis* (27), *Thecaphora* (18), *Sorosporium* (23).

Bunt, or Stinking Smut (*Tilletia tritici* and *T. fœtens*).—These two species, which differ in the first having reticulated spores and the second smooth ones, are parasitic upon wheat, filling the kernels at maturity with a mass of closely packed, fetid spores (Fig. 5). Both are common in the U. S., Europe, and most other wheat-growing countries. Bunt may be prevented by the hot-water treatment referred to above.

Fig. 5.—*a*, head of wheat affected with bunt; *b*, kernels filled with spores, × one-half; *c*, spores of *T. tritici*, × 200; *d*, spores of *T. fœtens*, × 200.

Onion Smut (*Urocystis cepulæ*) attacks the leaves of cultivated onions, often seriously damaging the crop in the eastern parts of the U. S.

Literature.—In addition to the standard works on fungi, the reader is referred to the following: J. B. de Toni, *Ustilagineæ*, in Saccardo's *Sylloge Fungorum*, vol. vii. (1888);

J. Schrocter, *Die Pilze Schlesiens* (1889); C. B. Plowright, *A Monograph of the British Uredineæ and Ustilagineæ* (1889); Kellerman and Swingle, *Report on the Loose Smut of Cereals*, in *Second Annual Report* of the Experiment Station of the Kansas Agricultural College (1889).

CHARLES E. BESSEY.

Smyr'na [= Lat. = Gr. Σμύρνα. Cf. σμύρνα, myrrh]: city; in the vilayet of Aidin, Asia Minor; in lat. 38° 25′ N. and lon. 24° 50′ E., at the eastern extremity of the Gulf of Smyrna (see map of Turkey, ref. 5–D). It presents a magnificent appearance as seen from the water, spreading along the bay and up the slope of Mt. Pagus. A fine quay over 3 miles in length, along which the tramway runs, lines the shore, and in front is a spacious and sheltered harbor. Were it not for the hundreds of camels constantly traversing the quay, Smyrna with its modern edifices would be taken at first glance for a city of Western Europe. It still justifies its poetical names of Crown of Ionia, Eye of Anatolia, Pearl of the East. The slow deposits of the river Hermus and the quantities of rubbish thrown into the water threaten its existence as a port.

Its origin is lost in myths. According to tradition, Tantalus, about 1500 B. C., was its founder. Its name is said to be derived from Smyrne, the Amazon, the wife of Theseus. Colonized by the Grecks soon after the Trojan war, it was constantly fought over by the Æolians and the Ionians, and ultimately remained in the possession of the latter. Taken and dismantled by Alyattes, King of Sardis (628 B. C.), it was rebuilt according to the order of Alexander the Great by Antigonus and Lysimachus. It rapidly developed, and has since that time been the chief commercial city of Asia Minor. Here was one of the Apocalyptic churches. Captured by the Seljuk pirate Tzachas (1080), Smyrna suffered greatly, but was soon retaken by the Greeks. The Seljuk prince of Aïdin conquered it (1313), but a crusading fleet drove out the Moslems. The Roman Catholic faith was introduced in 1346, and the city has contained ever since many members of that communion. Tamerlane, after defeating Bayezid I. at Angora (1401), filled up the port, carried the place by storm and butchered the inhabitants. Since 1424, when it was conquered by Murad II., it has remained in the undisturbed possession of the Ottomans save that it was sacked by the Venetians in 1473. The site of the city, though always near the bay, has changed many times. Smyrna has often suffered from earthquakes, notably in 177 (after which it was rebuilt by Marcus Aurelius), 1688, 1778, and 1880; and from plague, as in 1812 and 1837.

The streets run generally parallel with or at right angles to the shore. The houses are built of wooden beams encased in stone, as safer in fire and earthquake. There are several free hospitals, each prominent nationality having its own, and numerous churches of the leading Christian faiths, as well as a synagogue and several mosques. The schools are excellent, especially those maintained by the Roman Catholic and Protestant missionaries. Educational advantages are nowhere greater in the Ottoman empire. Six newspapers are published. Smyrna is the western terminus of the great inland commercial routes and of two railways that run eastward into the interior of Asia Minor. It is the chief mart for European commerce in Anatolia. The principal imports are sugar, coffee, cotton, silk and woolen goods, worked leather, nails, machinery, earthenware, building-stone, lumber, cordage, etc.; the exports, dried fruits, raw silk and cotton, opium, wheat, rice, valonia, oil, sesame, goatskins, carpets, wax, emery, cheese, beans, bones, mohair, etc. The exports average about $20,000,000 annually in value, and the imports about $15,000,000.

Smyrna possesses some remarkable ruins, as the Genoese castle on the summit of Mt. Pagus, the theater lower down, the stadium and scant remains of the temple of Diana. Pop. (estimated 1893) 225,000, of which about half are Greeks, the rest being Turks, Armenians, Europeans, and Jews. The Levantines, offspring of marriages between Europeans and natives, are numerous. E. A. GROSVENOR.

Smyrna: town; Kent co., Del.; on Duck creek, and the Phila., Wil. and Balt. Railroad; 36 miles S. W. of Wilmington, 60 miles S. of Philadelphia (for location, see map of Delaware, ref. 4–N). It is in an agricultural and fruit-growing region; is engaged in ship-building and the manufacture of agricultural implements, fruit-baskets, sashes, doors, and other articles; and contains a public high school, two national banks, and a weekly paper. Pop. (1880) 2,423; (1890) 2,455; (1900) 2,168.

Smyth, CHARLES PIAZZI, LL. D.: son of Admiral W. H. Smyth; astronomer; b. in Naples in 1819; was employed for some time under Sir T. Maclear in the observatory of the Cape of Good Hope; was appointed royal astronomer for Scotland in 1845, which position he resigned in 1888; made a valuable series of observations from the Peak of Teneriffe 1856; published *Teneriffe, an Astronomer's Experiment, or Specialties of a Residence above the Clouds* (1858); in 1859 visited the Russian observatories (see his *Three Cities in Russia*, 2 vols., 1862), and made a thorough examination of the Great Pyramid of Egypt, which he considers to have been built under divine inspiration as a standard of a system of weights and measures. This theory is set forth and defended in three works—*Our Inheritance in the Great Pyramid* (1864), *Life and Work at the Great Pyramid* (3 vols., 1867), and *Antiquity of Intellectual Man* (1868). He composed a comprehensive star catalogue and ephemeris of selected observations of the same stars, published in the Edinburgh Observatory's publications (1877–86). D. Feb. 21, 1900.

Smyth, EGBERT COFFIN, D. D.: educator; son of Rev. William Smyth (1797–1868), Professor of Mathematics in Bowdoin College; b. at Brunswick, Me., Aug. 24, 1829; graduated at Bowdoin College 1848, and at Bangor Theological Seminary 1853. In 1854 he was made Professor of Rhetoric and Oratory in Bowdoin College; in 1856 he succeeded Rev. Dr. Roswell D. Hitchcock as Professor of Natural and Revealed Religion in the same institution; and in 1863 was appointed Professor of Ecclesiastical History in Andover Theological Seminary. Since 1878 he has been president of the faculty there. He is one of the board of trustees of Bowdoin College, and was for a number of years a member of the prudential committee of the American Board of Commissioners for Foreign Missions. He translated (with Prof. C. J. H. Ropes) Uhlhorn's *Conflict of Christianity with Heathenism* (1879), has published many addresses, sermons, and scholarly articles, and was one of the founders and editors of *The Andover Review*. Revised by G. P. FISHER.

Smyth, HERBERT WEIR: Greek scholar; b. at Wilmington, Del., Aug. 8, 1857; A. B., Harvard, 1878; Ph. D., Göttingen, 1884; instructor in Williams College 1883–85; in Johns Hopkins University 1885–88; appointed Professor of Greek in Bryn Mawr College 1888; secretary of American Philological Association. He has published *Der Dipthong EI im Griech.* (1884); *Sounds and Inflections of the Greek Dialects*, vol. i., *Ionic* (1894); and various papers on philological subjects in *The American Journal of Philology*, *Transactions of the American Philological Association*, and *The Classical Review*. C. H. THURBER.

Smyth, JOHN: clergyman; b. in England about 1552: graduated at Cambridge 1575; became a fellow; took orders in the Church of England; was reproved by the heads of the university in 1586 for having advocated a Judaic observance of Sunday, but persisted in his teachings; connected himself with the Puritans; was minister at Gainsborough to a congregation with which he emigrated to Amsterdam in 1606; was converted to Baptist principles by Mennonite theologians; caused an Anabaptist separation among the Puritan refugees in Holland, and maintained controversies with Ainsworth, Robinson, and others. D. at Amsterdam in Aug., 1612. He was the author of *A True Description of the Visible Church* (1589); *The Difference of the Churches of the Separation* (1608); *Parallels, Censures, Observations*, etc. (1609); *The Character of the Beast*, etc. (1609); and a *Declaration of the Faith of the English People remaining at Amsterdam* (1611), etc.

Revised by W. H. WHITSITT.

Smyth, NEWMAN, D. D.: brother of Egbert Coffin Smyth; b. at Brunswick, Me., June 25, 1843; graduated at Bowdoin College 1863, and at Andover Seminary 1867; was acting pastor in Providence, R. I., 1868; was in Europe 1868–69; was pastor of the First Congregational church in Bangor, Me., 1870–75, of the First Presbyterian church in Quincy, Ill., 1876–82, and in 1882 became pastor of the First church (Congregational) in New Haven, Conn. He was assistant teacher in the Naval Academy in Newport immediately after his graduation, and was first lieutenant of the Sixteenth Regiment of Maine Volunteers in the last year of the civil war. He has published *The Religious Feeling* (1877); *Old Faiths in New Light* (1877; revised ed. 1887); *The Orthodox Theology of To-day* (1881); *Dorner on the Future State* (1883); *The Reality of Faith* (1884)—a series of sermons; *Personal Creeds*, etc. (1890); *Christian Ethics* (1892); and various articles in reviews. Revised by G. P. FISHER.

Smyth, William Henry: sailor and hydrographer; b. at Westminster, England, Jan. 21, 1788; entered the navy in 1805; made surveys of Sicily, the shores of the Adriatic, and Sardinia; became rear-admiral in 1853 and hydrographer to the admiralty in 1857. Author of *The Mediterranean* (1854). D. near Aylesbury, England, Sept. 9, 1865.

Snail [O. Eng. *snægel* : Icel. *snigill* : dial. Germ. *schnegel*; cf. Germ. *schnecke*, snail < Teuton. **snag-*, crawl]: a name given to the terrestrial shell-bearing gasteropod molluscs generally, and frequently extended to the similar forms inhabiting the waters. The terrestrial snails are divisible into three categories—viz.: (1) Pulmonata (*q. v.*), including the inoperculate forms as well as allied forms living in the water, and also the slugs; (2) certain operculigerous forms (*Cyclostomidæ*, *Aciculidæ*, etc.) which are closely allied to the aquatic *Littorinidæ*, etc.; and (3) other operculigerous types (*Helicinidæ*, *Proserpinidæ*, etc.) which are representatives of another group, the *Diotocardia*. It is thus seen that the form of the shell and even the presence or absence of a shell are of very inferior systematic significance, and entirely subordinate to differences in structure of the animal. Those differences are chiefly exhibited by the modifications of the nervous system, the heart, the dentition of the lingual ribbon, and the organs of generation. See, further, Gasteropoda. Revised by J. S. Kingsley.

Snake-bird: See Darter.

Snake-bites: See Poison of Serpents.

Snake-eels: marine eels constituting the genus *Ophisurus*, allied to the common eel, but found only in warm latitudes. They are remarkable for the absence of the caudal fin, the end of the tail being much like that of a snake.

Snakefish: a name given on some parts of the English coast to the *Cepola rubescens*, otherwise called Bandfish (*q. v.*), and in parts of the West Indies and Bermuda to the *Synodus* (or *Saurus*) *lacerta*.

Snake Indians: See Shoshonean Indians.

Snake Plains: a region in Idaho through which Snake river flows in a deep cañon, covered by successive eruptions of basaltic lava which came from fissures and deluged an area of not less than 250,000 sq. miles, including parts of Oregon and Washington. In Idaho the lava occurs in horizontal sheets resting on older volcanic rocks, and the streams from the mountains flow beneath it, forming "lost rivers." I. C. R.

Snake River: a river which rises in the high mountains of Western Wyoming, N. of Yellowstone Lake, in two main branches, known as the North and South Forks, flows westward across Idaho, and then northward, forming the boundary between Idaho and Oregon for 200 miles, and the boundary between Idaho and Washington for 30 miles. It then turns westward and joins the Columbia in Washington near Pasco. Its length is between 800 and 1,000 miles. At the junction of the North and South Forks the elevation is 4,800 feet, and at its union with the Columbia 340 feet. Throughout a large part of its course it is a rapid stream, flowing in cañons from 1,000 to 3,000 feet deep, and is interrupted by magnificent cataracts. From the Idaho-Washington boundary to its mouth it has been navigated by small steamers. It flows through an arid region, the drainage of which has been rejuvenated on account of vast overflows of volcanic rock and probably also by reason of recent elevations, and the gorge it has cut is still narrow and steep-sided. Its tributaries also flow in cañons, making traveling near its course difficult. Israel C. Russell.

Snakeroot: any one of many plants believed to be efficacious in the cure of snake-bites. In the U. S. the name is applied to the following among others: (1) The black snakeroot or sanicle (*Sanicula marilandica*), a common umbelliferous plant, with a root of an aromatic taste, of some value as an antispasmodic. (2) *Eryngium yuccæfolium*, buttonsnake-root, or rattlesnake-master, is diaphoretic and expectorant. (3) The Seneca snakeroot (see Senega). (4) *Liatris spicata*, (5) *L. squarrosa*, and (6) *L. scariosa*, called also buttonsnake-root, blazing-star, rattlesnake-master, etc., showy composite-flowered plants, with stimulant and diuretic properties. (7) *Eupatorium ageratoides*, common in the Northern States and a good tonic, is called white snakeroot. (8) *Aristolochia serpentaria*, the well-known Virginia snakeroot, has valuable stimulant and tonic powers and a pleasant fragrance. (9) *A. reticulata* of the Southwest has properties similar to those of Virginia snakeroot, and produces much of the snakeroot of commerce. (10) *Cimicifuga racemosa*, or black snakeroot, is a valuable sedative and expectorant. (11) *Asarum canadense*, or wild ginger, is called snakeroot and Canada snakeroot in New England. It is fragrant, with properties much like those of *Aristolochia serpentaria*, but is much more pungent.

Snakes: See Serpents.

Snakestone: a small piece of stone, bone, or other substance which is placed upon the bite of a poisonous serpent for the purpose of absorbing or charming away the poison. The vulgar in almost all countries have faith in this and other like means of cure, such as the madstone, which is applied to the bite of a rabid dog. In India, snakestones are often used, and there are several apparently well-authenticated instances of their seeming efficacy. It is possible that some of these stones may have a strong absorptive power for the snake poison, for they are often porous, and the unlimited faith which the bitten persons have in this means used for cure is doubtless a powerful adjuvant.

Snake-wood: the name of a number of trees (see Letter-wood); also of the root and wood of *Strychus colubrina* and *S. nux-vomica*, esteemed as a remedy for snake poison.

Snapdragon: any plant of the genus *Antirrhinum*, family *Scrophulariaceæ*. The snapdragons are annuals and perennials, and many fine flowering varieties are cultivated, mostly belonging to *A. majus* and *A. orontium*, Old World plants of easy culture. L. H. B.

Snapper: any one of several fishes of the family *Lutjanidæ*. The species inhabit warm seas; they are carnivorous, with short intestines and few pyloric cæca; vomerine teeth and canines, no incisors or molars, and a continuous dorsal fin. The red snapper (*Lutjanus aya*), common on the Gulf coast of the U. S. in deep water, is an important food-fish. The mangrove snapper, or gray snapper (*L. griseus*), ranges from the West Indies N. to New Jersey, and is especially abundant along shore among mangroves. The name is improperly applied to the rosefish (*Sebastes marinus*), the bluefish, and several other fishes. See Fisheries.

Snapping Turtle: in the U. S., any one of several species of tortoises. (1) The common snapping turtle of the Northern and most of the Southern States is the *Chelydra serpentina*. This has the head moderately large, and covered with a soft skin, and the marginal scales of the shell are in a single row. It is said that it sometimes (though very rarely) attains a length of about 4 feet and a weight of 50 lb. It is found from Canada southward, and from the Atlantic seaboard westward to the plains. (2) A species which in some parts of the Southern States at least replaces the *Chelydra serpentina* is the *Macrochelys lacertina*. This animal has the head very large and broadly triangular, and it is covered with numerous horny plates; the marginal scales of the shell are in two rows. It reaches a very large size, sometimes weighing as much as 100 lb. It is confined to the Southern States, extending from Florida to Western Texas, and northward up to Missouri. It is perhaps more generally known as the alligator snapper. Both of these species belong to the family *Chelydridæ*, and are distinguishable from all the other turtles of the U. S. by the long and imperfectly retractile neck and tail, and the cruciform plastron or lower shell. Their popular name is due to the habit of snapping at food or enemies. Their bite is severe, and it is difficult to relax their hold. They are by many esteemed for food, especially for making soup. They have a rather strong musky odor. In the early summer they lay from twenty to forty eggs in a hole dug by themselves. (3) In some sections of the U. S. the name is also applied to the soft-shell turtles, or *Trionychidæ*, which snap abruptly at food or other objects. Revised by F. A. Lucas.

Sneezewood: the beautiful and durable timber of the *Ptæroxylon utile* (family *Sapindaceæ*), a tree of South Africa. When sawing or rasping it, joiners are much troubled by the sneezing which its fine dust provokes. Its wood is very inflammable, even when green.

Sneezing, or **Sternutation** [from Lat. *sternuta're*, intensive of *sternu'ere*, *sternu'tum*, sneeze; cf. Gr. πταρνύναι, sneeze]: a convulsive movement by which the lungs and chest-walls are expanded and then suddenly contracted, forcing the breath out violently through the nose. It is produced by reflex action, there being some irritation of the pituitary membrane of the nose which originates the action. The sneezing tends to remove the irritating substance from the nose. There are a large number of irritating substances

whose presence in the nostrils will induce sneezing. When it is a symptom of cold, it indicates that catarrhal inflammation has induced a state of things similar to that produced by a foreign substance in the nose. In children measles may begin with this symptom, and influenza is also frequently so initiated. Revised by W. Pepper.

Snell, Willebrord (also known as Snellius): astronomer and mathematician; b. in Leyden in 1591; succeeded his father as Professor of Mathematics at the University of Leyden in 1613. He discovered the law of the refraction of light. (See Optics.) He was also the first to calculate the size of the earth by measuring trigonometrically an arc of a meridian. The method he employed in this undertaking he described in his *Eratosthenes Batavus, sive de Terræ Ambitus vera Quantitate* (Leyden, 1617). He also wrote *Cyclometria, sive de circuli dimensione* (Leyden, 1621), and other works. D. in Leyden, Oct. 30, 1626.

Snera: See Mogador.

Snider, Denton Jaques: See the Appendix.

Snider Rifle (so called from its inventor): a rifle, the essential features of which are that the breech-block revolves around an axis on the right of and parallel to the axis of the bore, and the firing-pin passes obliquely from the nose of the hammer through the breech-block to the center of the base of the cartridge. This was the first form of breech-loader adopted by the British Government, which in 1866 directed that the old Enfield muzzle-loaders should be altered to breech-loaders upon this system. See Small-arms.

Snipe [M. Eng. *snipe* : Dutch, *snep*, *snip* : Germ. *schnepfe*, snipe : Swed. *snäppa*, sandpiper]: any bird of the family *Scolopacidæ*, which includes those known as shore-birds or sandpipers. (See Sandpiper.) More commonly the name is restricted to the marsh-haunting species of the genus *Gallinago*, about twenty in number, which are distributed over the greater part of the globe, but more particularly in temperate regions. They have a straight bill, considerably longer than the head, grooved to the end, which is slightly expanded, well supplied with nerves and used in probing the mud for worms. The eye is placed far back, over the ear. The plumage is streaked with shades of buff and brown, black and white, and blends completely with the ground. The tail-feathers vary from twelve to twenty-six. The American snipe (*Gallinago delicata*) is found in suitable places over the greater part of the U. S., breeding in the northern portions and thence northward. In winter it migrates, occurring as far S. as Brazil. It is sometimes called English snipe; but that bird, although very similar, is a distinct species (*Gallinago gallinago*), which does not reach North America, although occasionally found in Greenland. The jack-snipe of Europe (*G. gallinula*) is the smallest of the group; the great snipe of eastern South America (*G. gigantea*) is the largest. F. A. Lucas.

Snipefish: another name of the Bellows-fish (*q. v.*).

Snoho'mish: city; capital of Snohomish co., Wash.; on the Snohomish river, and the Everett and Monte Cristo, the Gt. North., and the Seattle, Lake Shore and East. railways; 9 miles from Puget Sound; 38 miles N. N. E. of Seattle (for location, see map of Washington, ref. 3–D). It is in an agricultural, mining, and lumbering region, has regular steamboat communication with Seattle, and contains a county court-house (cost $30,000), 3 graded public schools, 5 churches, about 20 sawmills and shingle-mills, 2 sash and door factories, Masonic and Odd Fellows' halls, water-works, electric lights, street-railways, 2 national banks with combined capital of $100,000, and 2 tri-weekly and 3 weekly newspapers. Pop. (1880) 149; (1890) 1,993; (1900) 2,101.

Editor of "Eye."

Snoilsky, snoil'skĕ, Karl Johan Gustaf, Count (*Sven Tröst*): poet; b. in Stockholm, Sweden, Sept. 8, 1841. He made his first appearance in print, with several other young poets, in the publication of the Upsala society Namnlösa sällskapet (1860). His earliest collection of poems, *Smådikter* (1861), is characterized by great warmth and originality, especially in the descriptions of Italian life and scenery. His sonnets (1871) and his translation of Goethe's ballads (1876) are among the best of their kind in recent Swedish literature. His later poems, *Nye dikter*, etc. (1881), are more national in spirit, and display a deep sympathy for the unfortunate and oppressed classes of society. For a number of years he has served with distinction in the Swedish diplomatic corps. See C. D. af Wirsén, *Om Karl Snoilskys skaldskap i Svea* (1882). D. K. Dodge.

Snorri Stur'luson [usually written Snorre Sturlason]: the most celebrated historian of old Iceland. He was born in 1178, and belonged to the numerous and powerful clan of the Sturlungs. He was fostered by the prominent chief Jon Loptson, at whose home he acquired the book-knowledge of his day, and he became particularly familiar with the old poetry and saga literature of Iceland and Norway. At the age of twenty Snorre married a wealthy woman, and by this marriage he became one of the most powerful chiefs of Iceland and was able to attend the Althing at the head of about 900 armed men. He was made speaker of laws (*lögsögumaðr*) several times, and for several years he was the richest and most influential man in the whole land. He became involved in the bloody feuds which in his time split the Sturlungs into warring factions, and he was continually implicated in litigation with his relatives and others in regard to property and inheritances. In 1218 he made his first visit to Norway, and was received into the household of the young king, Hakon Hakonson. In 1219 he visited the lagman Eskil in Sweden, and there he must have obtained that thorough knowledge of Sweden and Swedish affairs which appears in his writing. In 1220 he returned to Iceland, after having previously promised to work for the subjugation of Iceland to Norway. As he made no progress in the realization of this plan, he was suspected of faithlessness by the rulers of Norway, and his enemies in Iceland took advantage of this circumstance to bring about his ruin. After endless feuds in his own country, Snorre had to go a second time to Norway in 1237, but he lost the good will of King Hakon and was compelled to return to Iceland. On his arrival there he got into trouble with his son-in-law, Gissur Thorvaldson, who, at the instigation of King Hakon, murdered him on Sept. 22, 1241, at his home at Reykholt, where ruins of his splendid mansion are still to be seen. Snorre became Iceland's most distinguished sagaman, and he enjoys some reputation as a skald. As a writer of history he ranks with Herodotus or Thucydides. His *Heimskringla*, embracing an elaborate history of the kings of Norway to the death of Magnus Erlingson in 1177, is famous throughout the world. An English translation of this work was published by Samuel Laing in London in 1844, and a revision of Laing's translation by Rasmus B. Anderson appeared in London and New York in 1889. The *Younger Edda* also bears Snorre's name, and is to a great extent his work. See Edda and Icelandic Literature.

Rasmus B. Anderson.

Snow [O. Eng. *snaw* : O. H. Germ. *snēo* (> Mod. Germ. *schnee*) : Goth. *snaiws*; cf. Lith. *snĕgas* : Russ. *sniegŭ* : Ir. *sneachd* : Lat. *nix*, *nivis* : Gr. *νίφα* (acc.) < Ind-Eur. *sneighos* : *snoighos* : snow]: the aggregations of minute spicules of ice into which the excess of vapor in the atmosphere is condensed when the temperature is at or below the freezing-point of water. These aggregations, called snowflakes, though assuming a great variety of crystalline forms, usually present the outline of a hexagon or a six-pointed star. (See the illustration in the article Ice.) In high and middle latitudes the ground is covered with snow each winter, but within the tropical regions no snow falls at or near the level of the sea, for the temperature of the lower atmosphere is always sufficient to melt it, even if it is formed in the upper air. In the northern hemisphere the limit of the fall of snow at the sea-level is an irregular line passing mainly between 25° and 40° N. lat.; in the southern it is more regular, lying in the continents between lats. 37° and 38°. In general, this line is nearest to the equator in the regions most exposed in winter to the polar winds, as on the eastern coast of Asia and of North America. As the heat of the air decreases upward, the formation of snow is always possible upon high mountains, even under the equator. At the summit of the Andes and the Himalayas, for example, the moisture condensed during the rainy season falls in the form of snow, while it rains on the slopes and plains below. Thus in all latitudes from the equator to the poles the tops of high mountains are covered with a layer of permanent snow, which the summer heat is not sufficient to melt. The lower limit of perpetual snow, called the *snow-line*, varies in altitude in the different portions of the globe. Within the tropics it is found about 3 miles above the level of the sea; in temperate latitudes it descends to a little less than 2 miles; and at the northern limits of the continents it is about half a mile, or even less, above the level of the sea; while on the arctic islands vast fields of snow remain permanently very near the seashore.

The height of the snow-line, as observed in different latitudes, is given in the following table:

Latitude.	New World.	Feet.	Latitude.	Old World.	Feet.
75° N.	North Greenland	2,300	75° N.	Bear Island	600
54°	Unalashka	3,500	71°	Mageroe, Cape North	2,300
48°	Mt. Baker, Ore.	about 8,000	67°	Sulitelma, Lapland	3,800
43°	Rocky Mountains	12,500	61°	Scandinavian Alps	5,300
39°	Rocky Mountains	14,500	50°	Altai Mountains	7,000
38°	Sierra Nevada	11,000	46°	Alps, north side	8,900
19°	Popocatepetl, Mexico	14,900	46°	Alps, south side	9,200
5°	Tolima, Colombia	15,300	43°	Caucasus	11,000
1° S.	Andes of Ecuador	15,700	35°	Hindu Kush	13,000
17°	Andes of Bolivia, west side	18,500	31°	Himalaya, south side	16,200
17°	Andes of Bolivia, east side	15,900	31°	Himalaya, west side	18,600
33°	Andes of Central Chili	14,700	12°	Abyssinian Mountains	14,000
42°	Andes of Patagonia	6,000	3° S.	Kilimá Njaro	16,000
54°	Andes of Straits of Magellan	3,700	44°	New Zealand Alps	7,500

This table shows that though the height of the snow-line decreases toward the poles, its greatest altitude is not at the equator, but near the tropics, and that it is also subject to great irregularity of elevation.

Two conditions regulate the altitude of the snow-line—the quantity of fallen snow, and the amount of heat to melt it. Thus in the sub-tropical zones, which have less snow and no less summer heat, the snow-line is higher than at the equator. In similar latitudes the coast-regions, exposed to moist winds, have a lower snow-line than the interior of the continents with their scanty snows, dry atmosphere, and hot summers. The peaks of the Sierra Nevada bear perpetual snow 3,500 feet lower than the Rocky Mountains in the same latitude. The southern slope of the Himalayas, which condenses the vapors brought by the warm monsoons, has a snow-limit, on an average, 2,000 and in some places 4,000 feet lower than the northern slope on the dry and sunny plateau of Tibet. In the Alps the line of snow is somewhat higher on the southern slopes, exposed to the warm summer wind from Italy. In passing from the dry climate of Central Chili to the rainy region farther S., the snow-line descends from 14,700 feet to 6,000. A vast amount of snow in the latter region, and a wet, cloudy summer, account for the change. In the Rocky Mountains, in a latitude corresponding to that of the Patagonian Andes, the snow-line has an altitude of 12,500 feet—that is, full 6,000 feet higher. See Glaciers. Revised by M. W. Harrington.

Snow, Francis Huntington: See the Appendix.

Snowball: the *Viburnum opulus*, a cultivated shrub of the family *Caprifoliaceæ*, called also Guelder rose. To this species belongs the high-bush cranberry of the U. S., whose fruit is edible. The species is native to Europe and North America. The snowball is a variety with handsome globular cymes of sterile flowers. The Japanese snowball is *V. tomentosum* (*V. plicatum* of nurseries). Revised by L. H. Bailey.

Snowberry: the *Symphoricarpos racemosus*, a handsome shrub (family *Caprifoliaceæ*), common in the U. S. in many parts, and half naturalized in European shrubberies. Its persistent, white, inedible berries are well-known and familiar objects. The name is also given to *Chiogenes hispidula* (family *Ericaceæ*), a creeping woody plant, whose leaves and white edible berries have the taste of the checkerberry (*Gaultheria*). It is common in the northern parts of the U. S. and Canada. Revised by Charles E. Bessey.

Snowbird: any one of several species or varieties of the genus *Junco*. These belong to the family *Fringillidæ*, and have a small conical bill, the wings rather short, the middle toe shorter than the short tarsus, the outer toe rather longer than the inner, and extending to the claw of the middle one, and the tail nearly as long as the wings, slightly emarginate, and decidedly rounded; the color is blackish or ash above, white on the belly, and not developed in streaks anywhere; the outer tail-feathers are white. The several forms generally rather exceed 6 inches in length, of which the tail forms a little more than half. They are distributed over different regions of the U. S., seven species and four sub-species being generally recognized, although the differences between some of them are very slight. Of these, the form *hyemalis* is the only Eastern type, the others being found in the West. They are mostly birds of passage in the Eastern and Middle States, for while some breed in the mountains from North Carolina to New York, the majority go North to breed while yet snow may be on the ground, and return in the late fall. They feed on seeds and berries. The nests are built on the ground; they lay about four eggs, about three-quarters of an inch long, and of a yellowish white dotted with reddish brown. The name is sometimes applied to the snow-bunting (*Plectrophenax nivalis*), a pretty little finch found in high northern latitudes and seen in the northern parts of the U. S. in winter, sometimes in vast flocks. The back is gray, tail and wings black and white, under parts white. In breeding-plumage the back and bill are black, and there is more white in the plumage than in winter.

Revised by F. A. Lucas.

Snow-bunting: See Snowbird.

Snowden, James Ross: numismatist; b. at Chester, Pa., 1810; educated at Dickinson College; studied law and settled at Franklin, Pa.; was Speaker of the Pennsylvania House of Representatives 1842–44; State treasurer 1845–47; treasurer U. S. mint 1847–50, and director of the mint 1853–61; wrote the articles on U. S. coinage in *The National Almanac* (1863), also in Bouvier's *Law Dictionary* (1868); published seven annual *Reports* on the mint, and many addresses and pamphlets on coinage, currency, and allied subjects; was author of two beautifully illustrated volumes descriptive of the ancient and modern coins in the U. S. mint (Philadelphia, 1860), and of the medals and other objects of interest in the same collection (1861); of a volume on *The Mint at Philadelphia* (1861); *The Coins of the Bible and its Money Terms* (1864); and *The Cornplanter Memorial, an Historical Sketch of Gy-ant-wa-chia, "the Cornplanter," and of the Six Nations of Indians* (Harrisburg, 1867). D. at Hulmeville, Pa., Mar. 21, 1878.

Snowdrop: the *Galanthus nivalis* (family *Amaryllidaceæ*), a small herb much cultivated in gardens for its snow-white flower, appearing in earliest spring. A native of the Alps, it is naturalized in Northern Europe, and is becoming so in the U. S. A larger species, *G. imperatri*, is also grown.

Snowdrop-tree: either the *Halesia tetraptera* or the *H. diptera* (family *Styracaceæ*), small trees or large shrubs native in the southern parts of the U. S. They bear showy-white clusters of flowers, which appear in spring somewhat before the leaves. They are very fine in cultivation. A third species is *H. parviflora*, from Florida. By some recent authors the genus is called *Mohrodendron*.

Snowflake: the *Leucolum vernum*, *L. æstivum*, and the *L. aulumnale*, European herbs of the family *Amaryllidaceæ*, cultivated also in gardens in the U. S. They are hardy bulbous plants with white flowers. The bulb of the first-mentioned species has long been employed in the Old World as an emetic, and probably all have aero-narcotic powers.

Snow-goose: a goose of the genus *Chen*, the *Chen hyperborea*. Its popular name was given it both on account of the pure white plumage of the adult and because of its northern habitat. The forehead is frequently of a light-rusty color and the ends of the primaries dark. The snow-goose reaches a length of 2½ feet and a weight of 5 or 6 lb., breeds in the far north, and during migration is common in the interior of the U. S. and on the Pacific coast. It is rare on the Atlantic coast and is accidental in Europe.

F. A. L.

Snow Hill: city (chartered in 1894); capital of Worcester co., Md.; on the Pocomoke river, and the Phila., Wil. and Balt. Railroad; 5 miles from Chincoteague Sound, and 20 miles S. S. E. of Salisbury (for location, see map of Maryland, ref. 5–H). It has regular steamboat communication with Baltimore; ships large quantities of oysters, fruit, and vegetables to the Northern markets; and contains 8 churches, 2 graded public schools, a national bank with capital of $50,000, and 2 weekly periodicals. There are manufactories of cotton goods, whips, baskets, feed, lumber, and shooks, and a canning factory. Pop. (1890) 1,483; (1900) 1,596.

Snuff: See Tobacco.

Snyder, Zachariah Xenophon: See the Appendix.

Snyders, Frans: painter; b. at Antwerp, 1579. He was a pupil of Peter Breughel, the younger, and afterward of Hendrik van Balen. He became a friend of Rubens. He began by painting still life only, but when he returned to his native city in 1609 after a visit to Italy, he began to produce pictures of the chase, in which he depicted the struggles of eager hounds with savage beasts at bay, introducing the human figure also. Rubens, whom he followed, sometimes made use of his services as an assistant. Snyders is celebrated as a fruit-painter. The Louvre possesses a *Concert of Cats* by him, and the gallery of the Prado at Madrid has many pictures of his, as also the National Gallery in London and the galleries of St. Petersburg, Antwerp, Munich, Dresden, Brussels, and other European cities. D. at Antwerp, Aug. 19, 1657. W. J. Stillman.

Soane, Sir John, F. R. S.: originally called Swan; architect; b. at Reading, England, Sept. 10, 1753; son of a bricklayer; was sent to Italy for three years (1777–80) as a traveling student at the cost of the Royal Academy; appointed architect to the Bank of England 1788; executed plans for the country-seats of many of the opulent gentry, a volume of which was printed in 1788; became clerk of the works to St. James's Palace and the houses of Parliament 1791, and Professor of Architecture at the Royal Academy 1806; published a volume of his plans of *Public and Private Buildings* (1828) and a *Description* (1827) of his own house and museum in Lincoln's Inn Fields, where he died Jan. 20, 1837. This house, with its art and antiquarian museum, he bequeathed to the nation. Among its treasures are pictures by Hogarth, Reynolds, and Turner, and models by Flaxman.

Soap [M. Eng. *sōpe* < O. Eng. *sāpe*: Germ. *seife* < Teuton. **saipjō*, whence Lat. *sāpō* > Fr. *savon*: Ital. *sapone*]: any salt of the fatty acids with a metallic base, usually a soda or a potash. All the true Oils and Fats (*qq. v.*) are decomposed by the alkaline hydrates, by certain metallic oxides, and also by acids, high steam, and hot water. In the decomposition of fats by alkalies the products formed are glycerin and the alkali salts of the fatty acids which were contained in the fats. This process is known as *saponification*. As a rule, soaps produced from soda are *hard soaps*, while those produced from potash are *soft soaps*. Castor oil, however, forms with potash a hard and brittle soap. A fundamental distinction between the hard and soft soaps is found also in the fact that in the former the glycerin is removed in the mother liquor or spent lye, while in the latter it remains mingled with the semi-fluid mass. Moreover, it is not possible to dry the potash soaps, owing to the very hygroscopic character of the base, while soda soaps may be so completely dried as to admit of grinding to powder.

Saponification takes place slowly in the cold, much more quickly by aid of heat, and the presence or absence of air is immaterial. The result depends on the nature of the fat or oil as well as on the base; e. g. if the fat is complex—containing, for example, stearin, palmitin, olein, etc.—then as many new salts are formed as there are fatty acids to combine with the base.

In the production of soap by the action of caustic potash on stearin (glyceryl stearate) the products are glycerin and potassium stearate; thus:

Stearin.	3 molecules pot. hydrate.		Glycerin.	3 molecules of potassium stearate.	
$(C_{18}H_{35}O)_3$	K_3		$(C_3H_5)'''$	$(C_{18}H_{35}O)_3$	
$(C_3H_5)'''$ O_3 +	H_3	O_3 =	H_3	K_3	+ O_3

Formerly in North America and Russia much larger quantities of potash were obtained in clearing up forests than now, and hence potash soaps were produced in proportionate quantity. These were, especially in Germany, converted into hard or soda soaps by utilizing the property of the potassium-salts in decomposing common salt or sodium sulphate, forming potassium chloride or sulphate and soda soap. Moreover, the enormous production of caustic soda at a cheap rate consequent on the adoption of Leblanc's soda-process, stimulated by the great demand for bleaching-powders, of which sodium salts are a by-product, has well-nigh put an end to the use of potash in producing soap, excepting as an element of domestic economy in those regions where potash is still a common product. Thus in Canada and in some other parts of North America "pot-ashes" and "pearlashes" are still articles of considerable importance.

As a technical art, soap-boiling depends on the use of caustic lyes of a suitable strength for the saponification of fats, oils, and resins. The lye of the soap-boiler is a dilute alkaline liquor prepared by the action of slaked lime (calcium hydrate) on a boiling solution of 3 parts of potassium carbonate in 12 parts of water, or the same quantity of sodium carbonate (soda-ash) in half this quantity of water. "The manufacturer nowadays buys solid caustic soda or potash from the alkali-works. The sodium aluminate obtained by the decomposition of cryolite is used in the U. S. under the name *Natrona refined saponifier* for soap-manufacturing purposes" (*Wagner*).

The manufacturer of hard soap, having provided a stock of alkaline liquors (lyes) of various strengths, charges his soap-pan with a quantity of neutral fat or oil, and adds weak liquors of about 1·050° density. Soap-pans are made of iron plates riveted at the joints, and of various sizes, from 10 to 15 feet in diameter and of proportionate depth, set over fire-chambers, or more frequently heated by steam, either in jackets or injected from numerous small holes pierced in pipes introduced into the liquors. They vary in capacity, of course, but many hold from 20 to 30 tons of soap. As the temperature rises and the oil and alkali liquor mingle, a uniform milky emulsion is formed in which neither oily globules nor water are visible on cooling a portion of the fluid. The operator watches for this change, and adds more solution of alkali or water, as the case may require, until the emulsion forms and all alkaline taste has disappeared, using the tongue as a test. Stronger liquors are then added gradually to complete the displacement of the glycerin, which was begun by the weak liquors, and the boiling continues until a strong alkaline taste is detected. The workman then adds more fat or oils, and repeats the use of stronger lyes until gradually the soap-pan is nearly filled, taking care that at the last there shall be no excess of alkali. During this series of operations he often also adds a portion of resin, which by virtue of its constitution undergoes a kind of saponification with alkalies, and adds to the product more than its value in weight and volume. Then comes the next important stage of the soap-boiling operation, in which, by the addition of salt, the emulsion of oils and alkali is decomposed, the salt taking the water and causing the precipitation of the newly formed soap in a curdy or granulated state, floating on the dense spent lyes in which is found the glycerin and salt, but no alkali. This mother liquor, after the separation of the soap is complete, is withdrawn and rejected as having no value. The imperfectly developed soap is subjected a second time to a like series of operations as at first; it is brought by boiling to a homogeneous state, more oils or fats and strong alkaline liquors are added until the whole has a decided alkaline taste, and more salt is then added to cause the separation of the soap from the alkaline solution, and the whole mass is kept boiling for some time until all the fats, etc., are completely saponified. This completes the chemical part of the operation if the soap contains no rosin, and after allowing time for subsiding of the dregs the "curd" is transferred by skimmers to the "frames," where it cools and becomes solid preparatory to cutting up for use. If the soap contains rosin it requires a further treatment before framing—viz., the curds, after removal of the spent liquor and dregs, are melted with more water and boiled by steam or fire or both. A homogeneous compound results, containing an indefinite quantity of water, which is permitted to rest for two or three days, when it separates into a stratum of a definite compound containing about 65 per cent. of fat acids, 6·5 of soda, and 28·5 of water, and resting on a lower stratum of an indefinite compound containing much more water and the dregs or sediments of the operation. This lower stratum, called nigre, contains also an excess of alkali, and forms with the addition of fat and salt the staple of another "boil" for more soap. The nigre which accumulates with each boil is used as a mottling for clouded soaps, or may otherwise be worked up in subsequent operations. A strong preference at one time existed for mottled soaps, founded on the fact that in such soaps no excess of water could exist. The substances which impart the mottled appearance, being heavier than soap, were held in suspension only in consequence of its thick and pasty condition. It is, however, possible so completely to simulate the appearance of genuine mottled soap, by adding mineral and other colors during the process of hardening to soaps containing much more than the normal quantity of water, that this sign has lost its value, and such mottlings are justly re-

garded as only evidence of impurity from the introduction of bodies foreign to soap. Good hard white soap contains fatty acids, 61·0; soda, 6·2; water, 32·8.

The soaps vary chiefly with the fats or oils from which they are produced, and may be considered as forming two principal classes—viz., soaps made from vegetable oils and those from animal oils and fats.

A. Vegetable Hard Soaps.—*Marseilles or Castile Soap.*—In Southern Europe soap is largely made of olive oil mixed with about 20 per cent. of rape-seed oil. This soap is noted for its firmness, freedom from the depraved animal odors found too often in tallow soaps, and in general for its excellent qualities. Without the addition of rape-seed oil the soap from olive oil is so hard as to crumble when cut, and is difficult to dissolve in water. This soap has a peculiar mottling—like granite, and not in streaks of color, as in the imitations made from animal fats. The best olive-oil soap is made in Spain and Portugal, also in Provence and Aix, from oil hot-pressed from the olives after the virgin and table oils have been extracted: 100 parts of new and good oil produce 175 parts of finished soap when no rape oil is used, by which the product is reduced to 170 parts or less. The richness of olive oil in margarin or palmitin is the reason for the superior quality of the soap it produces. The marbling of the Marseilles soap is due to iron, which is sometimes added as sulphate, and is changed to sulphide by the alkaline sulphide present in the soda. By exposure to the oxidizing influence of air the dark stains of ferric sulphide are changed to a reddish color. Dr. Normandy found the foreign castile (or Marseilles) soap (sp. gr. = 1·0705) to contain fatty acids, 76·5; soda, 9; water and coloring-matter, 14·5 = 100. The English imitation (sp. gr. = 0·9669) gave fatty acids of pasty consistence, 75·2; soda, 10·5; water with a little coloring-matter, 14·3 = 100.

Cocoanut-oil Soap.—Marine Soap.—The soap made from the oil of the cocoanut is remarkable for its extreme hardness, and consequently for the very large amount of water it can hold without becoming soft. It has a disagreeable odor, which is with difficulty removed. The oil requires for its saponification a very strong lye, and is aided by the use of potash. This soap is not easily decomposed by weak saline liquors, and is hence used to wash in salt water, whence its name of marine soap. This quality of carrying a large amount of water has led to the use of cocoanut-oil soap as a means of mottling weak soda soaps from tallow, etc. Such soap can be made to hold up manganese oxide, ultramarine, etc., in connection with far more water than can be introduced into a genuine castile soap.

Rosin Soap.—Common Yellow Soap.—Rosin boiled with alkaline liquors, whether caustic or carbonated, is converted into a soapy emulsion. It is not a true soap, but from its plastic, viscid nature it is found to be a good vehicle for diluting true soaps from tallow or other fats. The process of manufacture for rosin soap varies from that of soap from oils or fats alone by the omission of the last boiling. By itself, rosin does not form a hard soap, and unless it is thoroughly treated by strong liquors it leaves on the hands or any surface washed with it a resinous varnish and offensive odor of rosin. It forms, when carefully prepared and not in excessive quantity, a very serviceable soap, which quickly forms an excellent lather and is very cheap.

Castor-oil soap and *palm-oil soap* are both soda soaps, although the oil of the castor-bean forms a hard soap with potash, and is remarkable, like the cocoanut-oil soap, for the large quantity of water which may be combined with it—as much as 70 per cent. The palm oil is saponified like tallow soap; it is used chiefly as an addition to yellow rosin soap, as the unbleached oil has a decided yellow color, and its strong and rather agreeable odor serves to disguise the disagreeable odor of rosin soap, which also acquires in addition a certain transparency, due to the palm oil.

B. Tallow and other Animal-fat Soaps.—Under the heads of fats and oils is given nearly all that is needful to say of hard soaps from animal fats and oils. The old German hard soap was prepared from crude tallow by lye of ashes or potashes, giving an imperfect soap, which in the subsequent boiling is converted into soda soap by salt, which, being at the same time supplied with an excess of alkali, produces a neutral soda soap, and is then boiled down to curd with salt. This art long preceded the knowledge of chemical principles underlying it. The indications of saponification, advancing by all the grades of the process, are so distinct that no thought was entertained at first of working with weighed quantities. All that was required was to add more lye or more fat, according to appearance, until the proper state had been attained. In all respects the teachings of this empiric experience led to the same result which chemical knowledge has since illustrated and confirmed. The use of crude tallow has been abandoned in favor of purified grease, and the abundance of pure caustic soda renders useless the old methods of leaching ashes for potash lye or of boiling up soda-ash with lime. Experiment shows that 100 lb. of tallow produce 150 to 155 lb. of perfect curd soap, weighed as soon as it is cut; if more is obtained it is because water is added.

Oleic Soap, or Red Soap.—This soap, resulting from the lime-saponification of animal fats in the stearic-acid manufacture, is an important product wherever the manufacture of stearin candles is carried on. As the glycerin has already been removed, the saponification of the oleic acid is readily effected even by alkaline carbonates. It is also mingled with neutral fats, and saponified by soda-lye of 18° B. A patented process for producing soap from red oil depends on treating the oleic acid in a steam-heated copper while agitated by a steam-twist with carbonate of soda, etc., in equivalent proportion in the state of fine powder, added in successive portions, with or without rosin, according as a coarser soap or a fine toilet-soap is required. The relative proportions of oleic acid, water, and rosin in this soap being adjusted at the beginning, there is no waste lye; the soap is said to come quickly, does not shrink by air-drying, and is in all respects represented as an excellent soap.

Soft Soap.—In domestic economy it is a practice in New England and New York to saponify the drippings of the kitchen, chiefly beef and mutton suet, with the crude potash of commerce in the cold. The following empirical receipt has become traditional for domestic soft soap: Fat, 12 lb.; potash, 9 lb.; water, 12 gal. The fat and alkali are placed together in a cask, and the water is added, 3 gal. at a time, boiling hot, once in twenty-four hours, until all is used. The process of saponification sets in soon, but is not completed until after many days, and is hastened by frequent stirring with a strong stick. When saponification is complete all lumps of unaltered fat disappear, the soap has a silky luster when stirred, and the consistency of a jelly, trailing off in slender threads from a stirrer, and is a powerful detergent for all the coarser purposes of the household. Such a soap is obviously an impure potash-fat soap in caustic lye, and not an actual soap; all the glycerin of the fats is of course present also in this crude product. If an attempt is made to purify it by separation of the glycerin and excess of alkaline lye by solution of salt, it results simply in the production of hard soda soap, on principles already explained.

In the manufacture of soft soap by boiling, caustic lyes are made from leached ashes or American potashes, exactly as when soda-lyes are used, and of graded strength, 9°–11° solutions being first used with gentle heat. The fatty bodies used are kitchen drippings, tallow, fish oil, linseed, rape-seed, and other drying oils. As soon as the complete combination is effected, and the thick fluid falls in strings from the stirrers with a shining appearance and somewhat turbid, the clarification begins with the gradual addition of a stronger lye at regular intervals until the soap passes from its turbid state to a clear, transparent slime. The boiler judges by empirical rules the state of progress toward completion of the saponification. If a drop from the middle of the pan when cooled on a plate of glass remains clear, the soap is complete; a gray margin indicates a want of lye in proportion to its breadth; and if this deficiency is great, the specimen is fluid and slimy. If the proper quantity of lye has been exceeded, the soap is said to be overdone, which is indicated by a gray skin spreading over the whole drop, instead of forming a ring or rim only; the soap is then granular, and when wet easily detached from the glass (*vitreous*). An excess of water is driven off by evaporation with a brisk fire and beating the froth as it rises with stirrers. As the soap thickens the froth subsides, the soap sinks and becomes darker, white bubbles are borne on the surface overlapping each other, called laminations by the workman; and the noise occasioned by this action has led to the saying, "the soap talks." As some kinds of oil, like that of hemp-seed, impart an esteemed greenish color to soft soap, while other varieties of soap are yellow, the greenish tint is artificially imparted to the yellowish soap by indigo. The detergent power of soft soap is very great, owing largely to its strong alkaline condition, and is hence

much esteemed in scouring wool, coarse linens, and for other like uses in the dyehouse. As it normally retains as inseparable from it the excess of alkali, the free glycerin and other impurities, there is no guaranty, as in the case of hard soaps, for its purity. Hence many methods have been practiced for reducing its cost—as, for example, the so-called bone soap, formed by the addition of the gelatin from ground bones, dissolved or partially decomposed by potash. In another plan hydrochloric acid is used to dissolve out the mineral matter of bones, leaving the gelatin, which, when carefully washed free of acid, is added during saponification to the fat. The soap with bones is called "Liverpool poor man's soap"; it is an open fraud, since gelatin and phosphate of lime can act only as useless diluents of soap. But this fraud is harmless compared with the use of the intestines of animals, skin, sinews, hoofs, hair, decomposed fish, and other animal refuse. Even naphtha, a non-saponifiable oil, and dextrin are sometimes employed in a like manner. Soft soap contains, according to quality, fatty acids, 50 to 40 parts; potash, 9·5 to 11·5 parts; and water, 38·5 to 50·5 parts in 100.

Silicated soaps contain either soluble silica or sand and powdered pumice, fuller's earth, and alumina. These substances act only mechanically as detergents, and may be permitted when a proper reduction in price is allowed. Sand soap, such as is used for scouring floors, contains as much as 75 per cent. of its weight of sand, and the French *savon-ponce* (pumice-soap) has from 20 to 26 per cent. of ground silica or pumice. These comparatively worthless mechanical mixtures have been replaced by soap in which soluble glass, or silicate of sodium, is employed with advantage. This feeble alkaline compound has by itself a considerable detergent power, and when mixed with ordinary soap an article of greatly reduced price and useful for many domestic and manufacturing operations is produced. These silicated soaps are quite strongly alkaline, owing to the nature of the soluble glass; this excessive alkalinity is reduced for some purposes by combining, with the soap, rosin or fatty acids, as in the ordinary process of soap-making. Carbonic-acid and sulphurous-acid gases are likewise passed into the liquid for the purpose of partially neutralizing the excess of alkalinity.

Toilet-soaps are made from very pure and sweet materials—sweet almond oil, beef-marrow, refined sweet lard, saponified without heat and perfumed with various essential oils. Very pure curd soap is also used for the foundation of toilet-soaps, for which purpose the soap is reduced to thin shavings, melted over a water-bath with rose and orange-flower water and common salt—24 lb. of soap, with 4 pints each of rose and orange-flower water, and about half a pound of salt. When cold next day, it is cut in small bits and dried in the shade, again melted down with the same proportion of orange and rose water, strained, cooled, and dried again. The heavy animal odor is thus removed, when it is powdered and left in a clean place exposed to air for some days. After this, it is ready to receive the desired perfume, and may be colored with aniline tints, ultramarine, etc., and moulded in forms for use. *Shaving-cream* is made by beating up lard with once and a half its weight of potash-lye, and perfuming and coloring as desired. *Glycerin soap* is prepared by mixing pure glycerin with a toilet soap, or with the transparent soap produced from its solution in alcohol. It mollifies the skin in cold weather.

Properties of Soap.—Besides its detergent properties every kind of soap in use contains a variable quantity of water, partly in chemical combination; and its power of absorbing water is also very various, being from 7½ per cent. in hard soda soaps to 162 per cent. in soft potash soaps of oleic acid when previously dried by artificial heat. Soap is perfectly soluble in alcohol, as also in hot water, both solutions becoming of the consistency of a jelly on cooling. In this state, mixed with camphor and oil of rosemary, the alcoholic tincture of soap is familiar as opodeldoe, or *linimentum saponis compositum* of the *Pharmacopœia*. Tincture of white soap is readily decomposed by salts of calcium and magnesia, and is familiar to the chemist, when made of normal strength, as the most convenient test for the hardness of natural waters (Clark's test). Potash soap is more soluble in water than soda soap. The sodium stearate is hardly affected when placed in 10 parts of water, while potassium stearate thus treated forms a stiff jelly. Sodium oleate dissolves in 10 parts of water—potassium oleate in 4 parts, and it forms a jelly even with 2 parts. Cold water partially decomposes the alkaline oleates, palmitates, and stearates (common soap), the neutral salts being resolved into alkali, which dissolves, and the free acid, which precipitates. This explains why in using soap, even with pure water, its transparency is always disturbed, while the alkaline property, and consequent detergent power, of soapsuds is due to the liberation of a portion of caustic potash or soda, which attacks and removes the grease of foul linen, etc.

The value of soap depends mainly on the amount of dry soap (the real soap or alkaline salt of the fatty acids) in any given specimen. The loss in weight of a given amount of soap cut in thin shavings, when completely desiccated in a drying oven, at 212° F., is hygroscopic water, which should not for best hard white soap exceed 20 per cent., for mottled soap 25 per cent., and for yellow soap 30 per cent. The fat acids vary from 60 to 70 per cent., and the alkalies from 7 to 9 per cent., according to quality. As before mentioned, soaps made from cocoanut oil contain normally much more water, and in the yellow soaps from 10 to 20 per cent. of the fatty acids are replaced by rosin.

Soap was not known to the ancients. It is first mentioned by Pliny, who refers to it as something used by the Romans for the purpose of beautifying the hair. Geber in the second century states that soap was prepared from various kinds of tallow with potash and lime. It is stated further that soap is used as a medicine, and that by means of it all dirt could be removed from the body and clothes. For more details respecting the manufacture of soap, consult Richardson and Watts, *Chemical Technology*; Muspratt's *Chemistry*; Watts, *Dictionary of Chemistry*; Ad. Wurtz, *Dictionnaire de Chim.*; R. S. Cristani's *Soap and Candles*; Dussance's *Manufacture of Soap*; Thorpe, *Dictionary of Applied Chemistry*. Revised by IRA REMSEN.

Soapberry: the fruit of the *Sapindus saponaria* and *S. inæqualis*, West Indian trees of the family *Sapindaceæ*. The pulp is a powerful detergent, much stronger than ordinary soap, and the hard shining seed has been exported and used for making buttons, which are very durable. In the southern parts of the U. S. there grows another soapberry-tree, *Sapindus marginatus*, which is sometimes 40 feet high. There are various tropical species which have a fruit with an edible pulp, but the seed is often poisonous. These trees have no practical importance. Revised by L. H. BAILEY.

Soapstone: See STEATITE.

Soapwort: a name sometimes applied in a general way to the plants of the family *Sapindaceæ*, on account of the soapy quality of the fruits of many species. It is also the name for plants of the genus *Saponaria* (family *Caryophyllaceæ*) and other plants of the same family, which are sometimes utilized for their detergent powers. There are in many parts of the world vegetables which are excellent substitutes for soap. In some instances this cleansing power depends upon the prineiple saponine, found in plants of widely diverse families. The root and leaves of common soapwort contain saponine, and are often used for washing. The root has also medicinal properties. Revised by CHARLES E. BESSEY.

Sobat River: See the Appendix.

Sobieski: See JOHN III., SOBIESKI.

Soccage, or **Socage**: See TENURE.

Socialism [from Lat. *so'cius*, sharing, associated, (as noun) fellow, partner, companion]: a conscious endeavor to substitute organized co-operation for existence in place of the present anarchical competition for existence; or the system of social organization calculated to bring this about. This definition, though it gives, perhaps, adequate expression to the active and practical side of socialism, leaves out of account altogether its theoretical basis. From this point of view socialism is an attempt to lay the foundation of a real science of sociology, which shall enable mankind, by thoroughly understanding their past and present, to comprehend, and thus, within limits, to control the movement and development of their own society in the near future. Consequently socialism in its wide sense is not, as is still commonly thought, a mere aspiration for a better state of society, still less only a series of proposals to mitigate the evils arising from the present social arrangements. Modern scientific socialism essays to give an intelligible explanation of the growth of human society, and to show that as each step in the long course of development from the institution of private property, through chattel slavery, serfdom, and wagedom, was inevitable, so the next step from capitalism to socialism is also inevitable. The object which socialists have in view in their propaganda is that this, the final trans-

formation, should be made consciously by an organized, educated, and intelligent people, instead of unconsciously, and therefore tempestuously, by groups of discontented, embittered, and ignorant workers. Agitation against the injustice of the present system of production, therefore, is only valuable in so far as it educates men and women to appreciate the tendency of the time, and in this way leads them to organize for the attainment of the definite end which the evolution of economic forms has made ready. Whether the great change will be brought about peaceably or forcibly has no bearing upon socialism in itself, but depends upon the stage of development which has been reached in each civilized country, and the attitude which the dominant class may adopt in relation to the demands that the economic situation impels the producing class to make.

The Early Communal System.—All authorities on the early history of our race are agreed that the primitive forms of human society were founded upon communism, or common ownership, alike of the means of production and of the products; the personal relations between the members of these communities being regulated by kinship, and not by property or residence. In these circumstances equality of social condition was the rule within the limit of the gens or tribe; women were supreme in the communal household, their children belonging to their own gens; and though the power of man to produce wealth was then very small, and scarcity or famine was not uncommon, it was impossible in these circumstances for one portion of the little community to be foodless while another portion was in possession of a superfluity of the necessaries of life. Examples of this form of society are still to be found in their pristine completeness, as well as in process of disintegration, in many parts of the world. According to socialistic theories, the same law applies to human society that has been found to govern development in other portions of inorganic and organic nature. This law, which has been formulated in the philosophic guise of unification, differentiation, and reintegration, may be traced throughout the vegetable and animal kingdoms. First there is the simple organism, then its division in the form of germination or otherwise, and lastly its reappearance in a form similar to the first. In the case of human society in its slow upward progress private property acts as the differentiating force, and the early communal society embraced within itself all the possibilities of the future, as the acorn possesses within itself, in suitable surroundings, the potentiality of the oak. With the institution of private property the entire break-up of the communal form and all that this involved became sooner or later inevitable. But during the period of communism all the inventions and discoveries which form the foundation of the modern system of machine production were placed at the disposal of mankind. The domestication of animals, the growth of cereals, the wheel, the potter's wheel and pottery, the canoe and sail, weaving, dyeing, the use of the stencil-plate, the mining and smelting of metals—each and all of these were in use under communism. The tribes benefited by the increased power to produce wealth thus very slowly obtained; but the very names of the inventors and discoverers are forgotten, and the circumstances in which they lived prevented them from deriving any individual or personal advantage from their superior ingenuity. At the same period of social growth, exchange, in its modern sense, was unknown, and considerable works were carried out in various directions as portions of the organized industry of the little communities, those who were engaged in work which could give no immediate return in food or clothing being supplied by the labor of other members of the community.

Slavery and Serfdom.—As the power of man to produce wealth increased further progress in wealth-production was hampered by these communal forms, and by the necessity incumbent upon each member of the tribe to perform his share of the communal duty. When, also, it was discovered that the captives from neighboring tribes could produce by their labor more than was necessary to maintain themselves in health and strength, there was a strong economic reason for keeping them alive, in the service of the conquering tribe or its chiefs, in place of butchering them on the spot or reserving them for cannibal banquets. (See SLAVERY.) Despite the evil features of slavery thus established it was an inevitable stage in development, and the strongest minds in the period of its economic supremacy could scarcely imagine that any organized human society could continue if slavery ceased; the slaves themselves, though in such cities as Athens, Corinth, or Rome vastly more numerous than their masters, scarcely thought of achieving their freedom. But with the growth of private property, the break-up of the old ties of kin, the increase of wealth, and the establishment of locality and residence as the basis of representation in the ancient oligarchies, miscalled sometimes democracies, the division into classes and castes took shape, and those class-struggles began in earnest which, in one shape or another, have since recorded the history of civilization. At the same time the extension of trade marked the rise of the merchant class on the shores of the Mediterranean and elsewhere, whose full influence was not to be felt until many centuries later.

Rome was, speaking in general terms, the last of the great slave-supported civilizations, and never, since private property was established, did the permanence of any empire seem so completely assured. But slavery became economically unprofitable. The great slave-worked estates in Italy and other countries, which had built up the wealth of the Roman nobles, had fallen into economic decay. Barbarians from without and insurrections from within broke down the fabric of Roman domination, and the second great form of human subordination to the possessors of property was established. Serfdom arose as slavery disappeared and the feudal system, with its complementary institutions, municipal and sacerdotal, obtained control over Western Europe. As slavery had become economically unprofitable, so, in turn, serfdom, with the various classes which it supported, gradually ceased to afford sufficient outlet to the social and economic forces that invention and the greater knowledge of the planet called into being.

Rise of the Modern Wage-system.—By degrees free individual owners and craftsmen formed the mass of the working population in the European nations which had grown up on the ruins of the Roman empire, although this enfranchisement took place at widely different dates in the various countries. It is from this period that the more direct analysis of modern society from the socialist standpoint begins. Throughout history, side by side with the class-struggles, the ideas of collectivism, derived from the old communistic societies, and of complete individualism, the direct outcome of private property, had been in more or less acknowledged conflict. With peasant cultivators in the country and free craftsmen in the cities the individual form of private property received its highest development. At no period can it be said that this personal independence for the producing class was universal in any community; at all times the propertyless retainers, wage-earners, or serflike dependents accompanied the dominant form. But at the end of the feudal period in Great Britain the individual peasants and individual craftsmen were sufficiently numerous to give the tone to the whole industrial system. The man who worked upon the land and the man who worked at his trade were both, in the main, owners of their soil, their tools, their products which they produced for their own use or for that of their neighbors in the immediate locality. Owing to a series of historic and economic causes, these free individual owners and craftsmen were gradually deprived of their private property and independence, and were driven to produce as wage-earners in the employment of others. The only freedom left to the propertyless man was that of selling his power to labor to some one else who paid him for his service, and used him in conjunction with others to produce goods, no longer primarily for use but for exchange. In the whole previous history of mankind production for exchange and profit had been the exception; now it became the rule. The personal relations which, in the main, had dominated over the old civilizations were transformed by degrees into mere pecuniary relations, and thenceforth pecuniary considerations became supreme in society.

Characteristics of the Modern Competitive System.—This economic change, though eventually complete, was of course gradual, and at first its effect was not perceived. Instead of individual production, generally for individual use or with a view to the local market, only the surplus coming into exchange after personal wants were satisfied, production itself assumed a social form, and the local market widened into the national and international market. A class had arisen out of the downfall of the feudal system unlike any class which history before had noted. The members of this class were free in the eye of the law, and possessed, nominally at least, full liberty to do what they pleased; but in practice, having no property of any kind, they were compelled to sell the sole possession left to them, the power to labor in their bodies,

to those who were in a position to purchase this their only commodity by the payment of daily or weekly wages. The payment of wages by no means began with the decay of feudalism; that form of remuneration for services rendered has itself a history extending over many centuries. But the difference between the wage-earner who accepted wages from others in the intervals between laboring for himself and the wage-earner for life, between the independent property-owner and the propertyless hind or "hand," is a difference not only of degree but of kind. The former was, on the whole, economically free, however badly he might be paid in mere money; the latter is economically a mere dependent, no matter to what point his wages may temporarily rise. These wage-earners employed by a master who had accumulated capital by commerce, the slave-trade, or piracy, worked together in co-operation in the workshop. They produced, primarily in social combination, articles of social use, for a social purpose, in the shape of exchange. But these workers had no share in the ownership of the raw material, no say in the quantity or quality of the articles produced, no control over the finished product, which belonged to the master. They received in the shape of wages that which represented on the average their cost of subsistence, in accordance with the standard of life of their class, so long as their employer required their services. What then had happened? A great and crucial change had been brought about. The individual form of production had been transformed into a social form of production; but the form of the ownership of the articles thus socially produced, as well as the control over their exchange, remained in the hands of the individual master or employer. Society at this stage—and the process can be traced at various periods in the development of all civilized nations—passed from an economical condition in which production as well as appropriation and exchange were in the main individual, to a condition of society in which production became social, but appropriation and exchange remained at the entire disposal of individuals. This manifestly involves a direct economic antagonism, and that initial antagonism lies at the root of all the antagonisms of the modern system of capitalist and wage-earning production for exchange and profit. Competition now ruled the market. Competition by free, propertyless wage-earners below; competition for increased profit by capitalists and employers above. The latter were driven by the very necessities of their existence to sweep aside the old local restrictive laws of the Middle Age period; and, as they gained strength, they were likewise impelled to substitute their own commercial control in politics for that of the classes which had hitherto been supreme. From this time forward all improvements and inventions went into the hands of the capitalist class and were shared by them, though much against their will, with the landlords.

Such was the course of events in Great Britain, where the economic transformation was soonest effected, the removal of the people from the individual or collective ownership of the soil having first been carried out. Geographical position and the character of the people favored this earlier development in England, but all civilized countries have followed, or are following, along the same road. Not, however, until the end of the eighteenth century, when steam and the great machine industry became the dominant factors in production, was it possible for the owners of the capital and machinery to obtain complete control over the wage-earners, and to marshal the industrial army under their management in disciplined array. With the factory industry, founded on the inventions of Watt, Hargreaves, and others, it may be said that the last great system of human slavery was firmly established, and wherever it has been allowed to flourish unchecked it is unquestionable that the cruelty and physical degradation by which it has been invariably accompanied fully equal, if they do not surpass, in horror the records of the old chattel slavery and serfdom. The British official blue-books show, indeed, that at the end of the eighteenth century and the beginning of the nineteenth, when unrestricted freedom of contract prevailed between the owners of the means of production and the workers, women and children, to say nothing of men, were treated with more entire disregard for common humanity than were slaves or serfs at any time whatever. Similar causes have produced like effects in other countries, and the condition of the working population in the great cities on both sides of the Atlantic, as set forth in official reports, proves that comparatively little has been done to remedy the evils which are inherent in the competitive system of wage-earning. At the same time the limited market of the Middle Ages has been converted into a universal international market. Even the nations that resorted to the most stringent restrictive tariffs have been unable to extricate themselves from the great market of the world, which capitalism has steadily extended since the discovery of America. Commercial wars have but served to expand the ever-widening circle of international commerce, and the demand for fresh markets to meet the growing output of commodities, due to the increasing power of machinery, has been the means of pushing expeditions into the remotest parts of Asia and Africa. Capitalism, therefore, in pursuing its inevitable course and in working out the law of its being, like the great slave-supported civilizations of antiquity and the feudalism—by no means confined to its European manifestation—which followed, has unconsciously prepared the way for a closer understanding between the inhabitants of this planet than had ever before been possible. The long slow movement of economic development which arises out of the institution of private property is thus approaching its close, and we are on the threshold of the greatest and most crucial transformation that the world has ever seen. To convince the dominant classes in every country that such a transformation is inevitable, while educating and organizing the producing classes, so that they may consciously and intelligently take advantage of the opportunities which they inherit from the long martyrdom of man to the forms of production and exchange—such is the task of the advocates of socialism.

It has been seen that when European society in the Middle Ages changed from the form of production by individual free men for individual use, only the surplus coming into exchange, to the form of production in which groups of wage-earners worked in social organization under employers, all the goods being made for the express purpose of exchange, no similar change was made in the ownership of these products. That remained in the hands of an individual as before, who competed with other individuals, similarly placed in economic control of nominally free workers for the sale of his products. That which distinguishes this capitalist system of production from all previous systems is that it is carried on primarily for profit and exchange. Goods are of no immediate use to those who produce them. They are made to go upon the market under the control of the employer who in order to keep his business going must sell them for cash in competition with others, who likewise sell for cash; and, in practice, he can only hold his place by steadily increasing his turnover. Cheapness being the determining force in the bitter commercial conflict of the markets of the world, each producer or manufacturer is compelled to cut down his cost of production to the lowest point possible in order that he may be able to undersell his rivals and thus enlarge the scope of his trade and therewith his personal profit. So early as the middle of the seventeenth century the great economist Sir William Petty could speak of "the trade of the world" as falling to the seller of the cheapest products. Assuming free competition to exist, this is even more true now than it was then.

Economic Antagonisms under the Modern Industrial System.—What, however, is the law which governs the exchange of commodities under the capitalist system of free competition—commodities being articles of recognized social use in the social conditions of the time, produced primarily for the purpose of profit and exchange? Such exchange is on the average conducted on an equality, and the relative value of commodities so brought forward for exchange is governed by the amount of social labor which it takes to produce them, or which is incorporated in them. It is impossible to tell whether a bushel of wheat is the product of the best or the worst land, or whether a bale of cloth has been made by hand or by the most improved or by inferior machinery. Neither is it possible to establish directly how much social labor is embodied in the articles so brought forward for exchange. This can only be arrived at indirectly, by way of such exchange and through the higgling of the market. But the amount of social labor necessary on the average to produce the two articles exchanged comes behind both parties to the transaction and settles the terms on which business will be done. Any reduction in the average amount of social labor incorporated in either of the commodities will reduce its value to a proportional extent relatively to the other. Gold in present conditions being, when dug from the bowels of the earth, a representative of incorporated social labor value, serves as a medium of exchange

and also as a standard of value for the various commodities; the ups and downs of value due to variations of demand and supply at particular periods are averaged over the whole, and do not disturb the level of exchange on the basis of incorporated social labor.

The free laborers without private property who are obliged to sell their labor-power as a commodity in order to live exchange it on the same basis as other commodities. Its value is regulated by the amount of social labor which, on the average, is necessary to keep the laborers alive on the ordinary standard of life in their trade in the country where they reside. This amount they receive from the employer in the form of money-wages, with which they in turn buy their food, clothing, housing, and the like. So far the exchange is conducted on the principle of all exchange of commodities. But the special commodity which the wage-earner sells—his power to labor, namely—produces in the course of the day or week or month considerably more value than the worth of the wages which he is paid. From this surplus labor-value incorporated in commodities the employer derives his profit, the landlord his rent, the commission-agent his brokerage, the banker his interest, and so on. It is the unpaid labor of the wage-earners—the labor which they give in excess of the value of the wages they receive—that enables the capitalist class and their associates to pile up riches and capital. Although individual capitalists may run risks, there can be no risk for the class as a whole. A profit for them as a class is absolutely certain; but in order to enhance this profit in circumstances where they are pressed by the competition of their fellows, individual capitalists, and not unfrequently the whole class, have naturally endeavored to reduce wages, to lengthen hours of labor, to introduce improved machinery, and to turn out as much goods as cheaply as possible, so as to obtain by their superior cheapness (due to the lessened amount of social labor embodied in a given quantity) a larger sale. The wage-earners being obliged, until their combinations are very strong and even afterward, to compete with one another for the sale of their sole commodity, labor-power, which will not keep unless rapidly sold, often accept lower rates of wages because they must do this or starve. The success of the employer seems a necessity of existence to them, and a large employer of labor for profit is often regarded as a public benefactor; but it is manifest that the interests of the wage-earning class and the capitalist class can not by any possibility be in reality identical, though it may be and is to the temporary interest of a particular set of wage-earners that their own individual employer should be successful. Those who are contributing of their vital strength and health in the form of unpaid labor to build up fortunes for others are, of necessity, whether they themselves recognize it or not, in a position of direct class antagonism to those others, however much this antagonism may be disguised or glossed over; but this class antagonism between wage-earners and capitalists or, to use the wider French terms, between proletariat and bourgeoisie, is itself the direct result and the inevitable human expression of the conflict already noted in its earlier and simpler strife between the social form of production and the individual form of appropriation and exchange.

Out of these two initial antagonisms, however, others arise in their turn. The factory industry, for example, and the mining industry, and agriculture carried on upon a large scale with machinery, call for the most thorough organization, and anything in the shape of unpunctuality or dereliction of duty on the part of the employees is severely fined. It is absolutely essential, from the profit-making point of view, that there should be no waste of time in business hours, and that the whole of the plant, mechanical and human, should work on with unvarying regularity, as if the various parts were dovetailed into one another. This perfection of organization and machine-like co-operation has been secured under the capitalist system to a degree which beforehand would have seemed quite impossible, and great works employing thousands of men and women produce from year's end to year's end with scarcely a break. This complete organization in the factory, the workshop, and the like finds its correlative opposite in the utter anarchy of the exchange at the time when competitive capitalism is in full swing. Each factory at that period is concerned solely with its own output, each mine or each farm with its own product; the object of all being to turn out as much as they can upon the market as quickly as possible, with a view to obtaining as large a profit as may be while trade is flourishing. No one takes the least account of the proceedings of his neighbor, being too deeply engaged in fighting for his own hand. Thus the complete organization of production in the factory leads to complete anarchy in the exchange. Further, in order to continue his operations successfully, each manufacturer or producer of any kind must convert his finished goods or products into money before he can begin again, credit merely disguising this operation. He can not exchange his products direct for the products of his brother producers, even for the purposes of his own consumption. They must be converted into money first in every case. If the circulation of the commodities be in any way impeded, then it at once appears that there is a difficulty in this way of conducting business—that money can not at once be realized for these goods which have been thus thrown upon the market. Money, in fact, then becomes temporarily a means for hindering exchange instead of for facilitating it, and it is apparent that in such conditions there is a clear antagonism between commodities and gold, or its equivalent in convertible paper. Again, the tendency of modern society to gather the population into great towns having no rural interests has developed another antagonism, as a partial result of those already specified, between town and country. The interests of the two are frequently found to be antagonistic instead of harmonious, and one of the great problems of the future will be to restore or to bring about a co-operative agreement between these two great departments of human life and industry. Moreover, the capitalist system of production has developed an antagonism between the sexes, and even between parents and their children. This antagonism arises, like all the rest, from economic causes. The family, in its ancient sense, has been disrupted, and men are met in the whirl of competition for wages by women who, owing to a variety of causes, compete with them on a lower standard of life for a lower rate of wages. Children, in like manner, are in many countries brought in to compete against men and women. A man's foes in this instance are literally they of his own household; though in this as in other cases the workers themselves do not perceive the mischief which is being done to themselves, and at the same time to the whole community. Of the antagonism between skilled and unskilled labor, between casual, unorganized workers and trade-unionists, between employed and unemployed, it is unnecessary to speak; these struggles are too apparent to all who study the history of society in the nineteenth century.

The Cause of Commercial Crises.—Ever since the capitalist system became the predominant form of production in civilized countries, ups and downs of trade, periods of inflation alternating with periods of depression, have been the rule. So much is this the case that they are taken for granted by men of business, who base their calculations upon such variations, but are seldom able to grasp the causes of them. (See Commercial Crises.) These sudden collapses of trade are generally regarded as being as much beyond human control as an eclipse or an earthquake, a tornado or a long frost. They are, nevertheless, indisputably the result of social causes, which, when they are understood, can be regulated and controlled. The most remarkable feature in all the successive cataclysms from 1815 to 1893, before as after the universal use of steam-vessels, railways, and telegraph cables, was that they were preceded and accompanied by an excess of products in every department. In all previous economic epochs, as in barbarous countries at the present time, general depression of trade has arisen from drought or from flood, from bad harvest or from pestilence among men or cattle; in any case from an insufficient supply of necessaries. Only among the most civilized peoples does an excess of what the world requires become an immediate cause of stagnation, and the reason why thousands of workers in all countries are prevented from earning their livelihood. At this time the power of man to produce wealth in every department of industry, including agriculture, is far greater than it has ever been before. Hence this enhanced productive capacity seems in some way to have become at intervals a serious hindrance to production and exchange. Whence does this arise? The control of all the great means and instruments of production, the direction of the huge industrial machines, the arrangement of the amount of labor to be devoted to great public works or to the output of commodities, the initiation of fresh enterprises and the adoption of new inventions—all this rests with the capitalist class and the managers whom they employ. When, owing to various causes, a time of good trade begins, all the financiers, employers, manufacturers, mine-owners, and so forth, hasten with one accord

to take advantage of the days of prosperity rendered the brighter by contrast with the previous gloom. The unemployed workers, who are an unfortunate necessity for the due functioning of the capitalist system, are absorbed into activity, the demand for goods from every quarter increases, prices (not values) rise all along the line, great works, such as railways and canals, are again undertaken, huge vessels are laid down in all the ship-building yards, demand in one direction enhances demand in another, wages are paid on an almost unexampled scale, and goods are turned out in greater abundance than ever before. But at the very moment when the expansion is at its height the collapse begins. Suddenly a difficulty arises in disposing of one set of goods for money, a large capitalist has to press his bills or his commodities upon the market in order to realize their value for immediate cash. Others pursue the same course. There is a general rush to sell. The antagonism between gold and commodities is felt in earnest. Prices fall more rapidly than they had risen. Workmen are discharged, factories are shut down or run on short time, furnaces are blown out, shipping-yards are closed, railways are suspended. A crisis has begun; the incapacity of the capitalist class to handle effectively the machinery of modern civilization is proclaimed to the world, and bankruptcy and stagnation at once follow. The social form of production revolts against the individual form of the exchange.

Tendencies toward the Socialization of the Means of Production.—At this point socialism comes in and, having completed its analysis, shows how the antagonisms inherent in the capitalist system must be solved by making exchange social, as production is social; by establishing co-operative production and distribution in the place of competitive wagedom and competitive capitalism. That which in itself is desirable from the *a priori* point of view, society is even now anarchically and unconsciously working up to. The entire series of differentiations arising out of the establishment of private property having been passed through, the complete reintegration of collectivism or communism on a higher plane is even now in progress, without the vast majority even of intelligent and educated men being in the least aware of it. Socialism is asserting itself in modern society by reason of economic causes, as capitalism owed its predominance before to the action of the same causes.

Thus the capitalist class in all civilized countries have championed competition and unlimited right of free contract between the wage-earners and their employers; but the hideous results of this scramble in the shape of physical degeneration, with accompanying mental and moral degradation, alarmed even the modern state, and laws have been passed to limit the freedom of the masters and servants alike in order to check in some degree this serious deterioration. At the same time, and as if in spite of themselves, modern statesmen, while upholding stoutly the doctrine that everything is best done by private effort, have been impelled to set on foot a number of public services, national and local, whose duties are continually extending in the face of all the protests raised by the older school of economists. Moreover, there is a growing feeling in every civilized nation that the hours of labor as well as the wages of the workers in these public services should no longer be governed by the law of competition for subsistence wages, but that the governments and municipalities should assure to their servants a day's work of no more than reasonable length in proportion to the intensity of their toil, and wages adequate to obtain for them a decent standard of life. This view, though still far removed from socialism, is manifestly a portion of a movement which is leading toward it. The public services are, in short, being transformed in the interests of the workers with the assent of the whole community. In like manner the public health, the improvement of the conditions and surroundings of the workers of the cities in particular, in order to secure to the working population a better physical development and some enjoyment of life—this also has become a matter of general concern to which national laws and state and municipal ordinances give expression. Such measures as these may be reckoned as conscious though small endeavors on the part of society to correct the evils of existing anarchy and to prepare the way for a better system.

Far more important, however, are the unconscious strivings toward the new period. On the one hand, the formation of companies, consisting of many bondholders and shareholders, to carry out great public works, and the transformation of private concerns engaged in all the departments of production and distribution into similar companies, form a distinct move in the direction of socialization. The individual employer is merged in a multitude of shareholders, and the pecuniary relation becomes the sole and only tie between employers and employed. This company form is manifestly an unconscious step toward socialism, seeing that these great organizations and corporations, whether for production or for distribution, are controlled and directed by managers and boards of directors who, regarding the matter solely from the economic point of view, might as easily be appointed by the workers to carry on the business in the interest of the community and the workers themselves as be nominated in the way they are to-day by shareholders who, in the majority of cases, have no direct knowledge of the affairs from which they derive an income, and perhaps have never been within hundreds or thousands of miles of the place where "their" factories, or mines, or works, or railways, or lands are situated. So soon as this economic possibility is generally recognized the final change has begun; but at the same time that this modification from the individual form into the company form of ownership and appropriation is taking place, the private firms and the companies are alike abandoning competition for combination. Banks are being consolidated, nationally and internationally; shipping companies are agreeing not to compete; joint-stock associations form trusts and "rings." In the U. S., where unregulated competition attained perhaps its highest pitch of development, this form of industrial and financial monopoly has unquestionably become more striking than anywhere else. This process is going on in all civilized countries. Moreover, the introduction of improved processes of manufacture, which was formerly hastened by individual anxiety to compete on better terms, is now hindered by the disinclination of monopolists to disturb vested interests with which they are well content. Thus the capitalist system of production no longer favors human progress, but heads back the economic evolution, and brings about periods of recurrent anarchy in every department of industry. Capitalism therefore is making plain the way before the face of socialism by its unconscious but inevitable institution of monopoly. The other human side of this great economic antagonism is likewise unconsciously organizing its forces to capture these monopolies. Throughout the civilized world the workers are beginning to see that whatever be their nationality, whether they are men or women, skilled or unskilled, their true interest lies in the thorough combination of labor with a view to the final overthrow of the wage system. Socialism is accepted only by the minority, but its principles are spreading daily, and ere long it will be universally recognized by the toilers that mere strikes, however well organized, are almost as hopeless a method of struggling against the domination of capital as was the old plan of machine-breaking. The machines were used against the interests of the workers; therefore they, in their ignorance, tried to destroy them, instead of combining to capture them. The great monopolies are in like manner used against the workers; therefore they, in their ignorance, attempt to strike against them, instead of using the political machinery at their command to obtain possession of and manage them. But with national and international organization come also education and full appreciation of the facts of their social surroundings. Then the producers, who will constitute practically the whole community, can move forward in fraternal solidarity and educated comprehension to take advantage of the economic conditions which have been prepared for them. Each nation must of course follow the route marked out for it by its previous economic history and its geographical position. It seems certain, however, that no matter by what means it may triumph socialism will begin with the public services and the more highly developed company forms, and proceed until production is last organized on the land which has not yet reached the company form in any country.

With the establishment of national and eventually of international socialism, mankind resumes the definite control over the means and instruments of production, and masters them thenceforward for all time instead of being overmastered by them. By such co-operative industry, whose power over nature is increased by each fresh invention and discovery, a carapace of repression is lifted off from the faculties of each individual, and wealth being made as plentiful as water by light wholesome labor, all freely contribute to increase their own happiness as well as that of their fellows. Human nature assumes a new and higher character in a

society in which the surroundings are such that life is not as to-day a constant struggle against the pressure of want and the temptations of misery. Instead of the personal, limited, introspective individual ethic is the social, altruistic, broad ethic in which the duty toward society necessarily involves the highest duty toward a man's self. Woman, relieved of economic and social subjugation, will assume her place as the social equal of man. So far, therefore, from individual initiative and personal freedom in the highest sense being limited and stunted, human beings will have the opportunity for attaining to a level of physical, moral, and mental development such as the world has never seen. The golden age of human society is, indeed, not in the past but in the future.

Such is a statement, obviously abstract and incomplete, of the theories of scientific socialism. There have been various schools of socialists, but the theories above set forth are accepted by the overwhelming majority of socialists in all civilized countries, and the differences which arise are chiefly on points of tactics; though in this respect an exception must be made with regard to Christian socialists who connect their socialist theories with the founder of the Christian Church. The utopian socialism which has striven, and even now attempts, to establish little oases of co-operation amid the existing wilderness of competition and monopoly, is slowly merging itself in the worldwide sweep of scientific collectivism. That such great thinkers and writers, however, as Saint-Simon, Robert Owen, and Fourier should in part have taken this view only shows how difficult it is for the highest minds to grasp the tendency of the facts around them until the time is ripe for the complete analysis of the fully developed economic forms. The anarchists, who sometimes call themselves socialists, are so fearful that universal co-operation and collectivism will crush the freedom of the individual that they not unfrequently drift into the advocacy of sheer reaction, and preach the gospel of wholesale destruction, which is really the creed of individualism run mad. It is needless to say that this revolt against all authority, even that which is voluntarily accepted for the purpose of securing the full advantage of organized industrial co-operation, is in direct opposition to socialism, though often confounded with it. The destruction or transformation of class government and the abolition of wagedom, which socialists look forward to as the next stage in the development of human society, will give free outlet to the individual; while the attempt to secure the supremacy of the individual by mere individual effort, if it could be realized and made effective, would but deprive mankind of the vast collective powers of production which are now available. Socialism and anarchism are directly opposed, alike as to theory and tactics; their only point of agreement is that both are in antagonism to our present society.

Socialism manifests itself in the shape of an organized disciplined party chiefly in Germany, where its development since 1870 has been remarkable. In that country the socialists form now a recognized political force, and their action is in the main guided by the views set forth in this article. If they continue to progress in the future at the same rate as in the past, there is every reason to believe that within the next generation they will be the dominant party in the state, and thus able to give full expression to their opinions. It is most probable, however, in spite of appearances, that the lead of the international socialist movement will be with the English-speaking peoples, whose greater economic development and superior adaptability in politics, together with their geographical extension, give them opportunities such as the Germans can never possess. In France the movement has advanced since about 1890 with amazing rapidity and the country which was the first to manifest to the world a genuine rising of the modern proletariat will have its full share in moulding the great international socialist movement. All through Europe and at length in the U. S. socialism is recognized even by the dominant classes as a coming power. The doctrines of human solidarity, of international fraternity, and worldwide co-operation for the benefit of the present and future generations, appeal to the sentimental aspirations of the large number who have little inclination to examine into the scientific theories on which those doctrines are based; who, moreover, having formed a high opinion of human intelligence, are apt to resent any attempt to demonstrate that men and women have hitherto been little better than sentient automata in their social and economic relations. Now, also, that socialism is translating itself into action in the direction of palliatives of existing evils, and recent international socialist congresses, as well as the proceedings of recognized socialists on public councils and boards, have shown that definite, practical efforts are being made to hasten on the attainment of complete emancipation for all, men and women of all nationalities and of every creed are led to investigate the causes of the class-war which is raging around them in the midst of profound peace, and to believe that socialism furnishes the only possible solution of the conflict. H. M. Hyndman.

Social War [*social* is from Lat. *socia'lis*, pertaining to comrades or allies, deriv. of *so'cius*, fellow, comrade, ally]: in Roman history, the name applied to the war (B. C. 90–89) between Rome and her Italian allies. The latter, who had for nearly two centuries shared the burdens and dangers of the republic, now justly demanded admittance to the privilege of the franchise. After the assassination of M. Livius Drusus (91 B. C.), who desired to grant citizenship to the Italians, the allies, including the Marsi, the Peligni, the Lucanians, the Samnites, and many others, rose in arms and proclaimed a new republic. A bloody war followed, and notwithstanding the great victories of Sulla, Marius, L. Cæsar, and others, the Romans were compelled to make many concessions, and in the end the Italians received the franchise, though they did not gain their due share of political influence on account of the restriction that forbade their voting in any but a specified number of tribes. Over 300,000 men are said to have been slain in this war.

Society Islands: a group of islands in the South Pacific Ocean, the principal part of what is officially known as the French establishments in Oceania, which also includes the Marquesas, Tuamotu, Gambier, and Tubuai groups and Rapa island. The Society islands lie between lat. 16° and 18° S. and lon. 148° and 155° W. They consist of one large island, Tahiti (*q. v.*), and a number of small isles, comprising altogether an area of 636 sq. miles, with 16,000 inhabitants. The islands are mountainous. In the center some of them rise to the height of 6,000 or 8,000 feet, but they all have a belt of low land extending between the foot of the mountains and the sea, and they are generally surrounded by coral reefs. The soil is very fertile and the climate delightful. All tropical fruits grow luxuriantly, and European fruits which have been introduced succeed well. The inhabitants are Polynesians; most of them are Christians. The chief town and port, and capital of the colony, is Papeete. The chief exports are mother-of-pearl, copra, cotton, and vanilla. Sugar and coffee also are produced. Revised by M. W. Harrington.

Society of Friends: See Friends, Society of.

Society of Jesus: See Jesuits.

Socin, sō'săn', Albert: Orientalist; b. at Basel, Switzerland, Oct. 13, 1844; studied at Basel, Göttingen, Leipzig, and Berlin; Professor of Oriental Languages at Basel, Tübingen, and Leipzig successively; author of *Die Gedichte des Alkama Alfahl* (1862); *Baedeker's Palestine and Syria* (1876); *Arabische Grammatik*, 1885 (Eng. trans); 2d ed. 1893; *Die neuaramäischen Dialekte* (1882); *Arab. Sprichwörter und Redensarten* (1882); *Die Genesis übersetzt* (with Kautrich), 2d ed. 1891; *Kurdische Sammlungen* (1887–90). B. I. W.

Socin'ians and Socin'ianism: the historical designations of the advocates and doctrines of the most thoroughly organized system of anti-Trinitarianism that has ever existed. In the U. S. the names are seldom used, having long since given place to Unitarians and Unitarianism, names of much wider scope.

I. History.—The Trinitarian doctrine, as defined in the Nicene and Athanasian creeds (see article God), a gradual development of three centuries, was held almost universally after the time of Justinian as a fundamental element of Christianity by the ancient churches, Eastern and Western, and by all the churches springing immediately out of the Reformation. At the era of the Reformation the first anti-Trinitarians were certain individuals who appeared at different points, chiefly among the German Anabaptists. Among these were Martin Cellarius (b. in Stuttgart, 1499, educated at Wittenberg, at first a disciple and coadjutor of Luther, d. at Basel, 1546), John Denk (d. at Basel, 1528), Lewis Hetzer (at first a fellow laborer of Zwingli, executed for polygamy at Constance, 1529), and John Campanus (studied at Wittenberg, and died after long imprisonment at Cleves, 1574). One of them, named Spiritus, supposed by Dr. Rees to have been Adam Pastor, a Frisian Anabaptist,

first carried Unitarian doctrine to Poland in 1546, which afterward became the seat of the denomination. Servetus in 1531 published his first work, *De Trinitatis Erroribus.* In 1532, at Haguenau, he published his *Dialogorum de Trinitate, Libri duo*, and at Vienna, in 1553, his *Christianismi Restitutio.* He was then imprisoned by the Roman Catholics for heresy. Escaping, he went to Geneva, where he was burned as a blasphemer and disturber of the peace. His heresy was neither Arian nor Socinian, but apparently a more consistent assertion of the deity of Christ than that of his enemy, Calvin.

In Italy, where during the preceding century religious faith had been generally superseded among the educated by a semi-pagan humanism, many prominent persons, affected by the religious excitement of the Reformation, adopted rationalistic views. In the second quarter of the sixteenth century, at Vincenza, a small town in the district of Venice, a society existed consisting of persons denying the divinity of Christ and related doctrine. It was dispersed in 1546, previous to which, it is said, Bernard Ochinus and Lælius Socinus joined it. The latter, born in Sienna in 1525, was educated as a lawyer, but devoted his life and great talents to theological speculations. He has been correctly designated "the spiritual father of Socinianism," while his nephew, Faustus Socinus, was "the founder of the sect." He remained ostensibly a member of the Reformed Church at Zurich, although by personal influence, wide correspondence, and extensive journeys disseminating his opinions. He visited Poland in 1551, and again in 1558, and died in Zurich in 1562. His nephew, Faustus Socinus (1539–1604), filled with his uncle's spirit, but with a much more elaborate and consistent system of theology, settled first in Basel, was called into Transylvania to assist Blandrata in his controversy with Francis David, and settled permanently in Poland 1579. After the removal of Spiritus to Poland in 1546, Francis Lismanin, a Corsican monk and confessor of the queen, Bona Sforza, had been converted to Unitarianism in 1551. He was soon re-enforced by Peter Conezius and George Blandrata, a native of Piedmont, who through the influence of Lismanin was appointed physician to the queen. At this time all the Protestant synods held in Poland embraced promiscuously the ministers of all the Reformed societies, whether Lutheran, Calvinistic, or anti-Trinitarian. In 1565 the latter were expelled from communion, and forced to form an independent ecclesiastical organization. The Unitarian Church thus formed comprised persons of very dissimilar opinions. "They all concurred in maintaining the supremacy of the Father, but with respect to Jesus Christ, some thought him to be a God of inferior nature, derived from the Supreme Deity; others held the doctrine of Arius, conceiving him to have been the first created Spirit, who became incarnate with a view to effecting the salvation of mankind; while a third party believed him to be a human being. These last were divided into two classes—the one believing the miraculous conception of Jesus; the other considering him to have been the son of Joseph as well as of Mary." Socinus held that although a man only, he was entitled to divine honors, since his exaltation at the right hand of God and assumption of the government of the Church, while others, pre-eminently Francis David, denied this.

From the advent of Faustus Socinus these various elements were, through his superior genius, wrought into a homogeneous ecclesiastical organization, and brought into substantial agreement with the theological views of his uncle; and ultimately the denomination and system of theology took their historical designation of "Socinian" from these great leaders, but during their earlier history they were called Pinczovians, from Pinczow, the place of their first settlement, and afterward Racovians, from Racow, a town built for them by a Polish nobleman, and their metropolis of learning and influence. They flourished exceedingly for the greater part of a century, converting to their views many of the Polish nobility; they established colleges which attained great reputation, attracting multitudes of Roman Catholic and Protestant youth, and they produced a number of theological speculators and polemics of great learning and ability, whose works attained a vast circulation. In 1563 Blandrata went into Transylvania to attend the prince, John Sigismund II., as a physician, where he succeeded in bringing over to his own opinions Francis David, at that time superintendent of the Reformed churches. These together secured a large following, but the prosperity of the sect was greatly impaired by the bitter controversy which subsequently arose between Blandrata and David, the former affirming and the latter denying that divine honors are to be paid to Christ. David was condemned by the diet held at Weissenburg in 1579, and died in prison in November following. After a long struggle with their opponents the Socinians were suppressed in Poland in 1658, the centennial of Blandrata's arrival. Those who refused to renounce their opinions went into Transylvania, Hungary, and Prussia, and the majority into Holland, where they were merged with the Mennonites and Low Arminians. Of churches of their order in Transylvania there were 108 in 1887, with nearly 60,000 registered members.

A first catechism was written by George Schoman (d. 1591). Faustus Socinus (d. 1604) left another incomplete. Valentine Schmalz and Jerome Moscorovius produced the *Racovian Catechism*, the standard of the Socinian churches. It appeared in Polish in 1605, and was published in German 1608, and in Latin 1609. An English edition, produced in Amsterdam 1652, was ordered to be burned the same year by the English Parliament. It was again translated and published in English in 1818, with a history of the Polish Socinians by Dr. Thomas Rees. After their expulsion from Poland, Andrew Wissowatius and other learned men, finding refuge in Holland, collected their more important writings and published them in 8 vols. folio, comprising the works of Socinus, Crelius, Schlichtingius, and Wolzogenius; to which a ninth volume has been added, containing the writings of Przipcovius and Andrew Wissowatius, and a tenth volume, containing the works of Brenius. This collection is known as the *Bibliotheca Fratrum Polonorum.*

II. Doctrine. 1. *The Scriptures.*—Socinians admit that a supernatural revelation is essential as a means to effect the salvation of men. They regard Christianity as a new law, revealed and executed by Jesus Christ. This revelation is contained in the Scriptures of the Old and New Testaments, and especially in the latter. These are authentic, sufficient, and perspicuous. Yet, as they can contain no elements inconsistent with reason, they are to be interpreted in a sense agreeable to reason; which rule of interpretation in their hands led practically to the conclusion that although containing a divine revelation, and virtually infallible, they contain minor errors.

2. *Theology.*—(1) The divine unity is inconsistent with personal distinctions. (2) Free self-determination is more fundamental in the divine nature than either justice or love. (3) By the act of creating the world, God has voluntarily limited his omnipresence as to his essence, and by creating free agents he has voluntarily limited his power and his knowledge, because free will is self-determined, and future contingent events are not the objects of knowledge. (4) "There is no such justice in God as requires absolutely and inexorably that sin be punished. There is, indeed, a perpetual and constant justice in God, but this is nothing but his moral equity and rectitude, by virtue of which there is no depravity or iniquity in any of his works." (Socinus, *Prælect. Theol.*, c. xvi.) Hence he can pardon any repentant and reforming sinner without a satisfaction to justice. (5) The Holy Ghost is the impersonal power and efficacy of God.

3. *Anthropology.*—The guilt of Adam's sin is not imputed. Man was created naturally mortal, and since the time of Adam has gradually acquired an hereditary tendency to sin, which of itself does not involve guilt. Responsibility is limited by ability. Man, animated by the promises of God, is able to turn unto God; and when he does so turn and believe, God seals his promises more and more on his heart by the Holy Spirit. *Rac. Cat.*, sec. 5, ch. x.

4. *Christology and Soteriology.*—(1) Christ, as to his essential nature, is strictly human, but miraculously generated by the power of the Holy Ghost in the womb of the Virgin. Hence he was from birth without sin. At his baptism he was supernaturally sealed with the Holy Ghost, and qualified and endowed with authority for his office as Prophet, Priest, and King. He was also taken up to heaven and admitted to the vision of God, and instructed in divine things. While on earth he revealed the will of God to his disciples with divine authority. After his death he was raised to the throne of God, endowed with the divine attributes of omniscience, omnipotence, and supreme dominion. He is the rightful object of divine worship and of invocation. He saves his people as Prophet and King, the office of Priest being merged in the other two. He will judge the world at the last day, and raise believers to share in his own glory. (2) As God's justice demands no satisfaction, Christ's death

saves us as an exhibition of divine love; it subdues obduracy, confirms hope by sealing God's promises; it was the necessary means to his resurrection, by which he brings life and immortality to light by an ocular demonstration.

5. *The Church and Sacraments.*—The Church they defined as the company of those who believe saving doctrine. As to what this doctrine is, they allowed, within the limit of the recognition of the divine mission of Christ, the largest freedom of opinion. Socinus discarded the term "sacrament," and held that the Supper was the only sacred rite which Christ intended to be permanently observed. The authors of the *Racovian Catechism* in its final form teach that baptism and the Lord's Supper are the two Christian rites. These they regard as only memorials and symbols and badges of church membership. They pronounce infant baptism an error, but advise its toleration.

In his practical ethics Faustus Socinus was exceedingly humane—opposed to war and capital punishment. The system of Socinus was remarkable for its radical departure from the traditional theology. Even the English Unitarians of the eighteenth century, who were Socinian rather than Arian, were much more cautious and conservative than Socinus, while the early Unitarians in the U. S. were generally Arians, regarding Jesus as a being *sui generis*, and only a little less than God.

LITERATURE.—See, as above mentioned, the *Bibliotheca Fratrum Polonorum*; Dr. Toulmin's *Life of Socinus*; Dr. Thomas Rees's *Racovian Catechism, with History of Unitarianism in Poland* (London, 1818); *De Tribus Elohim* of Hieron. Zanchius (1516–91); *Socinianismi Confutatio* (Amsterdam, 1664) of John Hornbeck; *Vindiciæ Evangelicæ* of Dr. John Owen (Oxford, 1665; vol. xii. of Goold's Edinburgh edition of Owen's *Works*); Dorner's *History of the Development of the Doctrine of the Person of Christ* (English trans. 1861–63, div. 2, vol. ii.); Principal Cunningham's *Historical Theology* (1862, vol. ii.). Revised by JOHN W. CHADWICK.

Soci'nus, FAUSTUS and LÆLIUS: See SOCINIANS.

Sociol'ogy [Fr. *sociologie*, from Lat. *so'cius*, companion (whence by deriv. *soci'etas*, society) + Gr. λόγος, discourse]: the science or natural philosophy of society. More definitely, sociology is the general and fundamental science of society, which occupies itself with the elements and first principles of social phenomena, and leaves to ethnology, demography, political economy, comparative jurisprudence, the theory of the state, the comparative study of religions, and other special social sciences a detailed investigation of particular groups of social facts, all of which have their ultimate interpretation in the underlying and co-ordinating principles of sociology.

HISTORY OF SOCIOLOGICAL THEORY.—To some extent society was studied scientifically and philosophically in ancient times. The *Republic* and the *Laws* of Plato and the *Politics* of Aristotle abound in scientific generalizations. Later, Hobbes, in the *Human Nature* and in the *De Corpore Politico*, entered upon an interpretation of society in terms of its internal forces or motives; and Montesquieu, in *L'Esprit des Lois*, laid the foundations of an interpretation in terms of external conditions or environment. But there was no true science of society until the nineteenth century. Auguste Comte, who coined the word sociology, was the first to put together in one conception all the necessary elements of such a science. Plato and Aristotle had not separated the science from the art of politics nor from ethics. Neither Hobbes nor Montesquieu nor the economists had studied society comprehensively in all its aspects, and, notwithstanding the influence of Hume (to whom, as Huxley has pointed out, Comte was indebted for whatever is scientifically valid in his notions of causation), the explanations of society were still to a great extent theological and metaphysical. Comte insisted that society must be viewed as a whole, indivisible and organic, and he desired to found a science of social phenomena in their co-ordinated entirety. This comprehensive sociology he desired to make positive, basing it on a wide observation of facts and freeing it altogether from theology, metaphysics, the revolutionary spirit, and the art of politics. Comte's conception was incomparably superior to his performance. Both together made for a time so little impression upon thought that the very name sociology was well-nigh forgotten when Herbert Spencer took it up, and by making a voluminous treatise on sociology an integral part of his system of *Synthetic Philosophy*, established for both the conception and the name an enduring place in the circle of the sciences.

Spencer had worked out his scheme of thought before he knew anything of Comte's, and his sociology has nothing in common with Comte's beyond the general idea and the name. It is an application of the philosophy of evolution to society. Society, like the material world and the living organism, undergoes integration and differentiation. It passes from homogeneity and indefiniteness to heterogeneity and definiteness of organization. Comte used the term social statics in a merely rhetorical way, as a name for social order, and social dynamics as a name for progress. Spencer uses the terms in the physicist's sense. Social statics is an account of social forces in equilibrium, social dynamics an account of disturbing and evolutionary changes. Actually the static and the dynamic tendencies are themselves balanced, and the result in society as in the solar system and in the living body is a moving equilibrium. On the physical side therefore Spencer's explanation of society is more profound and scientific than Comte's. At the same time his conception of society as organic is more definite. Without adopting Hobbes's conceit of the leviathan, he finds in society a division of labor not only among individuals, but among groups and organizations of individuals. There is a sustaining system made up of industrial groups, a distributing system of commercial activities, and a regulating system of political and religious agencies. In working out this analogy, however, Spencer, while avoiding the fancifulness of Hobbes, fails to rise to the thought of Plato, who found in this functional organization of society the basis and the true type of the ethical life, and so prepared the way for the conception of society as a means to the perfection of human personality.

The biological-organic conception of society has been made much of by two later sociologists of distinction, namely, A. Schäffle, in the *Bau und Leben des socialen Körpers* (Tübingen, 1875), and Guillaume de Greef, in his *Introduction à la Sociologie* (Brussels, 1886–89), and in a less degree by Lester F. Ward in his *Dynamic Sociology* (New York, 1883). All these writers, however, lay especial stress on the psychical phenomena of society. Ward argues that at a certain stage the natural evolution of society passes over into an artificial and teleological evolution in which society consciously determines its own destinies. De Greef asks what fact distinguishes society from other organisms, and answers that it is contract, including all understandings and alliances. The Platonic or moral-organic conception of society is elaborated with ability by John S. Mackenzie in *An Introduction to Social Philosophy* (London, 1890).

Much of the best work in sociology has been directed upon a more profound study of fundamental social processes. Gabriel Tarde (*Les Lois de l'Imitation*, Paris, 1890), finds the elementary and distinctively social phenomenon in imitation; Ludwig Gumplowicz (*Der Rassenkampf*, Innsbruck, 1883, and *Grundriss der Sociologie*, Vienna, 1885) finds it in the conflicts, amalgamations, and assimilations of heterogeneous ethnical groups. J. Novicow, of Odessa (*Les Luttes entre les Sociétés humaines*, Paris, 1893). has studied exhaustively the phenomena of conflict and alliance; and Émile Durkheim (*De la Division du Travail social*, Paris, 1893) has shown that the division of functions creates not only economic solidarity, but, through reactions upon law and morals, a social and ethical solidarity. Of all these writers it is Tarde, undoubtedly, who has perceived the true and ultimate nature of social facts. Phenomena of any kind, as he points out, can be known only because they repeat themselves. In physics we study repetition under a variety of forms; in biology under the form of heredity, or the transmission of life and characteristics from cell to cell; in sociology under the form of imitation, or the transmission of impulse, feeling, and idea from individual to individual, from group to group, and from generation to generation.

Systematic sociology, however, is not an abstract science, tracing the operation of particular social forces through all their ramifications. On the contrary, it is a concrete science, descriptive, historical, and explanatory, concerning itself with the organization, activities, and evolution of those bands, hordes, tribes, and nations into which the animal and human populations of the world are distributed. Sociology is the fundamental social science, or the science of social elements and first principles, because it includes the elementary and preliminary descriptive matter which is presupposed by all the special social sciences, whether abstract or concrete.

Descriptive Sociology. — Systematic sociology begins with analysis, classification, and generalization. It is necessary to observe the elements that are combined in social phenomena, to know the conditions under which they are brought together, and to examine the groupings and organizations that result. The elements of society are all included under the term population, which must be studied under its outward aspect of numbers, reproduction, increase, density, migrations, and the intermingling of races and nationalities; and under its subjective aspect of sympathies, antagonisms, tolerances, habits, and traits of character. These internal or subjective elements of society are combined in the subjective aspect, or internal constitution, of society itself— that is to say, in the common sympathy and purpose, the accepted tradition, the public opinion, the general will; in a word, in the social mind. Society as subjective, the social mind, projects itself and realizes itself outwardly in an external organization, which is twofold in form. There is a series of groups which are alike in all important respects, and merely repeat themselves to make up the larger aggregates. This series, which may be called the social composition, includes the family, the horde, the tribe, the town, the county, the commonwealth, and the nation. The other form of organization may be called the social constitution. Its basis is a division of labor, and it consists of associations engaged in different activities, some economic, some political, some cultural, but all co-ordinated in one complex system of mutual helpfulness.

Population.—The study of population in its outward or physical aspect begins with the facts of aggregation or grouping. Animal life and human population are massed in dense aggregates in certain places, in less dense aggregates elsewhere. Comparatively few individuals among animals or men live strictly isolated lives. This physical aggregation is the indispensable preliminary condition to the evolution of society. That there may be communication, companionship, and mutual aid, there must be propinquity and contact. These are ensured by the unequal distribution of food-supplies, the varying degrees of temperature and moisture, the topography and other physical circumstances, making life in some places easier than in others.

Looking still at the outward facts and neglecting for a time the internal factors of sympathy and social instincts, we observe that aggregation is of two forms. Individuals descended from a common ancestry are often found living near each other in and about the place of their birth, as in an isolated village, whose inhabitants have married in-and-in for generations and have never separated. This may be called a genetic aggregation. Other individuals born in many different places, perhaps in widely remote parts of the world, are found assembled and carrying on their life-activities in one place, as in a great modern city like London or New York. This may be called a congregate aggregation. The patriarchal theory of the origin of society assumed that genetic aggregation was the original form. The social-contract theory, logically carried out, would assume that congregate aggregation was the original form. Actually no large community is a genetic aggregation only, or a congregate aggregation only. The vital and mental energies evolved in regions where resources are on the whole abundant expend themselves not only in maintaining the food-supplies by industry, and in perpetuating population by reproduction, but in ceaseless motion, travel, exploration, and colonizing; while on the other hand, from regions where the life-struggle is becoming severe, population moves to more favored areas where the opportunities are greater. Migration is thus a normal phenomenon. Every community loses in this way individuals born within it and receives individuals born elsewhere. Every community thus has a mixture of population elements, which may be called its demotic composition. At the same time every community except colonies, and new cities in the first generation or two of their existence, is perpetuated mainly by its own birth-rate rather than by immigration. Society, therefore, we may say, is normally autogenous. It is for this reason that the assimilation of the foreign-born goes on with astonishing rapidity, even in a country like the U. S., which received from 1820 to 1890 an immigration of 15,427,657 souls.

Turning to the internal or psychical factors of society, the most elementary phenomena of social psychology are simple activities of feeling, perception, and will that involve two or more individuals, namely: (1) Mutual perception and communication, by motions, tones, or speech; (2) recognition of fellow beings of one's own kind or species as like one's self and unlike all other objects; (3) imitation; (4) conflict; (5) toleration; (6) mutual aid, alliance; (7) mutual pleasure, play, festivity. These mutual feelings and activities constitute association as distinguished from the merely physical phenomenon of aggregation. An important question to be answered through the study of these phenomena is that of the relation of the social to the individual instincts. The notion which Hobbes converted into a classical doctrine, that individual instincts only are primitive and that "the state of nature" which preceded society was "a state of war," of each individual against every other, is not supported by the results of modern research. Among the lowest forms of life creatures do not prey upon their own kind, but upon other species. Even the amœba, a mere drop of structureless sarcode, discriminates between fellow amœbæ swimming near and such favorite food-objects as desmids and diatoms. This recognition of kind and of accompanying acts of imitation begins when a sentient creature identifies the feeling of touching a fellow creature as like the feeling experienced when it touches one part of its own body with another part. Such feelings can not be associated with nutrition because, even though one pseudopodium of an amœba encountering another should coalesce with it, nutrition would not follow. Therefore, at the dawning of consciousness fellow creatures of the same species can not regard each other as food-objects. On the contrary, they necessarily imitate one another in capturing non-related food-objects, since the touch of a moving part of one is to another a stimulus like the touch of a moving part of itself against itself, and starts like motions. Consequently these beginnings of social feelings and social actions are as primitive as the individual instincts. Among the lowest animal forms, as among civilized men, the struggle for food is normally a rivalry or competition rather than a "war."

Under the pressure of scarcity, however, conflict may at any time break out. Cannibalism has doubtless everywhere had its origin in starvation. Toleration is then re-established by force, not by moral feeling, nor by a conscious calculation of expediency. The very strong kill off the very weak. The very strong are overborne by the numerical superiority of the individuals of average power. The latter are too nearly equal for one to hope to vanquish another, and their resulting toleration is an equilibrium of strength, which is tested from time to time, and so maintained, by frequent acts of aggression and revenge. Toleration being established, fellow-feeling, sympathy, and imitation can work themselves out, step by step, with the evolution of intelligence, in the positive forms of mutual aid, alliance, and mutual pleasure. Mutual aid begins in accidental helpfulness and protection, and is perpetuated consciously when its benefits are perceived. Social pleasures are observed among nearly all the higher animals, as among men. Among the birds and the more intelligent mammals infancy and youth are a continuous playtime. In social pleasures the higher sympathetic feelings, which presently become the strongest social bonds, are developed, and the cultural activities are born. Mutual aid is the foundation of political alliance and of economic organization. Toleration is the foundation of justice. Imitation is the foundation of diversified desires and individual industry.

Association reacts on the associated individuals, developing in them a social nature; but owing to differences of circumstance and of heredity the development does not go on equally, or at the same rate, in all parts of the population, and social classes result. In a majority of individuals fellow-feeling, imitativeness amounting to industry, tolerance amounting to justice, helpfulness, and companionableness, are ruling qualities. This class is the normally social. In other individuals these qualities are deficient or absent, but are simulated. Pretending to have the social nature and appealing to those in whom it is real, these pseudo-social characters, if not aggressively anti-social, make up the pauper class. Yet others, whether simulating the social nature or not, having become aggressively anti-social, are the criminal class.

The Social Mind.—The foregoing mental and moral elements of society are combined in products which we call by such terms as the common feeling, the moral sense, the public opinion, the general will, of the community, and which it is convenient for the sociologist to name collectively the social mind or the social consciousness: but care is necessary to avoid associating false conceptions with these terms. They do not stand for mere abstractions. The social mind

is a concrete thing. It is more than any individual mind and dominates every individual will. Yet it exists only in individual minds, and we have no knowledge or evidence of any consciousness but that of individuals. There is no real paradox here, however. The social mind is the phenomenon of many individual minds in interaction, so playing one upon another that they simultaneously feel the same emotion, arrive at one judgment, and perhaps act in concert. It is therefore, as Tarde has called it (*La Logique Sociale*, Paris, 1894), a social logic, binding the products of individual logic into more complex wholes.

The social integration of desire, belief, and will, which constitutes this logic, is effected sympathetically or rationally; passionately and violently, or deliberatively. One mode is seen in popular fads or crazes, panics, emotional revivals, mobs, lynchings, riots, violent revolutions. The other is seen in the proceedings of a parliamentary body, the execution of legal justice, the movements of a disciplined army. The proportion of rational or deliberative action depends on the mental evolution of the population, its temperament, and the amount of its criminality. The greater the criminality, the less the rationality and the greater the violence.

In discussion and deliberation society arrives at self-consciousness. Each individual concerned makes his neighbor's thought the object of his own thought at the same instant that he makes his own thought such an object; he judges the two to be identical, and then acts with a full belief that his fellows have come to like conclusions and will act in like ways.

The primary products of the social mind are social choices and values. These are further combined with reference to the phases and interests of life into standards of living and of industry, rules and methods of art, laws of conduct, political policies, religious faiths, scientific doctrines, ethical ideals, all of which, handed on from one generation to another, become traditions. The three primary traditions are: (1) The economic, consisting of the whole body of knowledge and usage pertaining to material well-being; (2) the juridical, consisting of the customary and positive law; (3) the political, consisting of the political history, policy, and aspirations of a state. Secondary traditions are the lingual, the æsthetic, the religious, the scientific, and the ethical.

All values, standards, codes, faiths, and traditions exist in individual minds only. Durkheim's argument, that they are independent objective realities because they can be committed to writing, is a fallacy, since the written page is meaningless apart from the living knowledge of the reader. But they exist in a multitude of interacting minds simultaneously, and are therefore objective as well as subjective to each individual. Upon each mind as it unfolds they are imposed from without, and sanctioned by penalties for disregard or disobedience that range from ridicule, disapproval, and boycotting to collective force or vengeance.

Through the channels of these different traditions the mental life of society flows in an ever-changing distribution. At one time society is religious, at another time creative and artistic, at yet another time scientific. One generation is absorbed in political concerns, another in business affairs. Always, however, a tendency toward the establishment of a normal equilibrium may be observed. At any given moment desires and beliefs assume unlike forms and find varied expression in different parts of the population. The social codes and faiths are mutually dependent. This is the social logic in its highest manifestation.

The social mind not only creates codes and faiths and imposes them upon individuals; it reflects upon the groupings of individuals which grow up more or less unconsciously, and upon various relations of mutual aid. Sanctioning some groupings and relations, opposing others, it shapes the social structure or organization.

The Social Composition.—In the social structure by composition small groups are combined into larger groups, and these again into groups yet larger. Each group, whether small or large, contains both sexes and more than one generation. Each, therefore, might live independently of the others, perpetuate itself, and grow to larger dimensions. Each group is made up of elements that are less like each other than one group, as such, is like another group of similar composition. For example, father, mother, and child in the family are more unlike than are two families of the same kind or type. The inhabitants of a town in which are found different nationalities perhaps, different ages, different abilities, characters, and tastes, are more unlike among themselves than are neighboring towns one to another. Each group has much the same characteristics and lives in much the same way as any other group of similar dimensions and composition. Such groups therefore supplement or mutually aid each other only in power and mass, not by division of labor.

The unitary group in societies of the higher animals, or of men, is the family, which may be a temporary or an enduring union of one male with one female and their offspring, or of one male with two or more females (polygyny), of one female with several males (polyandry), or of several males with several females (punaluan or communistic marriage).

Human societies composed of families grouped in larger aggregates are of two types, the ethnical and the demotic. Ethnical societies are genetic aggregations; a real or fictitious blood-kinship is the chief social bond. Demotic societies are congregate aggregations. They are groups of people bound together by habitual intercourse, mutual interests, and co-operation, with little or no regard to origins or to genetic relationships. Ethnical societies are the earlier. Demotic societies have been developed out of the ethnical. Among ethnical societies many are metronymic, kinship being traced through the mother-name only. Others are patronymic, with the kinship traced through the father-name only. Metronymic relationships are the earlier.

The smallest ethnical society, whether metronymic or patronymic, is the horde, which is a group of from three or four up to twenty or thirty families, dwelling together in a camp or village. The Bushmen, Fuegians, and Inuits afford examples. The next larger group is the tribe, an organization large enough to have been formed, and probably having had its origin in fact, in an alliance of several hordes for defense or aggression. Horde and tribe are often confounded in ethnological writings with the clan or gens, which is a totally different organization from either. The horde, and likewise the tribe, includes and claims all of its descendants, whether through its daughters or through its sons, who dwell together in the parent camp. The clan, on the contrary, is a partly natural, partly artificial brotherhood and sisterhood, which rigidly excludes all of the descendants of its sons if metronymic, or all the descendants of its daughters if patronymic. A clan therefore can never be perfectly identified with a horde or with a tribe. It may be a section of a tribe, or its membership may be scattered through many hordes or through several tribes.

Related tribes bound together by clanship ties and speaking dialects of the same language, when they unite in a military or political federation are a folk or ethnic nation. Such were the allied six tribes of the Iroquois, and such were the confederated Franks, the Lombards, and the Angles.

In demotic society the smallest community is the deme, village, or township. Townships are combined into counties, counties into commonwealths, commonwealths into federal states.

The social composition is effected by the deliberate action of the social mind under the pressure of external necessities, especially those of defense and aggression. When integration has been accomplished the social mind puts its own impress on each component group and moulds it into conformity with a certain type. Thus in a given community every variety of the family may have existed at the outset or may from time to time appear; but the social mind gives approval and sanction to some one type, as the monogamic or the polygamous, and prohibits or discountenances all others. In like manner in the commonwealth each component town, and in the federal state each component commonwealth, is compelled to conform to a type or standard. Psychologically, therefore, the social composition may be described as a mutual toleration and alliance of the unlike among the individual elements of a society, supplemented by an alliance of the like and non-toleration of the unlike among its component groups.

The Social Constitution.—The social structure by constitution is a co-ordination of associations, any one of which may or may not include both sexes in its membership, but in any case does not include them both for purposes of marriage and reproduction. Accordingly, the constituent associations of society are mutually dependent, and each presupposes the social composition. Each association is composed of individual elements that on the whole are more alike than associations themselves are to one another. The members

of a given trade-union are more alike with reference to the purpose which unites them than one trade-union is like another; otherwise the differing members would connect themselves with other unions. The members of a given church are more alike in feeling and belief than one church is like another. The members of trade-unions collectively or of churches collectively are more alike than trade-unions in general are like churches in general. Each association does a specific work; it may be said to have a functional purpose. Combination among associations is therefore a co-ordination, and mutual aid among them is not through mere increase of mass and power, but by a division of labor.

The social constitution is analogous to that of a biotic organism, as Spencer has shown; but the analogy is of limited value for scientific purposes until supplemented by a close study of those features of social organization that are distinctive. Of these the most important is a more perfect actual or potential duplication in the social organization of the organs or agencies for performing every essential function. Though in the animal many vital organs are duplicated, there neither is nor can be any complete duplication of the alimentary, the circulatory, or the nervous system. Public association or the state can at need assume every social function. Voluntary association can do the same. It is as if the cerebral nervous system, on the one hand, had the emergency power to organize from the body-tissues a new alimentary and circulatory system, and the sympathetic nervous system, on the other hand, could at will assume the functions of the brain and spinal cord. This power of public and of private association to assume each other's functions is maintained, because at all times some duplication is in fact kept up in every essential class of social services. The error of attributing to the state defensive and juridical functions only, and to private associations economic and cultural functions only, is being constantly repeated in political and economic writing. The fact is that the state performs always important economic functions of production, transportation, exchange and finance, and cultural functions, religious or educational, and that private associations, such as political parties, political clubs, revolutionary societies, and private tribunals to achieve political or juridical ends, are among the most important voluntary organizations known. The socialists, therefore, are right in saying that the state could, if necessary and desired, carry on all social undertakings, and the individualists are right in saying that society could get on, and in a way achieve its ends, without the organized state; but both are wrong in supposing that either thing will happen under a normal social evolution. The actual distribution of functions between public and private agencies is a varying one, always changing with changing circumstances. Consequently, movements tending to increase public activity on the one hand or to enlarge the opportunities for private initiative on the other hand will be self-limiting so long as conditions are normal. They should be regarded as tendencies toward equilibrium. Whatever belittles the state or destroys popular faith in its power to perform successfully any kind of social service—whatever impairs the popular habit of achieving ends by private initiative and voluntary associations, by so much endangers society, checks its development, and prevents the full realization of its ends.

The supreme end of society is the protection and perfecting of sentient life. The end of human society is the evolution of the rational and spiritual personality of its members. The associations directly concerned in this function are the cultural, namely, the religious, the scientific, the ethical, and the æsthetic, the educational organizations, and what is called polite society. Economic, legal, and political organization exists (in a functional sense) for the sake of cultural organization and activity. The social mind always has perceived this truth, and by means of its sanctions has endeavored to mould the social constitution into accordance with it. Associations and relationships sanctioned by the social mind are known as institutions, and they are fostered or abolished always with a view to cultural as well as to protective ends. For both ends specialization and division of labor are necessary. Society is obliged to tolerate and promote differentiation in its constitution while it maintains the homogeneity of its composition. Psychologically, therefore, the social constitution may be described as an alliance of the like and non-toleration of the unlike in each simple association, supplemented by toleration and co-ordination of the unlike in complex association—that is to say, in the relations of each association to other associations and to society at large.

Historical Sociology.—The stages of sequence in social evolution have corresponded roughly to the four stages of synthesis above described. Concourse, fellow-feeling, social instincts, and mutual aid had their origins in animal society, and it was by means of them that animal life was developed into various types. The first stage of association, therefore, was zoögenic. In the second stage the evolution of speech and the genesis of a varied tradition made the social mind self-conscious, and transformed the anthropoid into man. Society then was anthropogenic. The third stage, in which the social mind, acting on spontaneous forms of alliance, created clan, tribe, folk, and nation, was ethnogenic. In the fourth stage a wonderful development of the social constitution, with division of labor, has made possible a high utilization of resources, a rapid multiplication of population, and a democratic evolution of the social mind. Society has become demogenic.

Zoögenic association is as old as sentient life. All biological speculations that ignore the social factor in the struggle for existence are imperfect, and without appeal to it the evolution of animal intelligence can not be explained at all. Long before man appeared on the earth sympathy was highly developed, the art of communicating feelings and simple ideas, by tones and gestures, was practiced by millions of creatures, family relationships were established, and bonds of mutual aid, companionship, and pleasure held together swarms, flocks, troops, bands, and herds. Even the beginnings of tradition had appeared. Association had become the most important defense and help in the life-struggle. The survival of the fittest was the survival of the social.

Anthropogenic Association.—Therefore nothing could be more unscientific than a theory of human origins through the evolution of a single pair of anthropoid apes into man and woman. If science abandons the dogma of special creation, it must abandon also the dogma of a first pair. There could have been no continuity of animal and human descent without a continuity of animal and human society. If anthropoid apes became simian men, a whole community or many communities underwent the transformation. John Fiske's theory (*Outlines of Cosmic Philosophy*, Boston, 1874) that the prolongation of infancy, as an incident of the physical evolution of man, by holding the family together for a relatively long period prepared the way for more extended social relations, reverses the probable order of cause and effect. Increasing social intercourse stimulated and developed the cerebral nervous system. Cerebral development entailed the prolongation of infancy, which, in turn, by delaying the use of arms and legs and jaw, altered the proportions of the skeleton and the facial angle.

These changes, it is probable, took place step by step with the evolution of speech and of tradition. Many evidences point to communal festivity, with its attendant rhythmical gesticulation and some approach to song, as the means by which, under the influence of mental exaltation, conventionalized sounds were so definitely associated with feelings and ideas as to constitute the beginnings of speech. (See Language.) Industrial traditions had their beginnings among animals. Most characteristic of the beginnings of human society were the primitive explanations and traditions of life, death, and causation, known as Animism (*q. v.*), and the ghost-theory. See also Anthropology.

Ethnogenic Association.—There is no reason to doubt that the earliest hordes of men were composed of family groups. Among the higher mammals the troop, band, or herd is subdivided into pairs, families, or studs, and it would be astonishing to find that the same thing was not true of the primitive hordes of men. At the same time the relations of the sexes may have been of the loosest description. Writers on the history of marriage have too often made the mistake of assuming that the two things must be inconsistent. The living together of man and woman does not always preclude irregular indulgence on the part of either. Festival occasions are still, in many parts of the world, opportunities for conduct closely approaching promiscuity by men and women who, none the less, live habitually in family relations. The trading of wives also, and the lending of wives to guests, are customs of friendship and hospitality in many communities.

It is probable, further, that, as a rule, the domestic group was a simple pairing or monogamous family, in which male jealousy and power played the important part ascribed to

them by Darwin and Sir Henry Sumner Maine, and that polyandry and polygyny were exceptional deviations from the mean type. The argument for a primitive polyandry is based on the fact that primitive kinships were metronymic, and the attempt to explain it by uncertainty of paternity. Another explanation is quite as good. A family established by the forcible appropriation of the woman and maintained by masculine power is dissolved the moment the man tires of his captive and deserts her. Her offspring, knowing only the mother that cares for them, will take her name. That primitive family unions were commonly of such brief duration and followed by such consequences is extremely probable. See MARRIAGE.

The family, as a rule, was exogamous—that is, the sons preferred to take wives from other households instead of from among their sisters. This is a preference that had its beginnings in animal life, as Westermarck has shown, and is to be accounted for by the influence of novelty upon the sexual passion, supplemented by natural selection. When several hordes dwell in such proximity that some intercourse, friendly or hostile, is possible, the preference may extend to the women of other hordes, and especially if the practice of obtaining them by force, theft, or stratagem causes them to be prized as trophies of prowess or cunning. The hordes, then, like the households, may become exogamous.

Brothers and sisters by blood are a natural property-holding and defensive group, spontaneously aiding each other to redress wrongs inflicted by other groups. In pursuing its interests and redressing its wrongs, it seeks the aid and protection of supernatural power. In the animistic stage of culture some natural object, plant, or animal, which is regarded with superstitious veneration, becomes the special guardian of the household. Believing that a mysterious kinship can be established through touch, by imitation, and in other ways, the members of the fraternal circle do not doubt that they may become akin to the object of their worship, and to make sure that they always bear its protection with them they mutilate or mark themselves or their clothing or belongings with a sign or rude image of the sacred object. Soon every practice of the kindred circle is thought of as sanctioned by its totemic deity, and any deviation from established custom is looked upon as a sacrilege, sure to be followed by dire penalties. In this way exogamy becomes a binding obligation and incest a sin.

For a long period each little fraternity of uterine brothers and sisters in each succeeding generation is likely to have its own totemic deity; but sooner or later, under the influence of their mother and her relatives, or through reasoning that they are descended from their mother's totemic deity, a circle of brothers and sisters is sure to adhere to the mother totem and worship, instead of adopting a new one. From that moment the totemistic circle begins to enlarge. In the second generation it necessarily includes brothers and sisters, mothers, daughters and sons, uncles and aunts, nephews, nieces, and cousins. Since kinship is reckoned through mothers, but not through fathers, the circle will claim and include the children born of its daughters, and will exclude those begotten by its sons. Children of sons will belong to the kindreds of their mothers; and since in the household exogamy has become superstitiously associated with totemistic worship, and what was originally an instinct has developed into the idea that men must not take wives of their own totem, the wider totemistic circle also must be exogamous. The kindred has become a clan.

Though the clan can never be perfectly identified with the horde, and if neighboring hordes are exogamous each clan will have members in several different hordes, there are two ways in which a majority of the members of a horde may belong to the same metronymic clan. Men may go to live in the residences of their wives—beena-marriage. In this case clanswomen with their children and unmarried male kinsmen may live together in one place, and their husbands, belonging to many different clans, will be an unimportant minority. If, however, men steal or buy their wives (baal-marriage), who then follow the residences of the husbands, the children of a metronymic clan will be dispersed through many hordes, and each horde will be made up of members of many clans. Nevertheless it may happen that divorced wives and their children return in such numbers to their parent hordes that the clan is always tending toward identity with the horde. A cluster of neighboring hordes may thus be transformed into a cluster of horde-clans.

When neighboring clan-hordes draw together into a tribal organization, the lines of demarkation between hordes as such may disappear or cease to have importance, while the clanship lines remain sharply defined. Composed of hordes the tribe is constituted of clans, mutually dependent because exogamous. If a clan, becoming large, subdivides, the tradition of original unity is often preserved in the phratry, a fraternity of clans. If a tribe subdivides, individuals from each of its clans go into the new tribe. The household is the economic organization of the community, developing and handing on the economic tradition. The phratry is the religious organization, guarding the religious tradition. Its secret societies of medicine-men are the germ of a priestly and professional class. The clans are the juridical organization, developing and applying a customary law which regulates property rights, marital rights and limitations, feuds, and vengeance. The sachems, elected by clansmen and clanswomen, are the first lawyers and judges. The tribe is the military organization. Its council is composed of the leaders or chiefs of the volunteer war-parties put forward by each clan. In the tribal council a military tradition is evolved. True political organization begins only when tribes confederating become a folk or ethnic nation. Then for the first time the juridical power and the military power are combined in one governmental system, as different expressions of a single sovereignty.

Patronymic societies exhibit the same forms and stages of organization as metronymic, with the exception of differences that necessarily follow from kinship through fathers. The change from mother-kinship to father-kinship may occur at any stage of social integration; in the horde or in the folk. It is effected by economic circumstances or evolution. If the family can survive only through the industry and protection of the father, as among the Esquimaux, who depend on the arduous and dangerous chase of the walrus, it will hold together long enough for children to grow up under paternal authority and take the father-name. When under different conditions wealth in flocks and herds begins to be important, men appropriate it and desire to transmit it to sons instead of to sisters' children. Patronymic kinship prepares the way for an advance in culture from animism to ancestor-worship, which in turn greatly strengthens paternal power. With baal-marriage and patronymic kinship the horde and the clan can become nearly identical, compact, and powerful. In horde, clan, and tribe chieftaincy can become hereditary. Chieftains can become the founders of a nobility, and the chief military leader of a folk, becoming a true king by uniting supreme religious and judicial authority with his military functions, can found a royal family. Kings and chieftains receiving from their followers large shares of the booty of war, and privileges in the tribal land, enrich their favorites, who in turn, attaching to themselves the broken and ruined men of shattered clans and tribes, become the "cow noblemen" and systematic marauders of that barbaric feudalism which in time seriously undermines the kinship or gentile organization of society and prepares the way for another system. See, further, ETHNOLOGY.

Demogenic Association.—In ethnogenic association the social constitution is incidental to the social composition. In demogenic association the state has become supreme. It subordinates and rearranges the social composition and perfects the social constitution.

A tribal confederation seldom establishes itself permanently upon the territory where it originates. It moves on to conquer richer regions, and, if successful, reduces their inhabitants to slavery or serfdom. Increasing then in wealth, it attracts to itself strangers from far and near, who presently become so large an element in the population that it is no longer possible to organize legal and military administration on the clanship and tribal basis. Legal rights and membership in the state are made to depend on civic association within territorial limits. Society enters upon civilization.

Civilization exhibits three stages. Egypt and Babylonia did not get beyond the first, Greece and Rome did not complete the second. The modern Western nations have entered fairly upon the third. In the first stage all the energies of society are concentrated upon the task of political integration and defense. To this everything else is sacrificed or subordinated, and government is absolute. This work completed, the liberated national energies expend themselves in criticism, in the struggle for personal freedom, and in the effort to combine liberty with stability through the constructive evolution of municipal and constitutional law. Greece failed in legal construction, and Rome sacrificed

spontaneity to system. The civilizations of Greece and Rome, like those of the Eastern nations, were unstable, because they were surrounded by a worldwide environment of barbarism and savagery. The modern Western civilizations are stable because they simultaneously grew to great and powerful statehood in an environment of civilization, which for ages had lain between them and the more remote barbarism of Africa and Asia. Consequently there was no necessity for an extreme sacrifice of personal initiative and the lesser interests of life. The second stage also with them was no partial evolution. The Renaissance, the Protestant Reformation, the American and the French revolutions were but so many phases of a thoroughgoing criticism and reconstruction of the social constitution on lines of legality and free association. By means of this strong but elastic union of voluntary and flexible organization with law, the magnificent development of modern industry and a consequent multiplication of population without parallel in history have been made possible.

Spencer's generalization that societies are military or industrial in type is therefore neither adequate nor altogether accurate, in the form in which he has stated it. Militarism and industrialism are stages rather than types, and between them lies the stage of critical and legal reconstruction, which is the cause, rather than the effect, of industrial evolution.

The development of the fundamental social interests thus reverses the order of their genesis. Society is first economic, then juristic, then political. Perfecting then the political system, it works back through law to the economic foundations. Not so in its cultural interests. The order of their genesis—religious, scientific, ethical—is the order of their development. The political era is also the great religious period; society is theocratic. Then the social mind goes forward to critical and scientific activity while it applies itself to legal construction, and it is only by the aid of science and criticism that legal construction is accomplished. Finally, when it works back to industrial problems it advances to a serious study of ethical principles and ideals, and only as it does so can it hope to adjust the complicated relations of economic life. Future society, increasingly economic, will be also increasingly ethical.

Explanatory Sociology.—The details of explanatory sociology are yet to be worked out, but certain principles are established. The interpretations of social structure and evolution must be in terms of natural causation; but psychological phenomena, no less than physical, are natural, and society must be explained in terms of motives and choices, as well as in terms of outward forces.

The initial causes of society are physical. Aggregation and association are brought about by geographical and organic conditions; but association furthers survival and happiness, and the associated individuals, becoming consciously and fully aware of the benefits of society, attempt to defend and improve it. The unconscious natural process thus becomes conscious and artificial. Relations and activities are valued, choices are made, policies are devised, and institutions founded. The process does not end here, however. Natural selection works among policies, laws, and institutions, as among individuals. Some fail to benefit the community, and disappear. Those that survive are not always the ones that were supposed to be most promising at their inception.

The further task of sociology, therefore, is to discover the details and laws of these complicated processes. It must try to formulate, first, the laws of the purely physical and unconscious causation that occurs in society; second, the laws of conscious social choice; and, third, the laws that govern the natural selection and survival of arrangements, laws, and institutions.

Society has often been described as an organism. Being essentially psychical it is more and higher than an organism. It is also more than a multitude of individual minds. It is a psychological organization of conscious organisms.

In addition to the works mentioned in the text, see Giddings, *The Theory of Sociology* (Philadelphia, 1894); Durkheim, *Les Règles de la Méthode sociologique* (Paris, 1895); Darwin, *Descent of Man* (London, 1871); Morgan, *Ancient Society* (New York, 1877); J. Donovan, *The Festal Origin of Human Speech in Mind* (Oct., 1891); Sir Henry S. Maine, *Early History of Institutions* (London, 1875) and *Early Law and Custom* (London, 1883); Westermarck, *History of Human Marriage* (London, 1891); Fustel de Coulanges, *La Cité antique* (1864; Eng. trans. Boston, 1873); Smith, *Kinship in Arabia* (London, 1885). Franklin H. Giddings.

Socorro: See the Appendix.

Soco'tra: an island in the Indian Ocean, off the eastern coast of Africa; in lat. 12° 39′ N., lon. 54° 1′ E., 140 miles N. E. of Cape Guardafui; controlled by Great Britain. Area, 1,384 sq. miles. The island produces good tobacco and dates and the best aloes known, and has superior sheep and goats. There is considerable trade with Muscat. Pop. about 10,000.

Socrates, sok′rā-tēēz: philosopher; son of Sophroniscus and Phænarete; b. at Athens in 470 B. C. (or 469, in May or June); drank the cup of poison 399 B. C. (in April or May?). His father was a sculptor, and Socrates in his early years worked at the same occupation. He alludes to his mother (*Theætetus*) as a midwife, and likens to her art his own skill in drawing out ideas by conversation. In his youth he learned geometry and astronomy and practiced gymnastics. He is reported by Plato (*Phædo*) as having studied the work of Anaxagoras on *Nature*, probably under the instruction of Archelaus, the disciple of Anaxagoras; and according to Xenophon (*Mem. I.* and *IV.*) he had a critical knowledge of the writings of the early wise men, as well as of the Ionic school of philosophy. He probably met Parmenides when about twenty years of age, and mastered the Eleatic view of negative dialectic (which proved its theories by showing up the contradictions of its opponents), and was thoroughly instructed in the doctrine of the Sophists—possibly may have received direct instruction from Prodicus. It is said that having early lost the patrimony inherited from his father, the wealthy Crito assisted him in his education, and employed Evenus to instruct him in poetry, Theodorus in geometry, and Damo in music, and that the celebrated Aspasia had a share in his culture. He married, and had three sons. Xantippe, his wife, has come down in history as the typical scold. Socrates is represented as using the violence of her temper as a means of cultivating his patience. He took part in three military campaigns with his fellow citizens—that of Potidæa (432 B. C.), wherein he saved the life of the young Alcibiades, who was wounded; that of Delium (424 B. C.), in which he saved the life of Xenophon, and himself received assistance against his Bœotian pursuers from Alcibiades in the disastrous retreat which followed, and wherein his own cool bravery was conspicuously manifested; and that of Amphipolis (422 B. C.). He proved himself to have an extraordinary capacity to endure cold, heat, and fatigue. He walked barefoot upon the ice and snow of Thrace in his usual clothing, while others were clad in furs. By this time he had become noted for his peculiar mode of instruction by means of conversations which he held with people of all classes at the public resorts. Aristophanes in *The Clouds* held him up to ridicule as the arch-Sophist, as a dreamer morally worthless and physically incapable (as Grote remarks) nearly at the time when Socrates was exposing his life for his country on the battle-fields of Delium and Amphipolis. The personal appearance of Socrates was such as to shock the Athenian sense of the beautiful; with a turned-up nose, projecting eyes, bald head, thick lips, round belly, he resembled a satyr or Silenus; he wore a miserable dress, and would frequently stand still in sudden fits of abstraction, rolling his eyes, staring on vacancy. Aristophanes found in him the choicest subject for comedy. Modern historical criticism has justified in large measure the poet, and pointed out his patriotic desire to save his native city from the decline in morals and political ideas which he saw impending from the prevalent tendency to reflection and sentimentalism—the cultivation of independent subjectivity or individualism (the right of private opinion) as contradistinguished from implicit, unreflecting obedience to customs and laws. This he traced, correctly enough, partly to the teachings of the Sophists or private teachers of culture, among whom Socrates was acknowledged to belong by his contemporaries, notwithstanding his radical differences from them in doctrine. In common with Socrates, the Sophists cultivated reflection—to make up the mind on internal personal grounds. Dialectics was the art of the advocate and orator, so much needed before the courts and popular assemblies of Athens—the art to make the worse appear the better reason; an art which could be applied to good purposes or to bad ones, and not in itself a corrupt art. It was the same art that is cultivated in the debating societies and moot-courts of young lawyers of our own time. Plato and Aristotle were the first to bring the name "Sophist" into odium as a perverted species of philosophizing. Aristophanes condemned equally all species of philosophic reflection. Isoc-

rates called Plato a Sophist, and Aristotle calls Aristippus, the disciple of Socrates, a Sophist. Socrates was selected as representative of his profession by Aristophanes because of the notoriety of his personal appearance and his missionary habit of practicing his art among all classes without price. In *The Clouds* it is portrayed as teaching a vain and profitless semblance of wisdom, corrupting in its influence upon youth, and undermining all true discipline and morality. Twenty-four years after the appearance of *The Clouds*, Meletus, a poet, seconded by Anytus, an influential demagogue, and Lycon, an orator, hung up an indictment against Socrates accusing him of being "guilty of crime—first, for not worshiping the gods whom the city worships, but introducing new divinities of his own; next, for corrupting the youth. The penalty is death." Lycon is said to have felt aggrieved at what Socrates had said of the orators (see his attack on orators in Plato's *Gorgias*); Meletus, for his treatment of the poets; Anytus, a rich leather-dealer, had been driven from Athens during the rule of the Thirty, and as Socrates was supposed to sympathize with the tyrants, and especially with Critias, the most detested of them all (having taught him when a young man), his feeling toward the accused may be explained. Moreover, a son of Anytus had become interested in the conversations of Socrates, and the latter had interceded with the father to educate his son for something better than a leather-seller. To produce aspiration for a career above the family vocation was "corrupting the youth." Socrates had cross-examined with his dialectic skill and bitter irony most of the celebrated statesmen, orators, poets, Sophists, and artisans of Athens. None had forgotten their humiliation at his hands; a few had sought help and instruction from him afterward, but most of them avoided his presence and desired revenge. Very many of these were to be found among the 500 (557 according to Diogenes Laertius) judges who sat at his trial. In his defense before his judges he was so bold and free-spoken that he produced a very unfavorable impression, and was accordingly adjudged to be guilty by a small majority. According to custom, he was allowed to name the punishment he preferred to substitute for the penalty of Meletus; he gave it as his opinion that he deserved to be subsisted in the Prytaneum at public expense for the rest of his life as a benefactor of the state, but upon the solicitation of his friends agreed to ask a fine of thirty *minæ*. This haughtiness so incensed the judges that they voted by a majority of eighty votes for his death. The execution was delayed for thirty days, until the return of the sacred ship from Delos. Socrates refused to avail himself of the means of escape from prison offered him by Crito, thus attesting his law-abiding character. He drank the cup of hemlock with perfect composure after a conversation with his friends upon the immortality of the soul, being assured that he was merely setting out upon a happy journey, and that by his death he attested the steadfastness of his convictions to his disciples, and thereby accomplished far more than by living.

As to the best authority regarding the actual teachings of Socrates there has been much dispute. He has left behind no writings of his own, and we know him chiefly through his two disciples, Xenophon and Plato. It is supposed that the *Memorabilia* of the former give us a more accurate picture of his method and ethical doctrines, while the *Dialogues* of the latter present us with highly idealized portraitures, and offer us the further-developed doctrines of Plato through the mouth of Socrates. Aristotle testifies that to Socrates belongs the honor of the invention of induction and accurate definition of terms. His dialectic rests on induction. More important even than this was his practical application of the Delphian precept, "Know thyself," as the condition of virtue. Aristotle (*Nich. Eth.*) says that his fundamental idea is the union of theoretical insight and practical virtue. That virtue is a knowing is a very radical statement, and altogether incomprehensible unless one considers its relation to the time in which it was uttered. Relieved of its exaggeration, perhaps, it means only that self-consciousness is essential to responsible action. It expresses the transition from the morality of custom and habit, mere conventional use and wont, to morality as conscious right conduct, resting on reflection and moral principles. In this, therefore, Socrates is the most significant personage in the ethical history of the race. All beyond him lies in the region of unsophisticated use and wont, or prescriptive ethics, like that of the Chinese and other Oriental civilizations; on the hither side the chief interest is the ever-widening influence of the individual consciousness of moral necessity, the long and gradual discipline of mankind into independent, responsible wills, endowed with "rights of conscience." In the ante-Socratic principle the individual takes the impulse of his volition from external phenomena—from auspices or auguries, nothing being undertaken without them. Individual conscience and personal decision date from the epoch of Socrates, and their growth from that time is the progress of the world-history. The new principle in its appearance with Socrates is as yet undeveloped, and involved with much that is foreign to it and contradictory of it. His dæmon (*δαιμόνιον*) or "genius" is a relic of the old, and is akin to those immediate stages of psychical life which we know under the names somnambulism, dreaming, premonition, hypnotism, and is a return of the conscious mind to its fœtal stage of existence, to instinct—the transplanting, as it were, of the augury from external appearance to internal impression. On the other hand, it was related to the consciousness of principles, and as such formed a factor of what we call conscience. There is no individual responsibility without conscious determination of the will, and even the perverse action of the conscious will is higher than mere unconscious action: a wicked man is a higher order of being and more precious in the sight of God than a good, obedient ox or horse. Socrates seems to have exaggerated this view so far as to make all virtue to be correct knowledge, and all vice to be ignorance, thus ignoring the will altogether. This, however, is not surprising when we consider the novelty and the greatness of his insight into knowledge as a factor of true moral action. Nor, if we consider the ultimate consequences of perfect insight, can we regard him as wrong in holding that ignorance is the occasion of all wickedness, although we insist that moral responsibility implies knowledge of the right, and assert that wickedness is perversity of will in the face of better knowledge. See Moral Philosophy.

The panegyrics pronounced upon the character of Socrates are not surpassed. That of Alcibiades in Plato's *Symposium* is perhaps the finest—that of Xenophon, more sober and weighty: "Knowing him to be such a man as I have described—so pious toward the gods as never to undertake anything without first consulting them; so just toward men as never to do the slightest injury to any one, while he conferred the greatest benefits on all who came in contact with him; so temperate and chaste as never to prefer pleasure to what was right; so wise as never to err in judging of good and evil, nor needing the aid of others in order properly to discriminate between them; so able to discourse upon and accurately define the subjects we have mentioned; so skillful in penetrating the hidden characters of men and seizing the fittest time to reprove the erring and turn them to the paths of virtue—I can not but regard him as the most excellent and happy of mankind." The sources of information as to his life are Xenophon's *Memorabilia*; Plato's works, especially the *Apology*, *Phædo*, and *Symposium*; Aristotle's *Metaphysics* and *Ethics*; Diogenes Laertius (book ii.); and, among others of modern writers, the essays of Schleiermacher, Boeckh, Van Heusde, Hegel, Forchhammer, Brandis, Rötscher, and Grote are important. Zeller's *Socrates and the Socratic Schools* is the best work accessible in English.

William T. Harris.

Soda [from Ital. *soda*, liter., fem. of *sodo* (collat. form of *solido*, solid) < Lat. *soldus*, collat. form of *so'lidus*, solid]: in chemistry, a hydrous oxide of the metal Sodium (*q. v.*), Na_2O; in commerce, however, the compound formed by the action of water upon this oxide, and generally designated, even by chemists, hydrate of soda or sodium hydrate. The carbonates of sodium also are often called soda commercially. Sodium hydrate, NaOH, or caustic soda, is prepared commercially from the carbonate by the action of lime. Three parts of crystallized carbonate (*sal-soda*) are dissolved in five times as much boiling water, and one part of quicklime, slaked and mixed to a cream with three parts of water, is gradually added, with continued ebullition. The caustic solution is then decanted after settling, and boiled down rapidly with the access of air. From the residue pure caustic soda may be dissolved out by alcohol, which is then distilled off; but for most commercial, manufacturing, and medical uses the residue is merely melted and cast into sticks, which are preserved in bottles. Much caustic soda is also made by heating or boiling together the Greenland mineral cryolite with hydrate of lime. The compound is white, opaque, crystalline, and melts below incandescence. It is used largely, in the form of solution or soda-lye, for making soap.

Revised by Ira Remsen.

Soda-ash: crude soda, as first produced before having gone through any refining processes. Previous to the French Revolution of 1789 the only source of the alkali-soda was from the ashes of marine and seashore plants, or kelp. The trade in kelp ceasing during the Revolution, the Committee of Public Safety in France called upon chemists to find some new source of soda, all the potash attainable being needed for gunpowder. Nicolas Leblanc, a surgeon and chemist, obtained the prize offered. His method consists in converting common salt first into sulphate by means of sulphuric acid, and then heating this together with charcoal and carbonate of calcium, which gives (theoretically) a mixture of carbonate of sodium and sulphide of calcium. This process is carried on, particularly in England, in large chemical works, all the soda used for making soap, glass, and many other products being thus procured. For details of the process reference must be made to the standard works on chemical technology, as, for example, the *Dictionary of Applied Chemistry*, by T. E. Thorpe.

The crude soda-ash, sometimes called black ash, as it leaves the furnace is a very complex mixture of substances, containing chiefly carbonate of sodium, caustic soda (hydrate), carbon, carbonate of calcium, and sulphide or oxysulphide of calcium. It is treated with hot water or steam on a furnace-hearth to break it up, and then the carbonate is leached out with hot water in an apparatus contrived to accomplish much work with little water. The great defect of Leblanc's system as originally carried out was the loss of all the sulphuric acid or of the sulphur used in making it. Hence other methods of obtaining carbonate of soda from salt have been much sought after. One in successful operation, known as the Solvay or ammonia-soda process, consists of decomposing concentrated brine with a strong solution of bicarbonate of ammonia, which engenders chloride of ammonium and nearly insoluble bicarbonate of soda. The chloride of ammonium is readily reconvertible into bicarbonate. to be used over again. With respect to Leblanc's method, however, it may be noticed that by Chance's process, patented in 1888, the sulphur can be economically recovered from the exhausted black ash. Revised by Ira Remsen.

Soda-water: See Aërated Waters and Solution.

So'dium [Mod. Lat., from Eng. *soda*. See Soda]: one of the elements of matter, a very important and remarkable metallic substance which was first obtained in 1807 by H. Davy by the electrolysis of caustic soda (hydrate). Its occurrence in nature is chiefly as common salt (chloride of sodium) in the ocean, and as a constituent of silicates, chiefly the feldspars albite and oligoclase, on the land. It is also found in natron, an impure sodium sesquicarbonate, containing besides sodium sulphate and chloride. A cubic foot of ocean-water contains about 6,440 grains, not far from 1 lb. avoirdupois, of metallic sodium, and a cubical tank 14 feet on each side filled with sea-water will contain more than 1 ton of this alkali-metal. A cubic foot of rock-salt contains over 52 lb. of sodium. Sodium is a metal probably more abundant in its occurrence than iron, and probably not necessarily much more difficult or expensive to obtain in approximate purity than the latter metal, and yet, by reason of the fewer uses developed for it, the cost of sodium is much greater than that of iron. Sodium is one of the elements most essential to animal life, being a constituent of all blood. It is also found in the vegetable organisms that dwell in the ocean and along its coasts, but plants dwelling on land above the sea-level contain potassium more abundantly than sodium.

Preparation.—Gay-Lussac and Thénard first prepared sodium in quantity by the action of metallic iron at an intense heat on fused caustic soda, but a much better method is that of Brunner, which consists in distilling a mixture of charcoal and carbonate of sodium, the transformation being essentially as follows:

$$Na_2CO_3 + C_2 = 2Na + 3CO;$$

a current of carbonic oxide gas resulting, which sweeps along with it the metallic sodium in vapor. The latter is condensed by passing the gases through a thin, flat cast-iron condenser of peculiar form, which becomes, and remains throughout, hot enough to prevent the metal from solidifying within it, and thus clogging it up. It is so contrived also that a sharp-pointed iron rod may be driven in through it into the retort to clear it out when in danger of choking up and thus leading to a dangerous explosion. The sodium trickles out of the condenser in melted form, and is prevented from taking fire and burning in the air by being received in a vessel of melted paraffin. The vessel should be double, each part having a close-fitting lid to be applied in case the paraffin should kindle. Care must be taken that the carbonate of sodium and charcoal are free from silica and phosphates, which energetically attack the iron of the retort and perforate it from the inside. Deville introduced the admixture of powdered chalk with the mass, to prevent its passing into liquid fusion, but this may introduce silicates, and an excess of coarsely powdered charcoal has been used instead.

A method for the preparation of sodium on a large scale has been devised by Castner. This consists essentially in the reduction of sodium hydroxide (caustic soda), by heating it with an intimate mixture of finely divided iron and carbon. The mass is prepared by mixing the iron with molten pitch, allowing it to cool, breaking it into pieces, and heating it to a comparatively high temperature without access of air. The reaction is believed to take place as represented in this equation:

$$3NaOH + FeC_2 = 3Na + Fe + CO + CO_2 + 3H.$$

Sodium is a brilliant silver-white metal, of the softness of wax within the normal range of temperatures, but becoming somewhat harder at 20° below zero. It melts at 204° F., and has the specific gravity 0·972 at 15°. It crystallizes in octahedrons of the dimetric or tetragonal system. Its vapor, unlike that of potassium (which is green), is colorless. When exposed to the air, it rapidly absorbs oxygen, and moisture if present, forming either anhydrous oxide (Na_2O) or caustic soda (NaOH). When water touches it there is an intense reaction, with evolution of hydrogen gas and caustic soda. If the quantity of water is small, the heat produced is so high that the metal takes fire, and burns with a yellow flame and high heat.

In the preservation of sodium it must be kept immersed under the surface of some liquid which is free from oxygen, the heavy oils of coal-tar being better for this purpose, apparently, than rectified petroleums, which seem to absorb oxygen slowly and transmit it to the sodium, which thus becomes soon encrusted with a product not yet examined. The addition of a small percentage of amyl alcohol to the oil prevents tarnishing of the metal.

Sodium Salts.—The most important salts or compounds of soda are the acetate, borate, carbonates, hypochlorite, hyposulphite, nitrate, phosphates, silicates, sulphate, sulphite, and tungstate. *Acetate of Sodium.*—This is a commercial article, prepared on a large scale by the manufacturers of wood-vinegar or pyroligneous acid. It is a white salt in prismatic crystals, which effloresce in the air, soluble in three parts of cold water. Heat converts it into a mixture of carbon and carbonate. It is used in medicine and as the source of commercial acetic acid by distilling with sulphuric acid. *Borates of Sodium.*—Of these the most important is Borax (*q. v.*). *Carbonates of Sodium.*—Of these there are two of great importance—the neutral or normal carbonate, commercially sal-soda or washing-soda, and the bicarbonate, commercially cooking-soda. *Sal-soda*, $Na_2CO_3 + 10H_2O$, crystallizes in large, transparent crystals, which are monoclinic. This salt effloresces in the air very rapidly, falling down to a white powder, which contains but half as much water as before. It dissolves in twice its weight of cold water. On exposure to a gentle heat it loses all water, and becomes dry anhydrous carbonate. This latter is a product of enormous value in the arts, used chiefly in the manufacture of glass and soap. *Cooking-soda* (*disodium dihydrogen dicarbonate*), $HNaCO_3$, is made by exposing the last compound to an atmosphere of carbon dioxide, which is absorbed, with evolution of heat and separation of water. It is sometimes called soda saleratus. Commercial bicarbonate of soda is a white granular powder, which requires thirteen times its weight of water for solution. It is largely used in medicine and in cookery. For *hypochlorite of soda*, or *Labaraque's liquor*, used as a disinfectant, see Hypochlorites; *nitrate of sodium*, see Saltpeter, Chili; *phosphates of sodium*, see Phosphoric Acid; *silicates of sodium*, see Glass.

Sulphate of sodium, or Glauber's Salt (*q. v.*), $Na_2SO_4 + 10H_2O$, forms large transparent monoclinic crystals. It occurs native in mineral springs, and as the mineral species mirabilite. Glauber's salt is highly efflorescent, falling to a white powder in the air, and in time losing all its water of crystallization. It dissolves in three times its weight of cold and in its own weight of boiling water. It has a remarkable propensity to form supersaturated solutions. For *sulphite of sodium*, see Sulphurous Acid; *tungstate of sodium*, see Tungsten. Revised by Ira Remsen.

APPENDIX.

Ramsauer, raam'sow-*er*, JEAN: educator; pupil and colleague of Pestalozzi; b. in Hérisau, Switzerland, in 1790. At the age of ten he became dependent upon charity, and was placed in a family living near Burgdorf. Madam von Werth sent him to the school opened at Burgdorf by Krüsi, which was soon afterward united to that conducted by Pestalozzi, and when the Burgdorf institute opened in Oct., 1800, Ramsauer was the first boarding pupil received. As he was poor, he worked for his support, studying when he was at leisure. He found favor with Pestalozzi, who appointed him, at the age of twelve, assistant to the teacher at the head of the communal school, and Ramsauer discharged his duties efficiently. In the same year he became teacher of the lower class in the institute itself. He followed Pestalozzi to Münchenbuchsee, but when Pestalozzi went to Yverdun Ramsauer remained at Münchenbuchsee with Fellenberg. In 1805 Pestalozzi called him to Yverdun. At the age of twenty, after the departure of Joseph Schmid, he became master in the institute, and had charge of the instruction in drawing, gymnastics, and geometry, and from 1812 to 1815 he served as Pestalozzi's secretary. Owing to difficulties with Schmid, he left the institute in 1816, and became teacher to the young princes of Oldenburg. He remained in this position until 1835. He also founded an institution for young girls in Oldenburg. He died in Oldenburg, 1848. He was the author of several text-books, but his most interesting writings are his *Autobiography* and *Memorabilia*, which contain very valuable anecdotal reminiscences of Pestalozzi. His judgment of the philosophical and social sides of Pestalozzi's character is of little value, since after he left the institute he became a pietist, and his standpoint in writing makes him incapable of understanding the great pedagogue. C. H. THURBER.

Ramsay, FRANCIS MUNROE: naval officer; b. in the District of Columbia, Apr. 5, 1835. Entering the Naval Academy in 1850, he became lieutenant in 1858, lieutenant-commander in 1862. During the civil war he took part in the fight at Haines's Bluff, on the Yazoo river, and subsequently destroyed the Confederate navy-yard and some vessels on that stream. He was in the engagement at Liverpool Landing in 1863, commanded a battery before Vicksburg in the same year, and commanded a division of the Mississippi squadron 1863–64. He had charge of expeditions on the Ouachita, Atchafalaya, and Black rivers in 1864, and gave fight to the enemy at Simmsport, La. Commanding the gunboat Unadilla of the North Atlantic squadron 1864–65, he engaged in the bombardment of Fort Fisher, and was honorably mentioned in the official report for skill, good judgment, and bravery. Subsequently he participated in engagements at Fort Anderson and at other forts on the Cape Fear river; was made commander in 1866, was fleet captain and chief of staff of the South Atlantic squadron 1867–69, became captain in 1877, and had charge of the torpedo station 1878–80; was superintendent of the Naval Academy; became commodore in 1889, rear-admiral in 1894, and was placed on the retired list in 1897.

Range-finders and Position-finders: instruments used in the military service for quickly locating the position of the target fired at with respect to the gun. The distinction between the two names should be clearly understood. A *range-finder* determines the distance or range to the target, but does not give the direction, and it can therefore only be used at or very near the gun itself, since the range determined from some other or distant point might not be, and in general would not be, the same as the range from the gun. A *position-finder* measures both the range in yards to the target and its direction in degrees and minutes of azimuth, the meridian in passing through the vertical axis of the instrument being taken as the origin of direction, and the zero line of direction being the line of sight through the point, looking south. The *position-finder* may be located at or near the gun, or at a very considerable distance from it, without affecting the accuracy of the results, except that when used at a distance from the gun it is necessary to use in conjunction some form of replotting device, in order quickly to transform the readings given by the position-finder into the corresponding ranges and azimuths from the gun. Several different forms of replotting devices are in use, most of them being simple in construction, and in the most improved types of position-finders now in service the replotting is done by an automatic mechanical attachment, which makes the required transformation without appreciable error or loss of time.

Of the two kinds of instruments used range-finders alone are used with infantry, cavalry, and field and siege artillery, while the position-finder is exclusively used with the seacoast armament and guns of fixed position.

A number of different range-finders have been tried in the naval service, but up to the present time no instrument of this kind has been developed which successfully overcomes the many practical difficulties incident to service on shipboard. Position-finders are not needed in the naval service.

RANGE-FINDERS.—All range-finders may be classed under three general heads, viz.: (1) acoustic range-finders, (2) stadias, and (3) topographical range-finders. The first two classes are comparatively unimportant, since the instruments are few in number and limited in their use to conditions that seldom obtain in service. In the third class are included all range-finders whose construction and operation are based upon the usual topographical methods of solving a plane triangle.

1. *Acoustic Range-finders.*—After the flash of a gun or bursting shell is seen a certain time-interval must elapse before the sound of the explosion is heard, and any device which will measure this interval accurately may be used as a range-finder in determining the distance from the observer to the gun or bursting shell. Sound travels at the rate of 371 yards per second through air at normal temperature of 50° F. This rate increases or decreases 1 foot for each degree above or below 50° F.

The wind, humidity of the air, and barometric pressure all affect the *intensity* of sound, but do not appreciably affect its *velocity*. An acoustic range-finder is therefore a simple form of time-keeper or seconds-reckoner. It is small and cheap, and under certain favorable conditions is fairly accurate. The two best-known instruments of this class are the Boulengé and the Redier. The first named consists of a glass tube 6 inches long filled with benzine, and containing a silver traveler or indicator formed of two flat disks connected by a central wire, the whole inclosed in a neat wooden case. The diameter of the indicator-disks is slightly less than that of the tube, so as to equalize the errors caused by the expansion of the liquid and the increased velocity of sound due to rise in temperature. When the tube is held vertically the indicator travels along the graduated range-scale at a uniform rate of speed. In use the instrument, with the indicator at zero, is held horizontally in the hand, back of the hand up. When the flash of an enemy's gun is seen the hand is instantly turned until the tube is vertical; then when the report is heard the hand is quickly replaced in its original position. The range in yards is read directly from the scale. The Redier range-finder resembles an ordinary stop-watch in appearance and operation. The two hands are placed at zero, and secured by a small spring catch. The slightest pressure on this spring releases the mechanism, and the hands then continue to revolve rapidly, the long hand twelve times as fast as the short one, until the pressure is removed,

when both are instantly stopped and the number of revolutions made by each is registered by the dial of the watch. The range in yards, which corresponds to the interval of time during which the pressure was applied to the spring catch, is taken from a specially prepared table.

Both these range-finders are simple, convenient, and inexpensive, and are sufficiently accurate for service within the limits of the method; but the method itself is at fault, since in the confusion of the battle-field it could scarcely ever be used.

2. *Stadias.*—The *stadia* as a surveying instrument is well known. Used as a range-finder it determines the distance to a target by measuring the angle subtended by a known height at a known distance. The height of the target (such as a mounted or foot soldier) is supposed to be known, and forms the base of a triangle whose apex is at the eye of the observer. The intervening distance is ascertained by a micrometer measurement of the apex angle. This is done either by the vertical movement of a micrometer wire placed between the lenses of the eyepiece of the observing telescope, or by a fixed, graduated scale similarly placed. It is necessary, in using such an instrument, to refer to a specially prepared table of distances in order to find the range corresponding to any scale of micrometer reading. As the exact height of the object observed can never be known, and as they require a separate table of ranges for each different object, range-finders of the stadia class are of little practical value.

3. *Topographical Range-finders.*—At least nine-tenths of all field range-finders now in use belong to the class known as topographical range-finders. The number of these is so great and the essential differences in construction are so small that no attempt will be made to describe more than a few of the typical ones. The principle of construction common to all is dependent upon the well-known property of plane triangles—that when three elements are known the other three can always be determined. The solution of the triangle is, however, in all cases mechanical.

There are three types of topographical range-finders in service, viz.: Those requiring a short fixed base, such as Clerk's, Guthrie's, Adee's, Berdan's, and Mallock's; those similar to a theodolite, as Nolan's; and those of the nature of a sextant, like Watkin's, Weldon's, Goulier's, Gautier's, Labbez's, Dredge-Steward's, etc.

Those of the first type find the distance by the amount of displacement of the object as seen from either end of a short fixed base-line within the instrument itself. Mirrors have generally been used in instruments of this type, and the greatest difficulties encountered have been due to the necessity of exactly superimposing the direct and the reflected images and the loss of light by reflection. The Mallock, which is the most promising instrument of the type, has two sets of mirrors, one set at each end of a tube $2\frac{1}{2}$ or 5 feet long. The two mirrors composing each set are placed at an angle of 45 degrees. It is proposed to use prisms instead of mirrors in this instrument, which will no doubt greatly increase the accuracy. The Nolan range-finder is the best example of an instrument of the second type. It consists of two separate telescopes placed on gun-carriages or tripods some distance apart. The telescopes measure the angle subtended at the object by the distance between the telescopes, and the ranges are found from a special calculating disk. Range-finders of the third type all use a base of some considerable length, and require at least two observers working in conjunction. They are all subject to errors of parallax, but in the hands of skilled observers and under favorable conditions the results are sufficiently accurate to meet service requirements.

The Watkin range-finder has been the English service instrument for many years. It is, in reality, a convenient form of sextant, in which the horizon-glass is movable and the index-glass is fixed. To save the trouble of direct measurement, the true base is measured by means of a subsidiary base 18 feet long, and after adjusting a sliding pivot to the true base on a graduated bar the range is given automatically on a drum-scale, the movement of which alters the position of the index-glass sufficiently to measure the angle at the end of the base opposite the right angle. The instrument is better adapted for use with field artillery than for the infantry or cavalry, since the equipment of the two stations is too bulky and elaborate to be carried with foot troops or by one man. It is, however, easy of adjustment, and the most accurate and satisfactory type of its kind yet developed.

The Weldon range-finder is the simplest instrument of the kind in use. It consists of three accurately ground prisms set in one case, the whole being so small that it may be carried in the vest-pocket. Two observers similarly equipped are necessary, and the range is found by measuring the distance between the observers and multiplying this distance by the fixed multiplier of the instrument. Two of the prisms reflect the angles of a right-angled triangle, the perpendicular of which is fifty times the base (the angles being 90°, 88° 51′, and 1° 9′). The third reflects an angle of 74° 53′, and is used for measuring the true base by means of a subsidiary base one-fourth its length. With this instrument one interior angle and one exterior angle of the triangle are laid off, and not two interior angles, as with the Watkin.

A most ingenious topographical range-finder of the first type has recently been introduced for trial in the naval service. It is the invention of Capt. B. A. Fiske, U. S. N., and deserves especial mention because it is the first electrical instrument of the kind ever used. The principle of the Wheatstone bridge is applied in recording the angle through which the telescope at each end of the base-line is moved, a sensitive galvanometer being employed in obtaining a balance in the bridge to ascertain the range-reading. As installed on shipboard, the Fiske range-finder consists essentially of two specially mounted telescopes, one at each end of a fixed base-line (approximately the length of the vessel), a galvanometer and plotting station below deck, and the necessary battery power and wires connecting the telescopes with the galvanometers. At least three operators are necessary to find the range. As each observer at the telescope follows the target a sliding contact is moved along a wire of uniform resistance, thus changing the resistance in a particular branch of the Wheatstone bridge. To ascertain the range, the operator at the plotting station moves each plotting arm until the needle of the corresponding galvanometer stands at zero. The intersection of the two arms determines the range to the target. The mechanical and electrical details are carefully worked out in this instrument, and when in proper adjustment its results are exceedingly accurate.

Position-finders.—With the long ranges, flat trajectories, and enormous cost of modern seacoast ordnance, the use of some quick, accurate, and reliable means of determining the exact position of the target with respect to the gun becomes a necessity. The gun itself has developed into a machine of almost scientific accuracy when the conditions under which it is fired are once known. Two consecutive shots, for instance, from the Jubilee gun in England at a range of 11 miles fell within 30 yards of each other. But in order to utilize to the best advantage the accuracy of the gun and its carriage, it is necessary for the gunner to be constantly informed as to the distance to the target and its direction from him. Since the natural target of the coast artillery gunner is an enemy's vessel, and since this target will generally be in more or less rapid motion according to the kind of vessel and the character of the water approaches to the battery, the element of time becomes a vital one. The loss of a few seconds in determining the range will often mean the loss of a shot. The position-finder is therefore the basis upon which every system of modern artillery-fire control rests.

The comparative efficiency of the many different systems of coast defense possessed by the different powers of the world may be measured by the character and accuracy of the position-finding instruments in use by each.

Only two classes of such instruments are in general use at the present day, the essential difference being in the length and position of the working base-line and in the number of stations and observers necessary. The first class, known as *horizontal-base position-finders*, are used where the site of the fortification is low, and when the water approaches are such that the enemy can be seen simultaneously by the two observers at the opposite extremities of a base-line of considerable length. The second class are called *vertical-base* or *depression position-finders*, from the fact that the working base is vertical, being the height of axis of the telescope at the moment of taking an observation above the level of the sea, and the angles through which the telescope is moved in following the target are all angles of depression. Instruments of the second class are so much simpler in construction and operation, and possess such manifest advantages from a service point of view, that they are used in all cases where the fortification and its surround-

ings are such as to afford sufficient altitude for their installation.

The Horizontal-base Position-finder.—To constitute a horizontal-base position-finder three separate stations and operators are neeessary. Two of these stations, ealled the *observing stations*, are each equipped with a special quiek-reading theodolite, for determining the azimuth of the target, and a telephone or telegraph, and are situated at eaeh extremity of a earefully measured base-line. The third, or *replotting station*, is usually near the gun, is equipped with suitable replotting apparatus, and must be in eonstant eleetrical communieation with eaeh of the other stations and with the gun. The length of the base-line is generally a thousand yards or more, and its direction is as nearly as possible perpendieular to the principal line of approaeh to the battery.

To find the position of a target, eaeh observer directs his telescope upon it, and telephones the azimuth angle read to the operator at the replotting station. The latter first plots the position with respeet to the two base-end stations by means of two pivoted arms of the plotting-board, and then immediately replots it with respeet to the gun by means of a third pivoted scale-arm, the pivot of whieh represents the plotted position of the gun with respeet to the two observing stations. The third arm gives the range in yards and the direetion in degrees and minutes of azimuth from the gun to the target, and these are, of eourse, the data the gunner must have in order to train his gun on the target. When the target can be seen through the sights on the gun the direction may be determined by the gunner himself, and in this ease the replotter only transmits the range scale-reading.

With trained observers, a base-line of suitable length, and with targets fixed in position, these instruments give exeeedingly aeeurate and satisfactory results. They possess the great comparative advantage of not being affeeted by tidal ehange, curvature, refraetion, wave-action, and indistinetness of water-line. They are also eheap, and may be easily installed for temporary or permanent use. With a moving target, however, such as a vessel in motion, or where a number of sueh targets are approaching a gun at the same time, instruments of this type are not equal to the problem of position-finding then presented. The length and eomplexity of the lines of eommunieation, the difficulty of securing simultaneous readings on the part of both observers, and the still greater difficulty of getting both to observe the same target—all combine to diseredit the results obtained. The length of time consumed and the number of men necessary are also serious objections. Exeept in England, the horizontal-base position-finder is still largely used abroad, but in England and the U. S. it is used only to a limited extent, and in eertain special cases as already indieated.

Depression Position-finders.—A depression position-finder is a single-station, self-contained instrument, requiring but one man to operate it. The observer, through a powerful telescope, follows the target, keeping the horizontal wire eoincident with the water-line and the vertical wire upon any desired point of the object. The range in yards and the direetion in degrees and minutes are read direetly from the dials of the instrument. Like all range-finding instruments, its operation depends upon the quick mechaneal solution of a triangle. In this instance the triangle is right-angled, the vertical height of the instrument above sea-level constituting one side and the range to the objeet another side, the angle at the base being the angle of depression through which the telescope has moved in locating the target. It follows, therefore, that all ranges found by a depression instrument must lie either wholly or in part over the surface of water, and that the object observed must have a water-line. Means must be provided for compensating for changes in tide, since a rise or fall of the tide necessarily shortens or lengthens the working base of the position-finder. It is also found necessary to provide eorrections for the effeets of curvature of the earth and of atmospheric refraetion. All these correetions are applied meehanieally and automatieally, the exact amount of each for each division of the range-scale having been carefully eomputed during construction.

The position-finder is permanently installed upon a concrete foundation, in an underground protected cell, a complete view of harbor being afforded through a long, narrow, horizontal window. The pedestal is provided with leveling-screws, and the observer must be careful to see that the table remains level while in use. The instrument is usually installed at some eonsiderable distanee from the battery whose fire is to be directed and eontrolled from it. The electrieal eommunications eonneeting the two are laid in underground conduits. Sinee it is neeessary to transmit to the gun-layer, not the range and the direetion of the target from the instrument, but its range and direetion from the gun itself, each depression position-finder has used in eonnection with it some form of replotting apparatus. In the most improved instruments the replotting is done automatieally, so that the observer has nothing to do but to follow and loeate his target through the telescope and then read the correct range and direction from the gun from the proper dials.

At least one eomplete position-finder is provided for each independent battery or group of guns. A gun-group is usually composed of two or three guns mounted in eontiguous emplaeements. The right or middle gun of the group is designated the *directing gun*. The information from the position-finder is transmitted to each gun of the group. The gun-commander of the direeting gun lays his gun aeeordingly, but eaeh of the other gun-eommanders makes a slight eorreetion in direction to eompensate for the displaeement of his gun. The range given is correet for all. In what is known as "predieted firing," whieh is now generally employed by heavy artillery against moving targets, the observer at the position-finder elosely follows the target for a given interval of time, noting earefully its change in range and direction during this interval. With these data he quiekly prediets the ehange for a like interval (say two minutes) in advance and sets his instrument accordingly. He at once transmits to the guns the training for the predieted position, and the guns are laid to strike the point. The observer now, after making a slight correction to eompensate for the time of flight of the projectile, watehes the target as it enters the field of his telescope, and eloses the firing circuit or gives the eommand "fire" the instant the image crosses the vertieal wire.

With a trained observer (who is generally a eommissioned offieer or an intelligent non-commissioned offieer) at the position-finder, and with well-drilled men at the guns, it is possible by this method to follow an approaching vessel from the time she enters the zone of fire 10,000 yards away, keeping the guns constantly laid to strike her at any desired point of the course. It is this ability on the part of the defense to direet the fire of their guns with seientifie aeeuraey upon the hostile ship long before the latter can return the fire that eonstitutes the greatest advantage possessed by shore defenses over a naval adversary. Only when the battle-ship has approaehed sufficiently near to bring her rapid-fire armament into aetion ean she hope to disable the position-finding serviee.

The two most successful position-finders of the depression elass are the Watkin in England and the Lewis in Ameriea. The former is the invention of Major Watkin, of the Royal Artillery, who is also the inventor of the English service field range-finder, already mentioned. The Watkin position-finder was first introdueed into the eoast defenses of Great Britain about 1880, but so jealously have the details of eonstruction been guarded by the War Office that no representative of a foreign government has ever been permitted to inspect the instrument or to witness its operation and no description of it has ever been published. The invention was not patented, the rights being purchased outright by the Government for a very large sum. All the English eoast defenses, including those of the colonies, are now supplied with these instruments. In 1898 and 1899 an additional number of the most improved model were installed in the new fortifications at Gibraltar.

The position-finder which is now in use in all the coast defenses of the U. S. is the invention of Lieut. Lewis, of the Sixth U. S. Artillery. While similar to the Watkin in many of the essential principles of construetion, the Lewis instrument has been developed independently, and is believed to be superior to the former in several respects, particularly in the completeness of the automatic replotter, in the correction for abnormal refraetion, and in the known aeeuracy of its work. Two types of the Lewis position-finder are manufactured and in service, being known as type A and type B. The first type is intended for permanent installation at some considerable distance from the gun. It consists essentially of a speeial metal table 45 inches in diameter resting upon a hollow east-iron pedestal, which is provided with means of leveling, and pivoted in the eenter of which is a substantial traversing arm that carries the telescope and the elevating range and replotting mechan-

ism. The complete instrument, weighing about 650 lb., is mounted upon a concrete foundation in an underground cell. The type B instrument is portable, weighing about 18 lb., and somewhat resembles an ordinary engineer's transit in the ease and quickness of its adjustment. It is intended

Lewis position-finder, type A.

to be an emergency or breakdown instrument to be used at the gun in case of damage to the main position-finder or to the electrical lines of communication. Several alternate mountings are prepared for it along the gun-parapet, and when necessity arises for immediate use it takes but a few minutes to mount and adjust the instrument. The larger type A position-finder is, however, more accurate, and is chiefly depended upon in controlling the fire of the battery.

I. N. Lewis.

Rankine, John, LL. D.: law-writer and educator; b. in Scotland, Feb. 18, 1846: after receiving his early education at Sorn and the academies of Ayr and Edinburgh, he took courses at the Universities of Edinburgh and Heidelberg; then read law; was called to the Scottish bar in 1869; was made advocate-depute in 1885, and queen's counsel in 1897. He made a special study of Scotch law, and particularly the law of real estate, and was appointed Professor of Scotch Law in the University of Edinburgh in 1888. His publications include *The Law of Landownership in Scotland* (3d ed. 1891) and *The Law of Leases in Scotland* (2d ed. 1893). He is editor of *Erskine's Principles of the Law of Scotland* (18th and 19th eds.), and other minor works.

F. Sturges Allen.

Rapallo, Charles A.: b. in New York city, Sept. 15, 1823; received his early education under his parents' supervision, and at the age of twenty-one, without having attended school or college, was admitted to the New York bar; rapidly became prominent in the practice of his profession, and acquired a wide practice in matters relating to State, trust, and corporation law; in 1870 was elected as chief justice of the court of appeals under the amended constitution, and in 1884 was re-elected for a further term of fourteen years. His decisions are the most highly respected of those in the State reports, and are scattered through fifty-seven volumes of *Reports*. D. Dec. 28, 1887.

F. Sturges Allen.

Rathbun, Richard, M. S., D. Sc.: naturalist; b. in Buffalo, N. Y., Jan. 25, 1852. As a boy he developed an interest in the fossil remains of Western New York, and was curator of paleontology in the Buffalo Society of Natural Sciences 1869–71. He then entered Cornell University, and devoted much of his time to the special study of the Devonian fossils collected in Brazil by the C. F. Hartt expeditions, and in 1873 moved to the Museum of Comparative Zoölogy in Cambridge, Mass., to complete his studies on them, also serving as assistant in zoölogy in the Boston Society of Natural History 1874–75. Meanwhile he began the study of marine animals at Eastport, Me., under Prof. Edward S. Morse, and was a volunteer zoölogical assistant in the summer expeditions of the U. S. Fish Commission in 1874–75. In Nov., 1875, he went to Brazil as assistant geologist on the geological commission of Brazil, under the direction of Prof. Charles F. Hartt, and remained there until Feb., 1878. On his return to the U. S., he was appointed scientific assistant of the U. S. Fish Commission, in connection with the seacoast investigations and the study of marine invertebrates, continuing in that capacity until 1887, when he was appointed assistant in charge of the division of inquiry respecting food-fishes in the U. S. Fish Commission, which place he then held until 1897, when he became assistant secretary of the Smithsonian Institution. Since 1883 he has been curator of the department of marine invertebrates in the U. S. National Museum, which relation since 1887 has been an honorary one. During the winter of 1892–93 he served as the U. S. representative on the joint commission with Great Britain relative to the preservation of the fisheries in the waters contiguous to the U. S. and Canada. The honorary degree of M. S. has been conferred upon him by the Indiana University, and that of D. Sc. by Bowdoin College. Dr. Rathbun is a member of various scientific societies, and has written many papers for the Government publications of the various departments with which he has been connected.

Marcus Benjamin.

Ratich (known also as **Ratichius** and **Ratke**), Wolfgang: educator, chronologically the first of the pedagogical innovators; b. in Wilster, Holstein, Oct. 18, 1571; studied theology at the University of Rostock; devoted himself specially to the study of languages, since defective pronunciation prevented his preaching; made a journey to England in 1600, and went thence to Amsterdam, where he remained eight years to learn Arabic and mathematics. Here he conceived the idea of reforming the methods of instruction in use in his time. After an unsuccessful effort to interest Prince Maurice of Orange, he went to Germany and settled in Frankfurt in 1611. In 1612 he addressed a memoir to the imperial Diet, in which he promised by the aid of God and for the good of all Christendom to point out a way of teaching in a short time and in an easy manner, to both young and old, Hebrew, Greek, Latin, and the other tongues. This memoir attracted some attention, and two professors in the University of Giesen, Helwig and Jung, were commissioned to examine his method, and expressed approval, as did also four professors in the University of Jena who later examined it at the suggestion of the reigning Duchess of Weimar. There were plenty to oppose his plans, however, and some even declared that the pompous promises of his programme were only airy persiflage. In 1614 he went to Augsburg, by invitation, to reform the schools of the city, being accompanied by Helwig and Jung, who separated from him, however, at the end of the year, and he was forced to abandon the Augsburg experiment. During the following years he traveled from place to place, and finally, in 1618, was placed, by the Prince of Anhalt-Köthen, at the head of a model school, where he remained eighteen months. The prince, enraged that he had been made the dupe of a man whom he had come to regard as an impostor, cast him into prison at the end of that period, where he remained eight months, being released only after he had made a written declaration that he had promised more than he could perform. From Köthen he went to Magdeburg, where he was authorized by the burgomaster to open a school, but was driven out mainly in consequence of theological difficulties. Countess Anna Sophia of Rudolstadt welcomed him to her estates, and recommended him to the Swedish chancellor Oxenstiern, who instigated an examination into his method, but before anything could come of it Ratich was attacked by apoplexy, which brought on paralysis, and in 1635 he died at Erfurt. Ratich seems to have been a difficult person to get on with, and he was also lacking in the power of putting his theories into practice, nor was he entirely exempt from the charge of charlatanism. His programme of studies embraces only languages and mathematics. He was a most zealous Lutheran and narrow in his theological ideas. His pedagogical teachings were influenced by the writings of Bacon. He must be given credit for a number of new and correct ideas, which may be

summed up very briefly as follows: 1. Follow the order of nature. 2. Do one thing at a time. 3. Repeat the same thing often. 4. Begin with the native tongue. 5. Do everything without force. 6. Learn nothing by heart. 7. Give children frequent recreation. 8. Uniformity and harmony in everything (by which he seems to mean something similar to what we know to-day as correlation). 9. First the thing and then the nature of the thing (by which he meant the modern inductive or scientific method). 10. Everything by experience and induction. He wrote a considerable number of educational works. See Von Raumer, *Geschichte der Pädagogik*; Williams, *History of Modern Education*: Compayré, *History of Pedagogy*. C. H. THURBER.

Rattigan, Sir WILLIAM HENRY, LL. D.: East Indian lawyer and judge; b. in Delhi, India, Sept. 4, 1842; was educated at the high school in Agra and afterward at King's College, London; then took up the study of law and was called to the English bar in 1873. He is a barrister and advocate of the high court of the Northwest Provinces, India, and has been a number of times judge of the chief court of Punjaub, and was a member of the supreme legislative council of India 1892–93. He has made a special study of the science of jurisprudence as applicable to the government of India, and has published *The Science of Jurisprudence* (2d ed. 1892); *Private International Law* (1895); *Digest of the Customary Law for Punjaub* (5th ed. 1895): *De Jure Personarum, or the Roman Law of Persons* (1873); and he has translated the second volume of *Savigny's System of Modern Roman Law* (1884). He resides at Lahore, in the Punjaub, India. F. STURGES ALLEN.

Raymond, JEROME HALL, Ph. D.: educator; b. in Clinton, Ia., Mar. 10, 1869; A. B., Northwestern University, 1892, having previously spent two years in travel and study in Europe and the Orient; A. M., same, 1893; Ph. D., University of Chicago, 1895; lecturer in history and secretary of the Chicago Society for University Extension, 1892–93; Professor of History and Political Science, Lawrence University, 1893–94; lecturer in sociology and secretary of class study department, University of Chicago, 1894–95; assistant in Sociology, same, 1895; Professor of Sociology and secretary of the university extension department, University of Wisconsin, 1895–97; president of West Virginia University, Morgantown, W. Va., since 1897.

Read, DAVID BREAKENRIDGE: author; b. in Augusta, Ontario, June 13, 1823; admitted to the bar in 1845, and settled in Toronto. He was elected mayor of Toronto in 1858, and the same year was made a queen's counsel. He has contributed largely to various magazines, and has devoted much time to historical subjects. Among his works are *The Lives of the Judges of Upper Canada* (1888); *The Life and Times of General John Graves Simcoe* (1890); *The Life and Times of Major-General Sir Isaac Brock, K. B.* (1894); *The Rebellion of 1837* (1897).

Read, OPIE PERCIVAL: author and editor; b. in Nashville, Tenn., Dec. 22, 1852; after receiving education in his native State, and serving as a newspaper reporter in Franklin, Ky., edited the Little Rock *Gazette*, was on the staff of the Cleveland *Leader*, and in 1883 founded the *Arkansaw Traveler*. Among his publications are *Up Terrapin River* (1889); *A Kentucky Colonel* (1889); *Emmett Bonlore* (1891); *Miss Madam, and other Sketches* (1893); *A Tennessee Judge* (1893); *Wives of the Prophet* (1894); *My Young Master* (1896); and *Bolanyo* (1897).

Reade, JOHN: author; b. in Ballyshannon, Ireland, Nov. 13, 1837; went to America in 1856, and took up journalism in Montreal. In 1870 he published a small volume of poetry, *The Prophecy of Merlin, and other Poems*. In 1877 he was made an honorary member of the Literary and Historical Society of Quebec, and in 1895 he contributed an article to the memorial biographies of the Historical Genealogical Society of New England. In 1896 he was elected a fellow of the Royal Society of Literature of Great Britain.

Recording Apparatus, Psychological: The quantitative relations of mental states are measured by means of apparatus based on the laws of physics and physiology. Since it is impossible to measure sensations, thoughts, feelings, or emotions directly, the investigator must gauge them in terms of their causes and effects. All psychological measurements, therefore, are measurements of either the stimuli (or physical causes) which produce the mental state or the (physiological) motor effect which the mental state produces. The stimulus may be measured with respect to its duration, intensity, or spatial extent. The motor effect is generally measured with reference to its variation in extent or intensity from moment to moment.

1. *General Apparatus.*—Records are obtained by two methods. In the first, an index or pointer moves along a scale, and stops at a number representing the measurement desired. This is the principle of the apparatus whose names end in *-meter* or *-scope*. The index is usually constructed so as to stop at the point desired, while the mechanism either proceeds, as in the chronoscope, or returns to its starting-point, as in the dynamometer. A number of records can thus be obtained in rapid succession. An electric current is often used to start the mechanism or stop the index.

In the second or graphic method, a quill point moves back and forth on a cylinder covered with paper; as the cylinder rotates, a record or curve is obtained in two dimensions, one of which represents time (Fig. 1). This principle

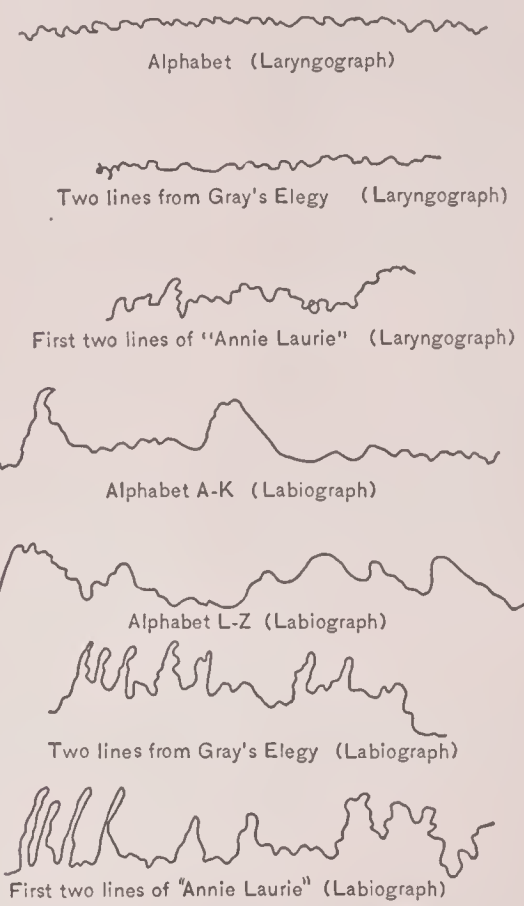

FIG. 1.—Laryngograph and labiograph tracings.

is involved in the apparatus whose names end in *-graph*. The quill may be attached directly to the special apparatus, as in the ergograph, or the record may be transmitted by air-pressure or an electric current. For air-pressure transmission the *Marey tambour* is used. This consists of two drums of wood or metal, connected by a firm rubber tube, each drum having one elastic rubber head. The movement to be recorded takes the form of an inward pressure on the elastic head of the first or exploring tambour; this compresses the air in the tube and in the second or receiving tambour, and the elastic head of the latter is raised. A quill extends over the receiving tambour, rising and falling with the movement of the head. This principle is used in the sphygmograph and similar apparatus. The electric mode of transmission is illustrated in the *Deprez signal*. Here the quill is fastened to the armature of an electromagnet. When the circuit is made, the quill is drawn to the magnet; when the circuit is broken, it is released and drawn away by a spring. A record of the points of time at which the circuit is made and broken is thus obtained on the paper. This is the principle of the chronograph.

Numerous devices are used for holding and running the recording cylinders. The *kymograph* consists of a clockwork, which turns the cylinder, and several convenient adjustments for altering the rate of rotation, the angle of its axis, and its position along the axis. The *polygraph* is used for obtaining several records simultaneously. Near the cylinder is a firm, upright rod, to which a number of receiving tambours may be clamped; their quills record at different heights on the cylinder, but at identical points of its circumference. A time record is generally included among the data, giving the duration of the phenomena

even if the cylinder does not rotate uniformly. The records are obtained on glazed paper that has received a uniform coating of lampblack or candle-black; they are made permanent by bathing the paper in some fixing solution.

2. *Apparatus for Measuring the Duration of Mental Processes.—Reaction Time.*—Reaction time is measured by means of the chronoscope or chronograph. See CHRONOSCOPE, CHRONOGRAPH. For discussion of the different mental processes involved, see PSYCHOMETRY.

The chronoscopes used for psychological measurement differ somewhat from the physical chronoscopes. The *Hipp chronoscope* (Fig. 2), the most common form, is a clock whose hands are connected with the works by making an electric circuit and disconnected by breaking it. There are two dials, each divided into 100 parts; the hand on the upper dial makes a circuit in one-tenth of a second, the lower in ten seconds; by reading the two together, the time is indicated in thousandths of a second (called σ, sigma; $1{,}000\,\sigma = 1$ sec.). In practice the clockwork is first started; then some mechanism gives the stimulus and starts the hands at precisely the same instant; when the given mental act is completed, the subject presses a reaction key, which stops the hands; the reaction time is the entire time during which the hands have moved. A simpler form of chronoscope is the *d'Arsonval chronometer*. This has but one dial, marking hundredths of a second; it is portable and almost noiseless; once wound it continues to go till run down. The arrangement for starting and stopping the hand is essentially the same as in the Hipp. The *pendulum chronoscope* is a pendulum which swings along a scale indicating the time occupied in swinging. The pendulum is held at the upper end of the arc by an electro-magnet and released when the stimulus is given; when the subject reacts, another electro-magnet draws a pointer to the scale and holds it, while the pendulum continues its course. The position of the pointer indicates the reaction time.

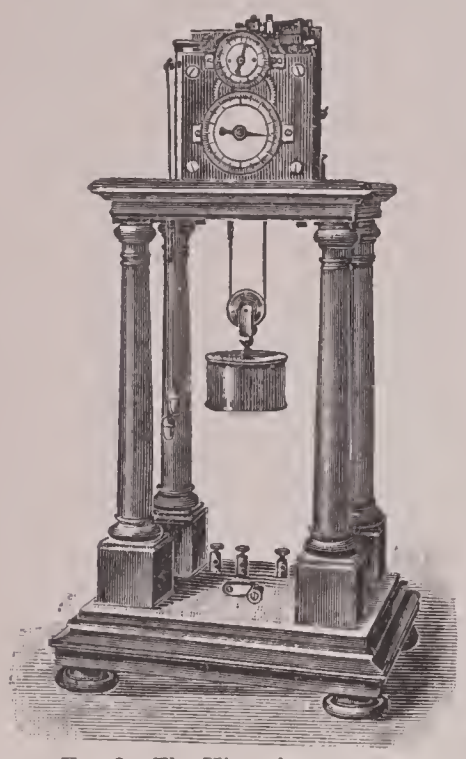

FIG. 2.—The Hipp chronoscope.

The *chronograph* used in psychological experiment is some form of revolving cylinder, such as the kymograph or polygraph, described above. The time is measured by a tuning-fork, metronome, or seconds pendulum, and recorded by means of tambours or an electric circuit. The tuning-fork gives the most accurate results. An electro-magnet near one prong of the fork draws that prong; this breaks the circuit, and the prong, released, flies back, makes the circuit again, and so on. The fork is thus kept in vibration, and as the circuit is made and broken with each vibration it is recorded on the cylinder by the Deprez signal. When the circuit is finally broken by the reaction movement, the record ceases, though the fork continues to vibrate. A continuous time record may be obtained by a quill attached directly to a prong of the fork.

The reaction-time apparatus includes also the *stimulus releaser* and the *reaction key*. For visual stimuli, such as light, colors, letters, and words, a screen with an aperture is attached to a pendulum; as the latter swings, the stimulus, behind it, is exposed for a time to view; the instant this exposure begins, the chronoscope or chronograph circuit is made. The two apparatus are combined in the pendulum chronoscope. Instead of a pendulum a heavy falling screen with an aperture may be used to expose the stimulus. For sensations of sound a bell or hammer is struck, and this completes the circuit which starts the time apparatus. For sensations of touch a blunt point is pressed against the skin, and this movement completes the circuit.

The most common form of *reaction key* is for the hand; it is similar to a telegrapher's key; the circuit is broken (or made) by pressing a knob at the end of a lever. For reacting with the vocal organs a lever is fastened to the jaw or pressed against the teeth; when the mouth is opened to speak a circuit is broken. In another form the mouth is placed at the large end of a funnel; a puff of air is sent through, moving a tongue at the other end and breaking the circuit. For reaction with choice a complex key is used, with a lever for each finger; if one stimulus appears, the thumb lever is pressed; if another stimulus, the forefinger lever, and so on, as agreed on beforehand.

Least Duration.—The least duration of stimulus consistent with a given kind of perception is measured as follows: A disk with alternate sectors of black and white is rotated on a color-wheel (described below); when the speed is increased beyond a certain rate the flickering ceases, and we see a uniform gray; from the rate of speed and width of the sectors the duration of the separate stimuli is calculated. Or, using a screen with aperture, swinging with a pendulum, and taking a printed word as stimulus, the speed of the pendulum is increased or the width of the aperture diminished, till the word is no longer distinguishable; the least time of exposure at which the word can be read is thus determined.

Time Relations of Different Senses.—The relation between simultaneous perceptions of visual and auditory stimuli is measured by the *complication pendulum*. This consists of a disk with a scale, over which swings a pointer attached to a pendulum. Concealed behind the disk is a bell, which can be adjusted so as to strike as the pointer passes any given point on the scale. The subject notes the point at which the bell seems to strike; in general, he indicates a point *before* that at which the bell actually strikes.

Appreciation of Time.—To measure the least perceptible difference between two periods of "empty" time, the *time-sense apparatus* is used. It consists of a disk with circular scale. Three levers, which project from the disk, may be placed at any points on the scale. Another disk, with a single pointer, rotates over this, and the pointer strikes the three levers in turn, making an electric circuit, and causing a bell or hammer to strike each time. The position of two levers being fixed, the third is varied until the time between the second and third taps is just noticeably different from the time between the first and second.

3. *Apparatus for Measuring the Intensity and Quality of Sensation.*—The least sensation is measured by the least stimulus that will produce a sensation (this is called the *threshold of sensation*); the least difference of sensation, by the least change in stimulus that will produce a different sensation (called *threshold of difference*). Where measurements of the quality of sensation are possible, as in sight and hearing, they are of the same character. For determinations of the threshold of sensation, see PSYCHO-PHYSICS.

Sense of Pressure.—The threshold of difference is measured with a set of *test-weights*. Jastrow's test-weights are cylinders of the same size and appearance, whose weight may be regulated as desired by pouring in shot. One cylinder, called the standard, is placed on the subject's hand; it is then replaced by another, and he compares the two. The standard is next compared with another in the same way, and so on, until we find the one least different from the standard which the subject observes to be different. Verdin's æsthesiometer (described below, under *Space Apparatus*) has a scale showing the amount of pressure exerted when it is applied to the skin.

Heat and Cold Sensations.—The threshold of difference in these two senses is determined by the *thermæsthesiometer*. One form of this apparatus consists of two tubes filled with water, whose temperature is measured by a thermometer and regulated by spigots. One tube is maintained at constant temperature, while the other is heated or cooled until a difference between the two is observed. Münsterberg's æsthesiometer (described below) is also adapted for this investigation.

Pain-sense.—The threshold of pain, threshold of difference for pain, and greatest endurable pain are measured by

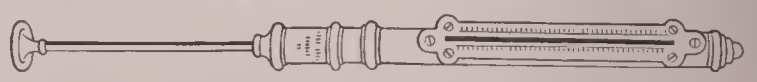

FIG. 3.—The temple algometer.

the *algometer*. This consists of a piston-rod which works against a heavy spring. At the end of the rod is a button-like tip, covered with flannel. This is pressed against the skin with increasing force, till it becomes painful; the

amount of pressure is indicated on a scale. One form of algometer is used on the temple (Fig. 3), another on the palm of the hand.

Muscle or Joint Sense.—The threshold of difference is measured with the test-weights, as in the sense of pressure; in investigating the muscle-sense, however, the weights are grasped and lifted by the subject, instead of resting on the palm of his hand.

Sense of Bodily Movement.—The sense of passive movement is investigated with the *rotation table.* This is a long board on which the subject lies, and which rotates freely in the horizontal plane. A fixed scale over which a pointer moves indicates the amount of rotation, and the beats of a metronome, or electric contacts at various points on the scale, record its rate. The apparatus measures the least perceptible movement, and demonstrates the relativity of these sensations.

Taste and Smell.—Taste has been but little investigated; the means used are solutions of sugar, quinine, tartaric acid, salt, etc. The substance is diluted in water until it can no longer be distinguished, or solutions of different strength are compared. For smell, the *olfactometer* is used. Zwaardemaker's olfactometer consists of a pair of horizontal tubes, turned upward at one end for insertion in the nostrils; a board conceals the other end from the subject's sight. Over this end are fitted in turn various tubes with odoriferous substances. The strength of the odor varies with the distance that the odor-tubes project out beyond the tubes of the olfactometer, and this furnishes a measure for the thresholds of sensation and difference.

Hearing.—The threshold of difference is determined by dropping a ball from varying heights on to a wooden stand; the ball is held by a clamp and released automatically; the length of fall is determined by a scale on the rod to which the clamp is fixed. Instead of a ball, a shot is sometimes used; it adheres to the lower side of an electro-magnet, and drops when the circuit is broken. The *sound pendulum* consists of a swinging metal rod, tipped with a hard rubber ball, which strikes against an ebony block at the lowest point of its arc. A clamp holds the ball at any desired point of the arc and releases it. The intensity of the sound is calculated from the length of arc, which is measured by a scale on the arm bearing the clamp.

Quality or pitch differences give rise to another set of problems in sound. The lowest audible pitch (see Acoustics) is determined by means of large tuning-forks; a fork is fitted with an adjustable weight, by which its rate may be varied from 16 to 24 vibrations per second; the rates for various positions of the weight are indicated on the fork. *Appunn's reed*, or *lamella*, is a blade surmounted by a flat bulb, and held below by a clamp; the length of the blade, and consequently its rate of vibration, is varied by adjusting the clamp. The highest audible pitch is determined by the *Galton whistle.* This is a very short pipe, whose length may be diminished to zero by a screw piston. A sound is made by squeezing a bulb attached to the pipe; the pitch is measured by the length of pipe, as indicated by a fine scale. Another means of determining the highest audible pitch is a set of steel cylinders, which, when struck with a steel hammer, give very high notes, the highest in the series being inaudible. To determine the threshold of pitch difference, tuning-forks of nearly the same pitch are compared, or a standard fork is compared with an adjustable one. The *Savart wheel* consists of a disk with a large number of teeth cut uniformly on the circumference; when placed on an axis and rotated against a tongue, it produces a tone which varies in pitch with the rate of speed. Pitch intervals and overtones are investigated with the *sonometer.* This is a long sounding-board, over which two wires are stretched; on the board are marked off various fractions of the length, and the interval through which the pitch is raised when the wire is held or dampened at these points.

Vision.—The threshold of light-difference is found by comparing different shades of gray on the *color-wheel.* This apparatus has an axle, on which black, white, and colored disks or sectors may be clamped and rotated rapidly by means of a series of geared wheels or a motor. The disks used are slit along one radius, so they can be fitted into one another, giving sectors of different colors or shades. The adjustable color-wheel has an axle in three parts, one within another; disks may be fitted to each, interlocking as in the simple color-wheel; but by moving a lever the proportion of each disk showing may be altered while they are rotating. To find the threshold of difference one black and one white disk are fitted together in a certain ratio, which is slowly altered until a difference is noted. The shade of gray is measured in terms of the proportion of black and white in the circumference. Another method used in this problem is to compare the shadows from two lights, one of which is varied in intensity or distance.

The thresholds of color-sensation and color-difference, and various phenomena of saturation, color-mixing, contrast, etc., are investigated by means of color-mixers. (See Complementary Colors.) There are several forms, including the color-wheel just described. The *reflection color-mixer* consists of a clear pane of glass, standing perpendicular to a black velvet surface. Strips of differently colored paper are placed on the velvet each side; the subject looks through the glass at an angle and sees the reflection of one strip over the image of the other. The intensity of the reflected color, and hence the character of the mixture, alters with the angle of regard. Another form is Hering's *binocular color-mixer.* Glasses of different colors are placed before the two eyes, which are directed upon three white spots; the left spot is seen with the left eye alone and in the color of the glass before that eye; the right spot similarly with the right eye; the central spot is seen with both eyes, and gives a binocular mixture of the two colors, which can be compared with each separately. For other tests of color-vision see Sensation, Complementary Colors, and Color-blindness.

4. *Apparatus for Measuring the Perception of Space and Space Relations.*—Besides the thresholds of space and space-difference, there is a threshold of direction obtained by comparing two lines or pairs of points differing slightly in direction.

Touch and Pressure.—The several threshold values are determined by means of points pressed on the skin (see Touch): for these investigations the æsthesiometer is used. *Verdin's æsthesiometer* (Fig. 4) consists of a long horizontal

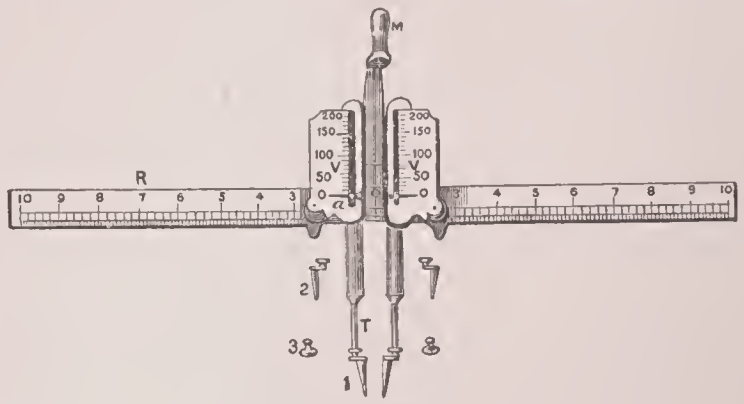

Fig. 4.—Verdin's æsthesiometer.

beam, on each half of which slides a vertical rod tipped with a rounded ivory point; the distance apart of the two points is indicated by a scale on the beam. The lower part of each rod holds a piston, which works against a spring; when the points are pressed on the skin the spring is forced up, the amount of pressure being indicated on another scale. *Jastrow's æsthesiometer* is a simplified form without the spring; the instrument is held by a handle which slides on a vertical rod; when the points touch the skin the handle moves down, avoiding any additional pressure by the operator. *Münsterberg's æsthesiometer* is a flexible rod, at one end of which is a handle, at the other a sheath, by means of which various contact pieces may be attached. Among the contact pieces used are points arranged in various figures, continuous squares and circles, and surfaces of various sizes, for investigating the thresholds of sensation and difference; a set of small pans is used for investigating the temperature senses. For reaction-time experiments a circuit is made, when the skin is touched, by the bending of the flexible rod.

Heat and Cold.—Besides the application of Münsterberg's æsthesiometer just noted, the space relations of the temperature senses are investigated by moving a hot or cold point along the skin. A brass cylinder tapering at one end to a fine point is used. Two cylinders are necessary, one being kept in hot or cold water while the other is in use, with frequent changes on account of the loss or gain of temperature from the skin. This apparatus is used for mapping out the position of the hot and cold spots. The thermæsthesiometer (described above) is also used for this investigation. When an area of the skin has been searched thoroughly with one

of these apparatus, and all the hot and cold spots marked in distinctive inks, a permanent record may be made by laying a *transfer-frame* of transparent paper over the area, and marking the spots, which are visible through the paper. Thus we may compare the distribution of the spots in different areas, or in the same area at different times.

Muscular Sense.—Cattell's apparatus for measuring the appreciation of small differences of movement consists of a carriage which travels freely on a track. One finger is inserted into a loop attached to the carriage, and the latter is moved a certain distance; the carriage is then brought back and the subject endeavors to make another movement of the same length. The distance traveled each time is indicated by a pointer on a scale.

Sense of Position.—For investigating the subjective estimate of bodily position the *tilt-board* is used. This is a long, flat board (like the rotation table) placed across a sawhorse, so as to swing vertically. The subject is strapped to the board with bandaged eyes; it is then swung into any position, and he makes a judgment as to the angle. The actual angle is shown by a scale and a plumb-line or pointer.

Hearing.—Our auditory space-perception consists chiefly of estimates of direction. It is investigated by means of a graduated horizontal circle in the plane of the ears, with other arcs in various planes. A sound is made with a telegraphic sounder at different points on these circles, and the subject's estimate compared with its actual direction.

Vision.—The space threshold is measured by means of a series of alternate black and white strips of the same width. The distance of the strips from the eye, or their width, is varied, till they are barely distinguishable. (See VISION.) The threshold of difference is determined by numerous methods. Münsterberg's *eye-measure* (Ger. *Augenmaass*) consists of a long black surface, across which extend three movable white strips. Two of the strips are placed a certain distance apart, and the subject endeavors to place the third so as to make an equal distance. A concealed scale indicates the actual distances. Other forms of apparatus are similar in principle. In some, the strip or point moves automatically, and is merely stopped by the subject at the point desired. To measure discrimination of *depth* a different instrument is necessary. Cattell's apparatus consists of a box with eye-holes at one end and threads within, stretched vertically across. These threads can be placed at various distances from the eye, the distance being measured on a scale. The subject judges their absolute or relative distance with one eye or with both together.

Near the periphery of the eye the power of space discrimination falls off considerably and the color-sense is entirely lost. These phenomena are measured by means of the perimeter; this consists, essentially, of a fixation point for the eye, and a circular scale rotating about the line of direct vision. To determine the peripheral limits of any color a small piece of colored paper is placed at the end of the scale and gradually approached to the center of vision until the color is correctly distinguished; this is repeated for as many points of the periphery as desired. To determine the peripheral variations of the space threshold the colored piece is replaced by a white surface having two black dots a small distance apart; the piece is moved in till the spots are distinguished as two. The *campimeter* is similar to the perimeter; instead of a circular scale, a large flat sheet of white paper is used; the color-limits, etc., are marked directly on this. For locating the blind spot, see VISION.

5. *Motor Recording Apparatus.—Movement in General.*—Apparatus for measuring the extent of movement have already been described; its duration and rate are measured by a simple application of the kymograph; its force may be noted by the pressure exerted against a spring. There are various apparatus for measuring one or more of these data. Delabarre's apparatus for finding the components of movement along vertical and horizontal axes consists of a vertical and a horizontal string, each attached to the finger and passing over a pulley; at the other end they are attached to recording quills, which are pulled one way by the finger, the other by an elastic. The *dynamometer* is used to determine the maximum force of a muscle, or to compare movements of the same estimated force. It is an oval of flexible steel, which can be compressed at the sides or pulled apart at the ends; the amount of force exerted in either case is indicated on scales by a pointer, which stops at the highest point reached. The hand dynamometer is grasped in the hand and squeezed; a larger form is used for the arm and other muscles. In the *dynamograph* the force exerted is recorded on a revolving cylinder by means of tambours. This shows the rate and variation, as well as the amount of force exerted. Mosso's *ergograph* measures the work done by a single muscle, and its rate of fatigue and exhaustion. The forearm is placed on a cushioned board and held immovable by two sets of clamps; the second and fourth fingers are held fast in tubes, and the middle finger is attached to a string bearing a heavy weight: in raising and lowering the weight this finger moves alone without bringing any other muscle into play. The recording part of the ergograph consists of a carriage, to which the string from the finger is attached; it moves on two rods; from this carriage another rod extends, with a quill which marks on a revolving cylinder. The *myograph* measures the form and rate of simple muscular contraction. It consists of a bridge placed over the muscle in question and bound fast. A rod extends down and rests on the muscle. When the muscle contracts the rod is pressed up, and this acts on a tambour, which records the movement in the manner already described.

Involuntary Movements.—Jastrow's *automatograph* consists of a pane of glass resting on three perfectly spherical balls, which rest on another pane, which is set firmly and carefully leveled before the experiment. The hand rests lightly on the upper pane, which moves without friction with the movements of the hand. A rod extending out from this pane bears a hard rubber pencil, which moves over a flat sheet of blackened paper. When the eyes are closed the hand makes slight involuntary movements, differing according to the nature of the thoughts, and these movements are recorded on the blackened paper. This is a scientific application of the popular planchette.

Speech.—The form of movement of various organs in speech is measured and recorded by apparatus which are applied to the proper organs in the same way as the myograph, and which work on the same principle. The *labiograph*, *laryngograph*, and *palatemeter* measure the movements of the lips, larynx, and palate respectively. (See tracings in Fig. 1.) By means of the polygraph (described above) these records may be obtained simultaneously.

Physiological Processes.—The rate and form of certain physiological processes furnish a measure of the condition and changes of consciousness. A record of these processes under normal conditions may be compared with other records, taken during hard thinking or strong emotion, or after intellectual effort, fatigue, etc. The rate and intensity of the heart-beat is measured by the *cardiograph*; the *sphygmograph* measures the rate and form of the pulse (see SPHYGMOGRAPH): the *pneumograph* measures the movements of the thorax in breathing. These are similar in principle to the myograph. In one form of pneumograph a flexible rubber bottle is bound to the chest: it is compressed by the expansion of the chest in breathing, and the pressure recorded by a tambour. The *plethysmograph* is used to measure changes in the volume of the arm, due to changes in the blood-supply. It consists of a vessel, G (Fig. 5), into which the arm is inserted; the opening about the arm is then closed, and the vessel filled with water. Any increase in volume of the arm forces the water out into a second jar and causes the weight N to fall, and *vice versa*; these changes are registered on a scale.

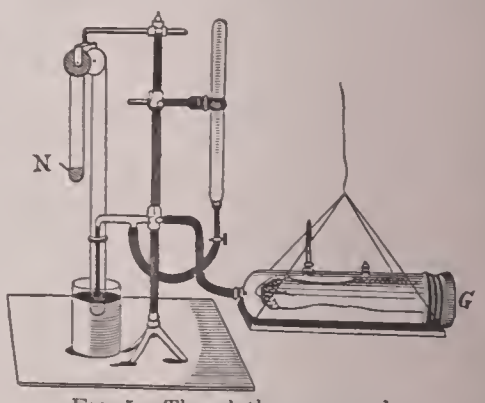

FIG. 5.—The plethysmograph.

6. *Apparatus for Measuring the Intellectual Functions.—Attention.*—If the attention be maintained at a maximum, this maximum will rise and fall at intervals. The rate of fluctuation is measured for vision by means of the *Masson disk*. This is a white surface, along one radius of which is a black line of uniform thickness but broken into segments; when the disk is rotated the inner segments of the line, being broader in proportion to the whole circumference than the outer segments, will give a darker gray. The breadth of the line is such that four or five rings are always distinguishable with close attention; the ring next beyond alter-

nately appears and disappears; the alternating intervals are measured by the chronograph. For hearing, the ticking of a watch at the farthest audible distance is used, or the faint sound of sand dropping continuously on a metallic surface.

Memory.—Ebbinghaus has measured the falling off in accuracy of memory trains and their latent force by means of nonsense syllables. Having memorized a series of these of given length after a certain number of repetitions, he observed the number of errors made in repeating the series after the lapse of one day, two days, etc. The number of repetitions required to relearn the series furnished a measure of the latent force of memory. Memory of intensity and intensity-difference has been measured in several of the senses for short intervals. The apparatus is the same as that used for the threshold for intensity-difference. Memory of visual size has been measured by means of a series of squares, circles, or lines of nearly the same dimensions. One of these, the standard, is shown and removed; after an interval another is shown. The falling off in accuracy is shown by the increase of the threshold value as the time is lengthened.

Perception of Motion.—A series of instantaneous pictures appearing in rapid succession will give the effect of continuous motion. The rate of change necessary to accomplish this is measured by the apparatus described above under least duration, or by a stroboscope whose speed is variable and measurable. (See STROBOSCOPE.) Other forms of apparatus having the same principle as the stroboscope are the zoetrope or zoötrope, vitascope, mutascope, and kinetoscope.

Illusions.—The well-known optical illusions of the size of angles, relation of horizontal to vertical lines, relation between filled and empty space, etc., may be measured by constructing variable figures, and altering their form until the illusion is allowed for and apparently corrected. Baldwin's two-square illusion apparatus is an example of this. It consists of a small and a large square, with a line connecting the mid-points of their sides; along this line moves a pointer, which the subject stops (by pressing a key) when the middle of the line appears to be reached; this judgment is affected by the size of the squares; the amount of error is indicated on a concealed scale, and constitutes a measure of the illusion. The illusion of weight as affected by size is measured by comparing a series of objects, of different weights and sizes but of uniform material, with a standard weight of different material. The subject determines which one of the series is apparently equal to the standard.

Imagination.—Scripture's apparatus for measuring the intensity of imagination consists of a telescope tube, through which the subject observes a screen of white paper. The latter is illuminated faintly in front and by a variable flame behind. The subject is asked to imagine threads like the cross-hairs of a telescope on the white surface, and to describe their changes as the illumination is increased. On the back of the paper, unknown to him, is a real line, which he finally sees and compares with his imagined lines. When they are equal in intensity the intensity of the real line furnishes a measure of the intensity of his imaginations.

7. *Apparatus for Anthropometrical Measurements.*—Measurements of height, weight, diameter of chest, etc., are performed in the usual way. The capacity of the lungs is measured by means of a *spirometer.* One form of spirometer consists of an inverted jar resting in water and counterbalanced by weights. When air is blown through a tube into this jar the latter is lifted, the amount of air sent in being indicated on a scale. The subject takes a full breath and breathes out through the tube. The dimensions of the head are measured by means of the *craniometer.* One form of this apparatus is the hatter's *conformateur*, which is set on the head and indicates the outline of the largest horizontal area of the head. The *pupillometer* is used to measure the diameter of the pupil of the eye. The *ophthalmometer* determines the curvature of the cornea. The dynamometer, color-blindness tester, perimeter, Galton's whistle, and reaction-time apparatus are also employed in anthropometrical tests.

LITERATURE.—Most of the apparatus are described in articles in psychological magazines on the investigations for which they are used. See also Sanford, *A Course in Experimental Psychology* (Boston, 1898); catalogue issued by the psychological laboratory of Harvard University (Cambridge, 1893); and catalogues of various instrument-makers —Verdin, Koenig, Rothe, Zimmermann, Petzold, Cambridge Scientific Instrument Company, Queen, Biddle, J. D. Brown, Meyrowitz, and Garden City Model Works.

HOWARD C. WARREN.

Reed, HUGH: soldier and author; b. in Richmond, Ind., Aug. 17, 1850; graduated at the U. S. Military Academy in 1873; promoted to second lieutenant, serving on garrison and frontier duty; was attached to the Signal Service, being Professor of Military Science and Tactics in the training-school at Fort Whipple 1878–79, at the Southern Illinois Normal University 1880–83, and on garrison and frontier duty 1883–84, having been appointed inspector-general on the staff of Gov. Porter, of Indiana, in 1881; on leave of absence since 1884, because of poor health; has invented a metallic shelving and a folding cash-box. He compiled *A Calendar of the Dakota Nation* (1877, afterward included in the fourth annual report of the bureau of ethnology of the Smithsonian Institution), and has published *Signal Tactics* (1880); *Cadet Regulations* (1881); *Upton's Infantry Tactics*, abridged and revised (1882); *Artillery Tactics*, abridged and revised (1882); *Military Science and Tactics* (1882); *Standard Infantry Tactics* (1883); and *Broom Tactics, or Calisthenics in a New Form* (1883).

Registration of Titles (to land): The recording, in a hall or office of public records, of deeds and other instruments conveying, granting, or creating titles to or liens or charges upon property is of comparatively recent date, and the registration of titles, as distinct from such recording of instruments merely, is even more recent, and as yet practiced only with regard to real property.

Owing to the essential peculiarities of real property and its tenure, and owing to the fact that it may be subject to varied interests and rights in different persons simultaneously, some or all of whom may not be in physical possession of the property, the recording of deeds of real estate, mortgages upon real estate, etc., becomes of peculiar importance, because in the absence of such registration the difficulty of determining the actual status of the title to the property and its condition as regards liens and incumbrances is very difficult as well as uncertain, and may require the expenditure of so large a sum as to interfere materially with commerce in real estate. In the absence of special legislation protecting purchasers or mortgagees, they must make such investigation into the title of property intended to be purchased at their own risk, and this investigation has to be repeated in each transaction involving title to the property in question. This investigation is still necessary, to some extent, under any system of registration of titles, but its difficulty and the risk of error are mostly done away with.

The registration of titles differs from the recording of deeds and other instruments, in that, while the law may provide for the recording, conveying, or granting titles to or interests in real estate without providing that such recording shall afford any special protection to the person recording them, the acts providing for the registration of titles secure to the party in whose name the title is registered a certificate or other instrument which in effect guarantees to him the title to the property.

In England there is still (1899) no general law requiring the registration of titles, and no law for the voluntary registration which is observed. The matter of statutory regulation of the recording of deeds and registration of titles practically dates from the reign of Henry VIII., when an act was passed providing for the recording of bargains and sales of freeholds. Similar acts for the recording of conveyances were discussed in Parliament under the Commonwealth, but none of them became a law. Later, in 1669, the matter was again actively mooted, and in a report of a committee of the House of Lords it was stated that the depreciation of land was partially caused by the uncertainty of titles, and a system of *registration of titles* was advocated as a remedy for this.

In England a bill for a general system of registration was introduced into Parliament in 1758, but this too failed to become a law, and the subject was practically dropped, until it arose again in 1830, and again in 1857, in which years royal commissions brought in reports favoring a system for the registration of titles, and as a result of the report of these commissions in 1857 there was passed in 1862 an act (25 and 26 Vict., chap. 53) for the facilitation of the proof of title to and the conveyance of real estate. This act provided for the establishment of an office for the land reg-

ister in London. It left the registration of title optional, and no title could be registered unless it were such as a court of equity would consider to be a good marketable title. The effect of registration was to make the title indefeasible, and a land certificate was delivered to the person registered as owning the title, and the deposit or indorsement of the certificate constituted an effectual sale or mortgage of the land. The expense and delay involved in making registration of title under the provisions of this act, however, were very great, the average expense of searching and registration being said to be about $1,000, and requiring never less than five or six months to consummate, and usually longer than that. Neither did the registration have the desired effect of cheapening or rendering more expedient subsequent conveyances or mortgages. This act proving a failure, in 1875 the Land Transfer Act of 38 and 39 Vict., chap. 87, was passed, providing for the registration of any person as the owner of land upon his satisfying the register that he had a *prima facie* fee in the property, and was in possession in this right. Such a registration of title did not bear upon or affect any adverse claim or interest, except that the lapse of time would perfect the registered title.

The act also provided for the registration of "qualified titles" in cases where the title could be made out only for a limited period or subject to exceptions, the registration in this case excepting from its effect the rights or interests respecting which the title was uncertain. This act failed, and in a report of the select committee of the House of Commons its failure was attributed to the absence of power to remove from the register a title which had been once placed upon it; the disinclination of solicitors to recommend to their clients compliance with the act, fearing a curtailment of their profits; a general distrust of land registration arising from the failure of the previous act; the disinclination of the public and the legal profession to familiarize themselves with the new system; and the prejudice against departing from established usage. In 1888 an act entitled the Land Charges and Registration Act (51 and 52 Vict., chap. 51) made further changes in the system of registration, intended to improve it and make its observance more popular, but to little effect. A bill for the compulsory registration of titles was introduced in 1895, but failed to become a law. In 1897 an act entitled the Land Transfer Act was passed. This act amended the law of 1875, and also provided that where real estate is vested in any person without a right in another person to take a right by survivorship it shall, on his death, notwithstanding any testamentary disposition, devolve to and become vested in his personal representative or representatives from time to time as if it were a chattel real vesting in them or him, and this provision was made to apply to any interest in any real estate over which the testator had a joint power of appointment.

It also provided for a probate and letters of administration of estates having real estate only, and vested the real estate in the personal representative as trustee, subject to the powers, rights, duties, and liabilities imposed in the act, for the benefit of all persons by law beneficially interested in the estate; and these persons have the same power of requiring a transfer of real estate as persons beneficially entitled to personal estate have of requiring a transfer of their interest in the personal estate.

It provided that in the administration of the assets of a person dying after the commencement of the act his real estate should be administered in the same manner, and subject to the same liabilities for debts, costs, and expenses, as if it were personal estate. If the personal representative fails, on request of the person entitled to the land, to convey the land to that person, the beneficiary may apply to the court, which, if it thinks fit, may, upon such application and after notice to the personal representatives, order that the conveyance be made, or, in the case of unregistered land, that the person entitled to be registered as proprietor, sole or joint, be registered as such. The act also repeals the act of 32 Henry VIII., chap. 9, which prohibits sales or other disposition of land where the grantor or his predecessor entitled had not been in possession for one whole year previous to the disposition so made.

Besides these general provisions, which vitally modify the previous real-estate law of England, it made special provisions for the regulation of the conduct of official searchers, the payment of indemnity to persons injured by the registration of title, etc. The act of 1897 went into effect on Jan. 1, 1898.

Except for these acts the evidence of possession of title in England remains subject to the common-law regulations, by which the delivery of the deed is effectual as a mortgage, and may even constitute a conveyance in equity. The titles to land are involved, and the transfer or conveyance of real estate causes so large an expense as to constitute a great obstacle to the sale of land in small parcels.

In the U. S. statutes providing for the registration of titles as such have been adopted in California, Illinois, and Ohio, where the acts of adoption provided for the establishment of systems essentially the same as the Torrens system; but in the States of Illinois and Ohio the act was adjudged as unconstitutional, as attempting to confer judicial power upon the registration office. Subsequently, however, in Illinois, an act was passed to remove the unconstitutionality of the statute. In Massachusetts an act for the registration of titles to land was passed, and went into effect Oct. 1, 1898, which provides for a court of registration, consisting of two judges, sitting at Boston, with the right to adjourn to such other place as may seem convenient. Under it only estates in fee simple may be registered, and this is done upon an application to the court and a formal notice to the occupants of the land adjoining the owners. The decree of the court confirms the title, orders its registration, and can not be opened except within one year if the registration is obtained by fraud, and not even for that reason against an innocent purchaser for value. The decree is registered in the county in which the land is situated, and a certificate of registration is issued to the owner, evidencing his ownership. After registration no voluntary conveyance or instrument of transfer, except a will and a lease for not over seven years, binds the land; but it constitutes merely a contract between the parties, which entitles the transferee to re-registration, upon which the new certificate is issued in place of the old one which is surrendered. In the other States of the U. S. a system of recording of deeds as distinguished from registration of titles prevails.

The system of registration of title has been adopted in Germany, part of Switzerland, Austria-Hungary, Australasia, and the larger part of Canada. In New South Wales and Victoria the Torrens system (see Torrens System) of land registration has been used since 1862; in South Australia since 1858; in Queensland since 1861; in Tasmania since 1863; in New Zealand and British Columbia since 1870; in Western Australia since 1874; in India since 1884; and in Manitoba since 1883. The German method of registration of title is very peculiar. The state undertakes to keep an account, similar to a ledger account, for each piece of property individually owned, correctly and in such form that any ordinarily intelligent person can, without an examination of any deed or other instrument, ascertain the owner of the property and the debts and other incumbrances which are a charge upon it. In Prussia transfers are made by word of mouth, without any deed or conveyance, and both parties may appear before a registrar and declare their contract, and the purchaser is then registered as the owner. See Recording of Conveyances.

For full account of the system of registration of title in Central Europe see 2 *Jour. Com. Leg.* 112 (June, 1897); see also the *Report of the American Bar Association for 1890*. Duffy; Eagleson, *Transfer of Land Act, 1890*; Yeakle on the *Torrens System*; Morris's *Registration of Titles, 1886*; Say and Chilley, *Nouveau Dictionnaire d'Économie politique* (title *Cadastre*); Burnett Morris, *A Summary of the Law of Land and Mortgage Registration*. F. Sturges Allen.

Reid, Alexander Peter, M. D.: b. in London, Ontario, Oct. 22, 1836; graduated in medicine at McGill University in 1858. He also took the degree of M. D. at the University of New York in 1865. He was instrumental in establishing the Halifax Medical College, of which he was president for several years. In 1878 he was appointed superintendent of the Nova Scotia Hospital for the Insane, where he remained until he was transferred to the superintendency of the Victoria General Hospital, Halifax, in 1892. Among his published writings are *Strychnia*; *Ascent of Man, or Stirpiculture*; *Poverty Superseded, or New Political Economy*.

Religious Societies: This term is rather loosely applied to various associations of individuals who have voluntarily united for the purpose of worshiping together, observing other religious rites and ceremonies, and administering to their common welfare. Such societies may be, and in the U. S. often are, incorporated as religious bodies, and are then called religious corporations. The term *religious so-*

ciety is distinct in meaning from *ecclesiastical corporation* as used in the English law, the latter being a religious body composed entirely of spiritual persons, such as bishops, certain deans, prebendaries, archdeacons, parsons, and vicars, who constitute sole corporations, and certain other deans and chapters, and formerly monks, abbots, etc., who constitute corporations aggregate.

The term religious corporation as here used implies some special privilege or power had by reason of its religious character; but where there are general corporation laws, as there now are in most of the States of the U. S., there is nothing in the nature of them which prohibits a body of men from organizing as a corporation under them unless such organization be expressly prohibited. All religious corporations in the U. S., however, are merely civil corporations, having the same rights and privileges as any other civil corporation, except where special privileges are given as mentioned above, the most important privileges so given being partial or entire exemption from taxation and the power of taking property in perpetuity for religious uses. As in the case of other corporations, the rights of property and of contract of such corporations are subject to the general law equally with other civil corporations, and the acts of its members are equally subject to the control of the courts.

The term religious society as here and generally used is not synonymous with the term *church*. Although the two bodies may coexist and the membership in each may be identical, they are distinct from and independent of each other; and a religious society may exist without a church and a church without a religious society. A religious society, however, usually does include or have associated with it a church consisting of members professing a common religious belief and worshiping together, and a congregation consisting of the church and such other persons as usually and statedly worship with the church, and a board of trustees acting for the church, the congregation, or the religious society as beneficiaries.

In such a case the church is governed by its own rules and regulations, and has the power to control and direct its members, and enforce strict observance and adherence to the church regulations, doctrines, and standards and subordination to the ecclesiastical courts, subject, however, to appeal to the civil courts in any matters involving property rights. For the purposes of such appeal property rights are construed to include the right to exercise the functions of an office, the right to membership in the church, and in general the right to have the rules and regulations of the church fairly and correctly enforced. The discipline of a church does not affect the membership of the disciplined person in the corporation, which has not the power to try its members or to deprive them of their membership for moral delinquency, and excommunication from the church does not affect membership in the religious corporation. The religious corporation, on the other hand, usually owns the property which is used by the church, and attends to and assumes the financial management and responsibility incidental to the conduct of the church and congregation. The minister, or person who administers the religious rites of the church, or the rector, priest, or pastor, as he may be designated, although having for his duties the conduct and care (*cure*) of the church, is usually hired by the corporation or society, and the church or congregation, in calling a minister, does not bind the corporation or society; and he should not be so called until the society has regularly and legally agreed to employ him. When he has been employed by the society and accepted such employment, the failure of the trustees of the church to apply the revenues of the church to the payment of his salary does not affect his right to recover it from the corporation by an action at law.

Organization and Membership.—Most of the States of the U. S. have passed laws for the incorporation of religious societies, but they are so varied and specific in their provisions that no general statement of their details can be made. Where no certificate is required, a religious corporation *de facto* may be created by the use and assumption of corporate powers by any body of competent persons. Where a certificate of incorporation is required by the statute, it must be accepted by the society or body of persons acting as such at a regular meeting, and the assent of the members as individuals is not a sufficient acceptance. If any specified forms are prescribed by the statute, they must be strictly observed in order to effect a valid incorporation. In the absence of statutes prescribing qualifications for membership the incorporating body may impose such qualifications as they see fit, provided the requirements be not inconsistent with the general law of the land; but in those States in which special provision is made for the incorporation of religious societies it is usually required that the persons intending to become members shall be adults professing a common religious belief. It is usual for the society also to require, as a condition of membership, public confession of the faith of the church associated with the society and submission to its decisions; but a society may be so formed that merely stated attendance at the religious service of the society or the renting of a pew may suffice to entitle a person to membership in the society.

Property and Pecuniary Liabilities.—In some States of the U. S. the incorporation of a religious society is required as a condition of its receiving the title to property, while in others this is not required; in others the formation of religious corporations is prohibited, as in the States of Virginia and West Virginia, where the law provides for passing the title to property to unincorporated religious societies. The vesting of the title to the property in a religious corporation which has been created by a special charter or under the provisions of a general incorporation act, or the vesting of it in a body of unincorporated trustees for the benefit of an unincorporated society, creates a trust that the property so held shall be devoted to the religious purposes contemplated; and the courts will interfere by injunction to restrain the diversion of such property to other than the religious uses for which it was acquired, except so far as the doctrine of *cy pres* may be applied. (See Cy Pres.) Property conveyed to the society for use in the support of any specified form of worship or other religious purpose can not be diverted from the specified use, even by a majority vote of the corporation; and, in the event of any change or modification of the tenets of the church or in its method of worship making it impossible to carry out the terms of the trust, a court of equity will appoint a trustee or trustees to effect their fulfillment. Trusts devoting property to the support of a specified form of religious doctrine are enforced mainly in those States which recognize and sustain charitable uses; but in some States, as Minnesota and Michigan, they are held to be invalid.

In case of a division in a religious society made under adequate authority a division of the common property ordinarily accompanies it; but members seceding from the organization forfeit their property rights in it, and the title to the entire property remains in the hands of those members acting in accordance with the purposes and objects for which the society was formed.

The power of a religious society to take and hold property under a will depends upon the statutes by which the subject is regulated more or less completely in the various States.

See Cummings and Gilbert on *Religious Corporations*; Roberts on *Religious Corporations*; Kynett on *Religious Corporations*.

F. Sturges Allen.

Rensselaer Polytechnic Institute: a school of science and engineering situated in Troy, N. Y. It was founded by Stephen Van Rensselaer in 1824 as Rensselaer School. This name was changed in 1832 by legislative act to Rensselaer Institute. In 1850 the present name was assumed. The institution is the first school of civil engineering established in any English-speaking country. Lectures on land surveying and civil engineering were given as early as 1828, and the degree of C. E. was first conferred in 1835. The curricula were completely reorganized in 1849–50, and soon afterward the courses were extended to four years. While the courses offered lead to the degrees of C. E. and B. S., the school is more widely known as a school for civil engineering. The course in natural science is identical with that in civil engineering for the first two years, but the last two years are, to a large extent, taken up with the study of chemistry, assaying, geology, mineralogy, and metallurgy. The course in engineering is a very general one, and includes the study of the design and construction of bridges and other structures, water-works, sewers, steam-engines, electric motors, dynamos, etc., the location and construction of roads and railroads, and the assay of ores. There are in all six buildings. The main building is 155 × 50 feet, and the others grouped about it, except the Alumni building, are of proportionate size. The Alumni building, a beautiful three-story structure, is in the business center of the city, and contains the administrative offices of the institu-

tion. The library consists of 6,500 volumes and many pamphlets. Fifteen professors instruct a student body of about 140 (1900). The school has 1,303 graduates, of whom 873 are living. In Troy and its near neighborhood there are engineering works of all kinds, and manufacturing plants of great diversity, which afford to sudents opportunities for practical observation and investigation. John Hudson Peck, LL. D., has been president since 1888.

Requests, Courts of: in English law, courts of special jurisdiction, analogous in their functions to modern courts of equity or chancery courts, constituted for the decision of civil actions, and especially the recovery of small debts. Various courts differently constituted, and with different powers, have been called by this name, the origin of some of which are obscure, The most important of these is what is commonly called the *king's court of requests*.

Courts of Requests other than the King's Court.—Besides the king's court of requests there were established various other courts so called, the most noted of which were the court of requests in the city of London, commonly called the "court of conscience, New Guild Hall," which was established Feb. 1, 1518 (Henry VIII.). This court, which probably owed its origin to Cardinal Wolsey, had jurisdiction extending only over the recovery of small debts, not exceeding forty shillings, in disputes between citizens and tradesmen of London; and its judges were "two aldermen and four ancient discreet commoners." It appears to have been established originally as an experiment to last for two years only, but maintained its successful existence until abolished altogether, with all other similar courts, by the Small Debts Act of 9 and 10 Victoria, ch. 95, and the order of council of May 9, 1847, by virtue of which the jurisdiction of these courts was transferred to the county courts. The London court of requests was first given legal validity by the act of Parliament, 1 James I., ch. 14, in the year 1604. No other similar court was established by statute before the reign of William and Mary, when by the act 1 William and Mary, Session I, ch. 18, courts of conscience were established for Gloucester and Bristol. These courts, although essentially the same as the king's court of requests, were not recognized by that title in this statute. Another similar court was established by the act 22 George II., ch. 47, creating a small-debt court for Southwark under the style of "The court of requests for the town and borough of Southwark"; and in the following year a court of requests for the city and liberty of Westminster was authorized, and subsequently a number of smaller courts were established in various parts of the country. The East India Company at a later date established similar courts of requests in each of the three presidencies governed by that company.

The King's Court of Requests.—The origin of the king's court of requests has not been definitely settled, but it undoubtedly was established as a definite tribunal during the reign of Henry VII., as the books of the court show it to have been active from the eighth year of his reign, and the judges of the court were nominated from that time forward. The judges even then, however, were not more than a standing committee of the chance attendants at the bar of the king's council; but this committee, at first forming but a numerically unimportant portion of the judges of the court of requests, eventually absorbed the whole of its active jurisdiction. This court, as established during the reign of Henry VII., was a court for civil causes corresponding to the star chamber, which had cognizance of criminal matters; and the members of the court were furnished from the star chamber. The Lord Privy Seal, who was an official of the star chamber, was president of the court of requests, which was at first called the court of poor men's causes. The court was evidently established at an interval between the sittings of Parliament and was never placed upon a statutory basis; but it gradually developed from a tribunal constituted by a more or less shifting committee to an itinerant council which attended the royal progresses into a court with a fixed place of sitting and permanent professional judges. It has been claimed by some historians that it was established to enhance the royal prerogative, but the history of the court seems to preclude this origin; and it appears that it was borrowed from a similar institution in France where the king was looked upon as a dispenser of patriarchal justice to his subjects. The judges of the courts were called masters of requests. Originally the court sat without regard to the law terms of the common-law courts, but about the year 1497 this custom began to undergo a change, and in the years 1522–23 the vacations of the law courts were observed by the king's court of requests, and about the year 1516–17 the court appears to have been assigned a permanent seat of judgment at the Whitehall in Westminster.

By reason of the summary and informal method of procedure of the king's court of requests it was opposed by the common-law judges and the practitioners in the common-law courts, and its constitutionality was constantly and bitterly contested. The judges of the common-law courts acknowledged the *de facto* existence of the court of requests, but the exercise of its authority by the masters of requests was frowned upon by the common-law courts, and in the time of Elizabeth the defendants began boldly to defy the court, relying upon the support of the common-law judges, who opposed and prevented the execution of its judgments by injunction and writs of *habeas corpus*. The court of requests, however, was sustained by the favor of the royal court and by those who favored the exaltation of the royal prerogative, but the assaults upon it were re-enforced by the authority of Coke, who in 1606 was made lord chief justice of common pleas, and assumed an attitude antagonistic to the royal prerogative and assertive of the independence of the bench. The reason for the energy and persistence of this attack by the common-law judges has been assigned to the alleged use of torture by the court of requests, but the real reason was probably that the court of requests interfered with the profits of the common-law judges and the common-law practitioners, by removing from the common-law courts a large number of cases from which fees would otherwise have been received both by the judges and the pleaders at the bar.

Some authorities believe the court of requests to have been virtually abolished by the statute 16 Charles I., ch. 10, passed in 1640, entitled "An act for the regulating the privy council, and for taking away the court commonly called the star chamber"; but, as the court of requests is not mentioned directly or indirectly in this act, it is more probable that it was not then abolished, but merely ceased to exercise its prerogatives at the time of the establishment of the protectorate under Cromwell. Petitions are in existence, dating at the time of the restoration, for appointments as masters of requests, or for confirmation of appointments alleged to have been made; but after the establishment of the Commonwealth the court did not again exercise any active jurisdiction.

For a full discussion of the origin, jurisdiction, and abolishment of these courts see vol. xii. of the publications of the Selden Society, and the authorities there referred to.

F. Sturges Allen.

Resistance of a Ship: the resistance which must be overcome in order to propel a ship through the water. This is but a special case of the more general problem of the resistance to the motion of a solid in a liquid, to which we may first refer.

It is shown in hydrostatics, for a body wholly or partially immersed in a liquid, and at rest relative to it, that the horizontal resultant of all forces between the liquid and the body is zero, and that the vertical resultant equals the weight of the body. If, however, there is relative motion between the liquid and the body, these conditions no longer hold, and we find in general a force acting between the liquid and the body in such direction as to oppose the movement, and tending thus to reduce the relative motion to zero. The force thus developed has in general a vertical as well as a horizontal component, and while the former is usually omitted, it may in special cases reach an amount requiring recognition.

The development of resistance thus appears as the result of a change in the nature and amount of the distributed system of surface forces acting between the body and the liquid. When the two are relatively at rest these forces are all normal to the surface. When motion is instituted they are no longer normal, but oblique. They may, however, be resolved into two systems, one composed of normal forces and the other of tangential forces. The former will differ from the normal system when at rest, and the latter is an entirely new development. The total resistance opposed to the motion will be the total longitudinal component of these two systems of forces. We thus reach an analysis of resistance based upon an examination of the modified systems of surface forces, and from this standpoint we should naturally distinguish two subdivisions or kinds of resist-

ance—(*a*) that due to the normal component system, and (*b*) that due to the tangential component system. These may be termed the normal and the tangential resistances.

Turning now from the body to the water, we find, consequent upon the relative motion, a certain number of resulting forms of disturbance. These may be classified under four heads: (1) The particles constituting a certain portion of the water, in their motion relative to the body, follow smoothly curved flowing or stream-line paths. (2) The particles constituting a certain other portion of the water, especially when the contour of the body is blunt at the stern, are thrown into large eddies and whirls, forming a series of more or less imperfect vortices left behind as the body proceeds on its way. (3) The particles constituting that part of the water which flows very near the surface of the body are acted on by the more or less pronounced roughness or irregularity of its surface, and by molecular forces as well. They are thus thrown into a series of minute vortices and whirls, constituting a kind of skin of eddying water surrounding the body as it moves through the liquid. (4) There will be formed a series of waves or surface disturbances more or less pronounced, according to the circumstances of the case. Subdivisions (1) and (4) are not independent. though they are frequently referred to as though they were. The more common but not altogether satisfactory method of analyzing resistance proceeds on the assumption that these various manifestations or disturbances correspond each to a particular kind of resistance. We have thus stream-line resistance, eddy resistance, skin or frictional resistance, and wave resistance. The skin resistance corresponds to the resistance due to the tangential system of forces, while the other three correspond to the resistance due to the normal system of forces, as referred to above.

The typical case for the exhibition of eddy or head resistance is with a small plane moving at right angles to itself, and immersed so far below the surface that there shall be no sensible wave disturbance. In such case experiment shows that the resistance may be expressed in the form

$$R_1 = f_1 \frac{\sigma}{2g} A v^2,$$

where R_1 = resistance, f_1 = an empirical coefficient, σ = density, A = area, v = velocity, g = aeceleration due to gravity. With the foot, second, and pound as units, the value of f_1 is found from 1·1 to 1·7, the latest experiments pointing to the lower values as the more correct. Where the direction of the plane is oblique, or at any angle θ to the direction of motion, experimental results differ and various formulas have been proposed for the longitudinal resistance. Joessel's formula, which is perhaps the most correct, is as follows:

$$R = f_1 \frac{\sin^2 \theta}{\cdot 39 + \cdot 61 \sin \theta} \frac{\sigma}{2g} A v^2,$$

in which f_1 would have the same value as above.

The typical case for the exhibition of skin or tangential resistance is with an immersed plane moving in the direction of its length. An extensive experimental investigation by William Froude between 1870 and 1874 shows that this resistance may be expressed by an equation in the form

$$R = f_2 A v^n,$$

in which, with the same units as above, f_2 varies according to the nature of the surface and the length of the plane, being naturally greater as the surface is rougher, and less as the plane is longer. For a varnished surface the values vary from about ·0040 for 2 feet length to ·0030 for 50 feet length. For medium sand the values for the same lengths vary from about ·009 to ·005. The exponent n also varies from about 1·83 to 2, being usually taken at the lower figure for smooth surfaces.

Wave-making resistance is due to the fact that the energy involved in a train of waves is not propagated on as fast as the geometrical contour, and the maintenance of a system of waves of fixed configuration requires, therefore, a constant supply of energy which must be provided by the ship. The wave-formation thus drains energy constantly from the ship, and the operation results in the development of a resistance to the movement.

The wave-making resistance of a ship-formed body is usually considered of the form

$$R = A l u^4$$
$$\text{or } R = B l u^4 + C u^6,$$

where A, B, and C are constants, l is linear function of the ship, and u is the speed.

For a ship-formed body the eddy resistance is usually negligible, so that the skin and wave-making resistances are alone of importance. The term *residual resistance* is often used to imply all of the resistance left after subtracting the skin resistance. As we have just seen, this will be chiefly wave-making resistance.

The satisfactory determination of the values of the coefficients in the above equations for wave-making resistance has not yet been effected, and in consequence the determination of residual resistance by formula is attended with some uncertainty. The most satisfactory way in which the problem can be approached for purposes of ship design is by means of the experimental canal and the law of comparison. By the aid of this law the experimental data for models are made available for ships of the same geometrical character but of varying sizes, there being a particular ratio between the speeds of the model and ship at which this relation holds. Such speeds are known as "corresponding," and are intended to be those for which the two forms would be surrounded by wave systems of like configuration. They are defined as speeds in the direct ratio of the square roots of similar linear dimensions of the two forms. The statement of the law is, then, that for similar ships at corresponding speeds the residual resistances are in the direct ratio of the volumes, or in the ratio of the cubes of their similar linear dimensions. The use of this law depends wholly on the separation of the total resistance into two parts, the skin and the residual. The former is computed for both model and ship by formula as above. The skin resistance for the model being subtracted from the total amount as determined by experiment, the remainder is the residual resistance for the model at the model speed. This multiplied by the ratio of the volumes gives the residual resistance of the ship at the desired speed. This added to the computed skin resistance gives the total resistance desired.

Still more directly the law of comparison is frequently considered to relate to the whole resistance instead of to the residual only, and hence the step from the resistance of the model to that of the ship requires simply the application of this law.

The law of comparison is sometimes considered as an exact relation between the residual resistances of similar forms at corresponding speeds. This, however, is not the case. It applies to all resistance due to stream-line deformation, including that due to the formation of waves, but is only exact on the supposition of a liquid without viscosity, and of the absence of all discontinuity of flow such as would be caused by breaking waves or eddies. As these conditions are the further from being fulfilled, the less exactly will the law of comparison apply. The confidence felt in the results of its use is therefore dependent on experience rather than abstract theory. This appeal to experience shows that the law, while not quite exact, furnishes a remarkably close and satisfactory approximation, and in the present condition of the science undoubtedly furnishes the most reliable method of treating the residual resistances of bodies moving in a liquid.

This field of hydromechanics has naturally received much attention from the theoretical as well as from the experimental side, and many important investigations have been made. From the nature of the case, however, these are necessarily limited to specially simple or regular forms of bodies, such as the sphere or cylinder, to an ideal constitution of the liquid, and to the supposition that the motion takes place at an indefinite distance from the surface, so that all superficial disturbance is eliminated. These restrictions so far remove the problem from the actual case that while such investigations have their interest, and furnish valuable indications regarding the nature of the relation between the surrounding conditions and the resulting resistance, yet for quantitative measurement entire dependence must be placed on experimental investigation, and its results as expressed by empirical formulas. Further progress in this field seems to be dependent on a wider provision of experimental data, coupled with its systematic and exhaustive analysis in the light of the highest results of theoretical investigation.

For more detailed information on this subject, reference may be made to the following papers and works: William Froude, Reports to British Association for the Advancement of Science, 1872, 1874; R. E. Froude, *Transactions of*

the Institute of Naval Architects (vol. xxii., p. 220); Pollard and Dudebout, *Théorie du Navire* (Paris, 1893); Taylor, *Resistance of Ships and Screw Propulsion* (New York, 1893); Durand, *The Resistance and Propulsion of Ships* (New York, 1898). W. F. DURAND.

Restraint of Trade, Contracts in: This term is technically used to designate those contracts which impose such hindrance or obstruction to the free and uninterrupted pursuit of trade and business as to conflict with public policy, and for that reason to be illegal and void, although the term has a wider general meaning, making it applicable to any contract which hinders or interferes with freedom of trade, whether to such a degree as to render it illegal or not. What shall constitute such restraint of trade as to render a contract illegal or void is so far dependent upon the conditions and circumstances connected with each contract as to render any more than a general statement of the matter impossible.

A contract in restraint of trade may exercise such restraint either in restricting the territory within which the business or occupation may be carried on by one or more parties to the contract, or it may entirely restrain one or more parties from pursuing a given occupation or occupations.

A certain degree of hindrance or impairment of freedom of trade may be imposed in a contract without rendering the contract invalid as against public policy, so that, generally speaking, such restraint may be imposed as is necessary to afford a fair protection to the interests of the one in whose favor the restraint is imposed. Whatever restraint is imposed beyond the needs of such protection becomes void, so that restraining covenants must be limited in regard to the territory to which they apply. Certain contracts, such as those for the sale of secret processes of manufacture which it is agreed shall be communicated for the exclusive use of the buyer, or the sale of a patent right for the life of the patent, may impose an unlimited restraint of time and place; and, generally speaking, where the restraint imposed is reasonably limited as to space, it may be imposed without limit as to the duration of time. Where, however, no space-limit is imposed, but the prohibition or restraint becomes general, the duration or length of time for which the restraint is to continue may be void. Contracts illegal because in restraint of trade most frequently are those involving the sale of a good-will of the firm or business concern to those intending to operate the same trade, or business, or calling within the same territory as that in which the vendor previously operated it.

Except in the instances above mentioned—the sale of secret processes, patent rights, etc.—it may be comprehensively stated that a general covenant in restraint of trade without qualifications is void because unreasonable and contrary to public policy; but if some qualification be placed upon the restraint, either at the time or place, so that the restraint is partial only, the question of reasonableness is raised, which can be legally settled only by a jury or court.

Another form of contract involving illegal restraint of trade which is very common and of great commercial importance at present are those contracts intended to establish a monopoly or form a combination of the capital or goods of two or more persons or corporations in such way as to restrict trade or to prevent competition in the sale of commodities.

The determination of the question whether a contract is in restraint of trade or not is chiefly governed by the specific circumstances under which the restraint originates and is exercised, and anything more than a very general statement of the principles of law governing the subject is impossible. A rule or statement which has met with favor is that "contracts in restraint of trade are in themselves, if nothing more appear to show them reasonable, bad in the eye of the law; but if from the peculiar circumstances of each case they appear to be reasonable, and they are founded upon a good consideration, the contracts are valid."

Thus for certain purposes, such as the prohibition of the practice of medicine, a restraint extending over a district within 12 miles of a place by a doctor selling the good-will of his practice within that place is considered valid, and in another case a contract not to engage in a certain business within 60 miles of a place within ten years was considered valid.

The tendency of the recent decisions to relax the rigor of the general doctrine that all contracts in restraint of trade are void is especially noticeable in the treatment of combinations effected for the sole purpose of creating monopolies or enhancing the price of commodities of which the public must have a constant supply. Such combinations are called TRUSTS (*q. v.*).

As to what is held to be legally an unlimited restraint of trade in respect of space there is some dispute, it being still a mooted question in England as to whether there exists an inflexible rule that contracts the restraint of which extends throughout England are null and void. In the U. S. it was early held that a covenant not to pursue an occupation within a State was in total restraint of trade and void, but subsequently it was held by the U. S. Supreme Court that a restraint coextensive with the limits of the State was not necessarily void.

See Parsons, *The Law of Contracts*; Patterson, *The Law of Contracts in Restraint of Trade*; Edison *On Contracts*; Matthews, *Covenants in Restraint of Trade*.

F. STURGES ALLEN.

Rhodesia: that part of Africa bounded N. by the Congo Free State and German East Africa, E. by the Central Africa Protectorate and Portuguese East Africa, S. by the South African Republic and the 22d parallel, and W. by German and Portuguese West Africa. It embraces the whole sphere of operations of the British South Africa Company, and is divided by the Zambesi into Northern and Southern Rhodesia. Northern Rhodesia includes the whole of British Central Africa except the Central Africa Protectorate. (See NYASSALAND.) It has about 600,000 inhabitants, and in 1899 is very little developed, though the northern part is said to be healthful and suitable for cattle-raising, while wheat and European vegetables are also grown. Here is the Stevenson road, between Lakes Nyassa and Tanganyika, built for wagon traffic and placed in excellent order in 1898. Southern Rhodesia is far more developed. Its area is 174,728 sq. miles. Matabeleland occupies about a third and Mashonaland nearly two-thirds of it, and the population, estimated at 460,000, is nearly equally divided between them. Railroads connect Cape Town with Buluwayo, the chief town of Matabeleland, and Beira, on the Indian Ocean, with Salisbury, the chief town of Mashonaland and the capital of Rhodesia. The area of the gold-fields of Southern Rhodesia is estimated at nearly 6,000 sq. miles, and now that mining machinery may be carried into the country by rail rapid development is expected. Other mineral resources are large, and much of the country is well adapted for farming. Salisbury, Buluwayo, and Umtali have nearly all the conveniences and improvements of flourishing cities, including banks and hospitals. They are now within twenty-four days' travel of London, and are connected with Europe by telegraph. C. C. A.

Rice, ALLEN THORNDIKE: editor; b. in Boston, Mass., June 18, 1853; graduated at Oxford, England, in 1875, afterward entering Columbia's law school, New York city; purchased the *North American Review* in 1876, and became its editor; organized and directed the Charnay expedition, which, under the auspices of the U. S. and France, made archæological investigations in Central America and Mexico; purchased a controlling interest in *Le Matin*, Paris, in 1884; was nominated for Congress by the Republicans in 1886, but was defeated; was first to recommend the Australian system of voting for adoption in the U. S., which system, owing to his advocacy of ballot reform, was incorporated in the platforms of the Republican and United Labor parties in 1887. He edited *Reminiscences of Abraham Lincoln* (1886), and contributed to *Ancient Cities of the New World* (1887). D. in New York city, May 16, 1889.

Rice, EDWIN WILBUR, D. D.: clergyman and author; b. in Kingsborough, N. Y., July 24, 1831; graduated at Union College in 1854, afterward studying law and theology; became a missionary of the American Sunday-school Union in 1859, and was ordained a Congregational minister in 1860; became superintendent of the Sunday-school Union's missions in Milwaukee in 1864, and assistant secretary of missions and assistant editor of its periodicals in Philadelphia in 1871, and has been editor of its publications since 1879; received the degree of D. D. from Union College in 1884; inaugurated and edited the lesson-papers that have been issued by the Sunday-school Union since 1872, and has prepared the series of *Scholar's Handbooks on the International Lessons*. He has edited the *Sunday-school World*, the *Youth's World*, the *Union Companion*, and other publications; contributed to Schaff's *Bible Dictionary*, edited

Kennedy's *Four Gospels* and Hood's *Great Revival of the Eighteenth Century*, and has independently published *Pictorial Commentary on Mark* (1881); *Historical Sketch of Sunday-schools* (1886); *The People's Commentary on Matthew* (1887); *The People's Lesson-book on Matthew* (1888); and *Stories of Great Painters* (1888).

Richard, Édouard, Lit. D.: lawyer and historian; b. in Princeville, province of Quebec, Mar. 14, 1844; was educated at the College of Nicolet and at McGill University; was called to the bar in 1868, and practiced his profession at Arthabaskaville for seven years; in 1872 was elected to the House of Commons for Megantic as a Liberalist, and retained his seat until 1878; was sheriff of the Northwest Territory 1878–83, in which last year he resigned his office and took up his residence at Winnipeg. He has made an exhaustive study of the history of the Acadians and published *Acadia* (2 vols., 1895), a history of the settlement of the Acadians. In 1897 he was sent to Paris by the Government to continue his historical researches.

F. Sturges Allen.

Richards, Henry Charles, F. S. A.: lawyer and politician; b. in Hackney, a suburb of London, England, Apr. 10, 1851; was educated at the City of London School and College, when he took up the study of law in connection with a clerkship in a law office; received the Bacon scholarship at Gray's Inn in 1879, was called to the bar in 1881, and has since been created queen's counsel. He entered actively into political affairs, and early in the practice of his profession became prominent as counsel for the local government, being retained as junior counsel to the post-office on his circuit, counsel to the Postmaster-General at the central criminal court in 1887, chairman of the city branch of the Church Defense Institution in 1877, and is now (1899) chairman of the City Church and Churchyard Society, which society he formed in 1880; was elected as Conservative candidate for Northampton in 1883 against Mr. Bradlaugh, and has been elected a Conservative member of Parliament for East Finsbury since 1895. He was retained in the Tower Bridge case, and in many cases for and against the London school board, and is an authority on the powers and duties of officers of charity, charitable and church organizations, and the law of compensation for damages arising out of municipal torts; and he has published several works on these subjects, including *Parish Councilor and Church-Wardens' Manual* and *The Law of Compensation*.

F. Sturges Allen.

Richards, Theodore William, A. M., Ph. D.: chemist; b. in Germantown, Pa., Jan. 31, 1868. He is the son of William T. Richards, the marine artist, and Anna Matlack Richards, the authoress of a volume of sonnets entitled *Letter and Spirit*. He graduated at Haverford College in 1885. He then entered Harvard University, where he took the degree of A. B. in 1886, and received those of A. M. and Ph. D. in 1888. Meanwhile he had been made an assistant in the department of chemistry in Harvard, and in 1894 was made assistant professor of that branch there. Prof. Richards has devoted himself chiefly to a study of the atomic weights of the elements, and is the author of nearly fifty papers in his specialty, most of which have been contributed to the *Proceedings* of the American Academy and to the *American Chemical Journal*.

Marcus Benjamin.

Richardson, Ernest Cushing, A. M., Ph. D.: librarian; b. in Woburn, Mass., Feb. 9, 1860; graduated at Amherst, and at Hartford Theological Seminary in 1883; was assistant librarian at Amherst in 1879; assistant librarian, librarian, and associate professor at Hartford Theological Seminary 1882–90, and became librarian of Princeton in 1890; received the degree of A. M. from Amherst in 1883 and from Princeton in 1896, and Ph. D. from Washington and Lee University in 1887; is a member of the American Library Association. His publications include *Bibliographical Synopsis of the Ante-Nicene Fathers* (1887); *Eusebius's Life of Constantine*, in the *Nicene and Post-Nicene Fathers* (1890); *Jerome and Gennadius: Lives of Illustrious Men*, in the same (1892); and *Hieronymus und Gennadius, De viris illustribus* (1896). Since 1896 he has furnished the annual review of the literature of American history to the Leipzig *Jahresberichte*.

Richardson, Hugh: jurist; b. in London, England, July 21, 1826; admitted to the bar in 1847. He began to practice his profession in Woodstock, Ontario, and in 1872 became chief clerk of the Department of Justice of Canada. In 1876 he was sent to the Northwest Territories, where he became judge of the Supreme Court of the Territories in 1887. He served as administrator of the Government during 1897 and 1898.

Richey, Matthew Henry: statesman; b. in Windsor, Nova Scotia, June 10, 1828; admitted to the bar in 1850. He practiced in Halifax, and became one of the examiners of candidates for admission to the bar. He was made queen's counsel in 1873, and later was elected vice-president of the Dominion Law Society. He was mayor of Halifax 1864–67 and 1875–78. He held a seat in the House of Commons in 1878 and 1882, and in 1883 was appointed lieutenant-governor of Nova Scotia, serving the full term of five years. He was president of the Nova Scotia Historical Society, and in 1884 received the honorary degree of D. C. L. from Mt. Allison University.

Richmond, Borough of: one of the boroughs of the city of New York as constituted under the charter of Jan. 1, 1898. It comprises the whole of Staten Island, and is coterminous with Richmond County. Pop. (1900) 67,021. For the new government, see New York, City of, in the Appendix.

Rideing, William Henry: author; b. in Liverpool, England, Feb. 17, 1853; early removed to Chicago, Ill., where he began writing for the press, devoting himself entirely to literature after 1874; traveled abroad extensively; was special correspondent of the Wheeler surveying expedition in 1878; edited the London, England, *Dramatic Notes* 1881–83, and on returning to the U. S. settled in Boston, and was attached to the staff of the *Youth's Companion*; was made managing editor of the *North American Review* in 1888, and resigned in 1897, and became associate editor in 1898. He is the author of *Pacific Railways Illustrated* (1878); *A-Saddle in the Wild West* (1879); *Stray Moments with Thackeray* (1880); *Boys in the Mountains* (1882); *Boys Coastwise* (1884); *Thackeray's London* (1885); *Young Folks' History of London* (1885); *A Little Upstart* (1885); and *The Boyhood of Living Authors* (1887).

Riggs, Kate Douglas (*Wiggin*): author; b. in Philadelphia, Pa., Sept. 23, 1857; received education at the public schools of Hollis, Me., and at the Abbott Academy, Andover; removed to Los Angeles in 1876 and there studied kindergarten methods, which she taught in Santa Barbara College; founded in San Francisco the first free kindergarten W. of the Rocky Mountains, afterward, with others, organizing the California Kindergarten Training-school; married Samuel Bradley Wiggin in 1880, removing with him to New York city, where he died, and in 1895 she married George Christopher Riggs. She is the author of *Kindergarten Chimes* (1888); *The Story of Patsy* (1889); *The Birds' Christmas Carol* (1889); *A Summer in a Cañon* (1889); *Timothy's Quest* (1890); *The Story-Hour*, in connection with her sister, Nora A. Smith (1890); *The Relation of the Kindergarten to the Public School* (1891); *Children's Rights* (1892); *A Cathedral Courtship* (1893); *Penelope's English Experiences* (1893); *The Kindergarten* (1893); *Polly Oliver's Problem* (1893); *The Village Watch-Tower* (1895); *Froebel's Gifts*, in connection with her sister (1895); *Nine Love-Songs and a Carol* (1896); *Froebel's Occupations* and *Kindergarten Principles and Practice*, both in connection with her sister (1896); and *Penelope's Progress* (1898).

Rimsky-Korsakow, Nicolaus Andrejewitch: musician; b. in Tichwin, Russia, in 1844, and was at first intended for a military career. After several years' service in the imperial army as an officer of marines, he took up the study of music, and in 1871 was appointed Professor of Composition in the conservatory of St. Petersburg, and succeeded Balakirew as director of the free music school. He produced two operas at the Russian Opera-house in 1873 and 1880. He has also composed *Sadko*, a legend for orchestra; a symphony, *Antax*; some string quartets; a symphonietta in A minor; a third symphony; a fantasia for violin and orchestra; a capriccio for orchestra; and a number of piano pieces. He is one of the brightest leaders of the Neo-Russian school.

D. E. Hervey.

Ritter, Frederic Louis: musician; b. in Strasbourg in 1834, and when sixteen years old was sent to Paris to continue studies already begun at home. After two years he returned home, and was appointed Professor of Music in the Protestant seminary at Fénéstrange, and also conductor of the Société des Concerts at Bordeaux. He went to the

U. S. in 1856, and after a short residence in Cincinnati he settled in New York in 1862, and was elected conductor of the New York Harmonie Society, for which he composed several meritorious choral works. In 1867 he was appointed Professor of Music at Vassar College, Poughkeepsie, retaining that position until his death. In 1878 the University of New York conferred the degree of doctor of music upon him. He wrote a *History of Music*; *Music in England*; *Music in America*; *Practical Method for the Instruction of Chorus Classes*; and other literary works. His compositions include several cantatas, three symphonies, several overtures, a piano concerto, several string quartets, a symphonic poem entitled *Stella*, after Victor Hugo, many songs, and some small orchestral pieces. He died suddenly in Antwerp, July 6, 1891. D. E. Hervey.

Ritual Law: an ecclesiastical law; the law governing the ritual or sacred offices of the Church. The term is applied broadly to include the rules governing the sacred offices and the manner of celebrating religious services in the church of any denomination, but usually and more specifically to such laws relating to an established Church, as in Great Britain.

The ritual laws or rules of a church organization or body in the U. S. have no force as public laws, and can not be enforced except by exercising the discipline provided for their enforcement by the rules, express or customary, of each particular organization, in much the same manner as the rules of a club or social organization may be enforced. A person disciplined has a right to appeal to the courts of the law to enforce his legal rights in the organization and protect him from any discipline or punishment which violates either the law of the land or his rights and privileges under the rules and regulations of the church organization to which he belongs.

In Great Britain there is a common law of the Church, which exists and is a part of the general common law of the land, and is of binding authority as well in the temporal as in the ecclesiastical courts. It is a part of the canon law, and rests for its authority upon immemorial usage. It may be proved either by reports of adjudged cases or by public custom, or be deducible from principles and analogy, or shown by having received legislative recognition. Until the passing of the judicature acts the enforcement of the ritual law was vested primarily in the ecclesiastical courts, of the decisions of which, however, there are no published reports, with one recent exception. See Law and Canon Law.

See Phillimore, *Ecclesiastical Law of the Church of England*; Hoffman, *Ritual Law of the Church*; Stubbs, *Constitutional History of England*. F. Sturges Allen.

Roberts, Charles George Douglas: author; b. in Douglas, New Brunswick, Jan. 10, 1860; graduated at the University of New Brunswick in 1879, taking his degree of M. A. in 1881. He taught for some time in New Brunswick, and later in Nova Scotia, where in 1895 he resigned his position as Professor of Literature in King's College University, Windsor, to devote his time to writing. He is a fellow of the Royal Society of Canada, and was one of the literary judges at the World's Fair, Chicago. Among his works are *Orion and other Poems* (1880); *In Divers Tones* (1888); *The Canadian Guide-book* (1891); *Ave: an Ode for the Shelley Centenary* (1892); *Earth's Enigmas*, a volume of prose sketches (1896); *The Book of the Nations* (1897); *The Forge in the Forest* (1897); *History of Canada* (1897); and *The Heart of the Ancient Wood* (1900).

Roberts, Howard: sculptor; b. in Philadelphia, Pa., Apr. 9, 1843; studied art at the Pennsylvania Academy and in Paris. His statue of Robert Fulton is in the Capitol in Washington. Among his more noted works are a statuette of *Hester and Pearl*, from Hawthorne's *Scarlet Letter*; *La première pose*; *Hypatia*; *Lucille*; and *Lot's Wife*.

Robertson, Henry, LL. B.: lawyer; b. in Whitchurch, Ontario, May 31, 1840; was educated at local public schools and graduated at the University of Toronto in 1861, in which year he was called to the bar, and began the practice of his profession at Collingwood; was created queen's counsel in 1890; in 1882 was elected grand master of Odd Fellows; in 1887–88 was grand master of Freemasons; in 1891 grand master of Knights Templars. He has published a *Digest of Masonic Jurisprudence* (2d ed. 1889).

Robertson, John Ross: journalist; b. in Toronto, Ontario, Dec. 28, 1841; entered upon the printing business in 1861, served as reporter for various Toronto papers, and in 1876 established the *Evening Telegram*, which he still owns and conducts. He was president of the Canadian Copyright Association for the years 1888–96. In 1896 he took a seat in the House of Commons.

Robinson, Christopher: lawyer; b. at Beverly House, Toronto, Jan. 21, 1828; was educated at Upper Canada College and at King's College, Toronto, and at Trinity University; read law and was called to the bar in 1850; took up the practice of his profession in 1852; was appointed reporter to the court of queen's bench in 1856, retaining the position until 1872, when he became editor of the *Law Reports*; in 1885 resigned his editorship, being selected bencher of the Law Society of Upper Canada. He has devoted himself exclusively to his profession, and been connected as counsel in many of the cases of great public interest, including the libel suit of the Queen against Wilkinson, the case for the arbitration respecting the boundaries of the province of Manitoba, the prosecution of Louis Riel, the Bering Sea arbitration, etc.

Rockall Islet: a small steep rock, only about 70 feet high and 300 feet in circumference, rising above a bank of small extent from the abysmal waters of the North Atlantic, about 260 miles N. of Ireland, 57° 36′ N. lat., 13° 14′ W. lon. The rock has often been mistaken for a ship. The bank on which it stands is about 100 miles from N. to S. and 50 miles from E. to W., with less than 100 fathoms of water over it. It has high repute as a fishing-ground, and is frequented by fishermen from Grimsby and the Faeroes. Mr. Cristy Miller called attention to the eligibility of Rockall as the site of a meteorological station, but investigations in 1897 seemed to show that it would hardly be available, on account of the difficulty of surmounting the steep rock.

Roe, Charles Francis: soldier: b. in New York city, May 1, 1848; graduated at the Military Academy in 1868, and was appointed second lieutenant in the First Cavalry; was transferred to the Second Cavalry in 1870, and mustered out in the same year; re-entered the service as second lieutenant in the Second Cavalry in 1871, and served as adjutant 1876–78; advanced to first lieutenant in 1880, serving as adjutant until 1886; resigned in 1888 to engage in the real estate business in New York city; joined the National Guard in 1889, becoming captain of Troop A of the First Brigade, and in 1895, when a squadron was formed, was unanimously elected major; commanded Troop A during the switchmen's strike in Buffalo in 1892, and during the Brooklyn trolleymen's strike in 1895; became major-general of the New York State National Guard in 1898, and in the same year was appointed brigadier-general in the volunteer army in the Spanish-American war, resigning at the close of hostilities.

Roe, Francis Asbury: naval officer; b. in Elmira, N. Y., Oct. 4, 1823. He became a midshipman in 1841, and left the service for nearly a year in 1848; served on a mail-steamer of the New York and West India line 1851–52; in the North Pacific exploring expedition he was attached to the Porpoise; was commissioned master and lieutenant in 1855, and served in the Coast Survey 1857–58; commanded the Pensacola, of Farragut's squadron, and manœuvred that ship in passing Forts Jackson and St. Philip; was advanced to lieutenant-commander in 1862. Serving on the Katahdin 1862–63, on the Mississippi river, he successfully defended Baton Rouge from attack, and engaged in destroying the Confederate ram Arkansas. He commanded the Sassacus of the North Atlantic blockading squadron in 1864, and did effective service on the coast of North Carolina, participating in the defeat of the Confederate ram Albemarle, in which engagement he heroically rammed the ironclad and captured her consort, the Bombshell. He was advanced to commander in 1866, and commanded the Tacony on a mission to Mexico, when he averted a bombardment of Vera Cruz; was made fleet captain of the Asiatic station in 1867, serving at that post until 1871; was advanced to captain in 1872, and made commodore in 1880; was governor of the naval asylum at Philadelphia 1883–84; became rear-admiral in 1884, and was retired in 1885.

Roe, Henry: Archdeacon of Quebec; b. in Henryville, Quebec, Feb. 22, 1829; educated at Bishop's College, Lennoxville, which has conferred upon him the degrees of B. A. (1845), M. A. (1867), D. D. (1879), honorary D. C. L. (1896). He was ordained priest of the Church of England in 1853, and has spent most of his life in mission work. From 1873

to 1891 he was a leading member of the faculty of Bishop's College, from which he retired to resume his mission work. He was appointed Archdeacon of Quebec in 1888. Among his published works are *The Ritual Question* (1858); *The Place of Giving in the Christian Economy* (1880); *Blessed are the Peacemakers* (1886); *The Things which Make for Peace* (1895); *The Continuity of the Church of England and the Papal Encyclical Apostolic Curæ* (1897).

Rogers, Franklin Whiting: artist; b. in Cambridge, Mass., Aug. 27, 1854; became an art-pupil of J. F. Cole in 1874, afterward studying under W. M. Hunt and Thomas Robinson; has given special attention to the portrayal of dogs, among his noted pictures being *The Two Friends*; *Steady*; *Resignation*; *Loo*; and *Mischief*.

Rogers, Robert Vashon, LL. D.: lawyer and law-writer; b. in Kingston, Ontario, in 1843; educated at private schools and at Queen's University, graduating in 1861; was called to the bar in 1865, when he took up the practice of his profession. He is now (1899) a law lecturer in Queen's University. He has published *Wrongs and Rights of a Traveler by Boat, by Stage, by Rail* (1875); *The Law and Medical Men* (1884); and various legal text-books.

Rogers, William A.: astronomer and physicist; b. in Waterford, Conn., Nov. 13, 1832; graduated at Brown University in 1857; became a teacher in Alfred Academy and subsequently Alfred University. In 1870 he was appointed assistant in the Harvard College Observatory, and it is with this appointment that his scientific career may be said to have begun. In 1875 he was promoted to an assistant professorship at Harvard College, and in 1886 was called to the chair of Physics and Astronomy in Colby University, which position he held up to the time of his death, in Waterville, Me., Mar. 1, 1898. As an astronomical observer Prof. Rogers was untiring, and the annals of the Harvard Observatory from 1871 to 1883 contain many voluminous and important memoirs from his pen. During the later years of his life he turned his attention more particularly to physics, and in the department of metrology especially he became an authority. To the question of the accurate comparison of the yard and meter, in which he became interested about 1880, he gave much of his time for nearly twenty years, and it was in connection with this problem that his well-known studies of the microscope, the dividing engine, the comparator, and the interferometer were made. He was a member of the American Academy of Arts and Sciences, Fellow of the Royal Microscopical Society of London and of the National Academy of Sciences, and he was twice chairman of a section of the American Association for the Advancement of Science. His most important scientific work was done, perhaps, at the Harvard Observatory, where for many years he took a prominent and laborious part in the celebrated "zone observations" carried on in conjunction with other astronomical stations by that institution. E. L. N.

Romero, Matias: statesman; b. in Oaxaca, Mexico, Feb. 24, 1837. He served as minister to the U. S. for more than twenty years, his last term extending over sixteen years. He was admitted to the Mexican bar in 1857; in the revolution of that year was made the private secretary of Juarez, then a cabinet officer; in 1859 was sent to Washington as secretary of the Mexican legation, and was subsequently *chargé d'affaires* until 1863, when he returned home, and, taking a colonelcy on the staff of Diaz, aided in overthrowing French power in Mexico; late in the same year returned to Washington as minister, holding that position until 1868, when he took the Mexican Treasury portfolio, in which capacity he served under Presidents Juarez and Diaz, having between his terms of such service been a member of the Congress; in 1880 became Postmaster-General, from which office he was retired by Gonzales; in 1881 accompanied Gen. Grant through Mexico; was again sent to Washington as minister during President Garfield's administration, when important boundary questions were amicably adjusted by him; resigned his ministerial post at the expiration of Gonzales's term as president, but was reappointed by Diaz in 1884, and served until his death. The Mexican legation was raised to the grade of an embassy just before the death of Señor Romero, and a day had been fixed when he was to present his credentials as an ambassador. His diplomatic services to the U. S. and to his own country were considered exceptionally beneficial. Among his published works are *Coffee Culture on the Southern Coast of Chiapas*; *Historical Sketch of the Annexation of Chiapas and Soconusco to Mexico*; and the first volume of a work entitled *Mexico and the United States*, dealing with political, commercial, and social relations. D. in Washington, D. C., Dec. 30, 1898.

Roosa, Daniel Bennett St. John, A. M., LL. D.: physician; b. in Bethel, N. Y., Apr. 4, 1838; entered Yale in 1856, but left on account of poor health; studied chemistry in New York city; graduated at the medical department of the University of New York in 1860; became a resident physician in the New York Hospital in 1862; studied in Europe in 1863, paying special attention to ophthalmology and otology; settled to practice in New York city in 1864; was Professor of Diseases of the Eye and Ear in the medical department of the University of the City of New York 1863–82, also in the University of Vermont 1875–80; was one of the founders of the Manhattan Eye and Ear Hospital, and became Professor of Eye and Ear Diseases in the New York Post-graduate Medical School and president of the faculty; was president of the International Otological Society in 1876, and of the New York State Medical Society in 1879; received from Yale the honorary degree of A. M., and from the University of Vermont that of LL. D. Besides several translations from the German, he has published *A Vest-pocket Medical Lexicon* (1865); *Treatise on the Ear* (1866); *A Doctor's Suggestions* (1880); and *On the Necessity of Wearing Glasses* (1887).

Root, Elihu: b. in Clinton, N. Y., Feb. 15, 1845; graduated at Hamilton College in 1864; studied law at Hamilton College and the University Law School in New York, and began practice in New York city in 1867. He has had a remarkable career in winning decisions in his litigation, having been the leading counsel for Judge Hilton in the Stewart case, in the Fayerweather contest will case, the Sugar Trust, and others; in 1879 was an unsuccessful candidate for judge of the court of common pleas; was U. S. district attorney 1883–85; in 1893–94 was one of the active members of the committee of thirty in resisting the Republican machine in New York County; was chairman of the judicial committee in the Constitutional Convention of New York in 1894. He became Secretary of War in Aug., 1899. He has been president of the New England Society: member of the Century, Metropolitan, University, and Players' Clubs and other similar organizations. F. Sturges Allen.

Root, George Frederick: song-composer; b. in Sheffield, Mass., Aug. 30, 1820, and in early life was much influenced by the English singers Henry Russell and John Philip Knight. He took some lessons from A. N. Johnson and Dr. Lowell Mason. In 1860 he settled in Chicago. He had already published several songs, including *Hazel Dell* (1853), and *Rosalie, the Prairie Flower*, to which he signed the name Wurzel, the German for Root. When the civil war broke out Root began the series of war-songs by which he is best known. *The First Gun is Fired*; *The Battle-Cry of Freedom*; *Tramp, Tramp, Tramp*; *Lay Me Down and Save the Flag*; and *Just before the Battle, Mother*, are some of these that were familiar to every soldier. He also composed several light cantatas for Sunday and day schools and many miscellaneous songs. D. on Bailey's island, on the coast of Maine, Aug. 6, 1895. D. E. Hervey.

Roraima, Mount: the highest of a number of isolated sandstone plateau-topped mountains discovered by Robert Schomburgk on the boundary line he surveyed between Venezuela and British Guiana. Roraima is 9,000 feet high, and its upper 2,000 feet was long supposed to be a perpendicular wall. Everard im Thurn, in Dec., 1884, found on one face a narrow ledge that afforded a pathway to the summit. The soft sandstone of the plateau at the top had been carved by denudation into many remarkable forms. The precipitation is very large. There are no trees, and the general character of the plants is dwarfish and almost alpine. Sir Joseph Hooker and others had thought the flora on the plateau would be found to be different from that of the plain, and to some extent this was found to be true. Other explorers have since visited the top of Roraima, and a black butterfly, spiders, frogs, lizards, and a small mammal have been found there.

Rosenthal, Albert: artist; son of Max Rosenthal; b. in Philadelphia, Jan. 30, 1863; studied art under his father and at the Pennsylvania Academy; devoted himself to etching, his work becoming widely known; has etched many portraits of historical American characters.

Rosenthal, Max: artist; b. in Turek, Russian Poland, Nov. 23, 1833; studied lithography, drawing, and painting in Paris, completing his studies in Philadelphia, Pa., in

1849: made the chromo-lithographic plates for *Wild Scenes and Wild Hunters*, believed to be the first book illustrated by that process in the U. S.; sketched and lithographed the interior of the old Masonic Temple in Philadelphia, producing the largest chromo-lithograph in the country at that time, the plate being 22 by 25 inches; accompanied the Army of the Potomac during the civil war, making many drawings; made lithographs of many distinguished Americans up to 1884, when he gave his attention to etching, executing numerous portraits of American and British officers; is a member of the Pennsylvania Academy and a founder of the Sketch Club. Among his celebrated pictures are *Storm Approaches*, after the painting by Henry Mosler; *Doris, the Shepherd Maiden*; *Marguerite*; and illustrations for several of Longfellow's poems.

Rosenthal, Moriz: pianist; b. in Lemberg, Austria, Dec. 18, 1862; began study of the piano when a child. In 1875 his parents settled in Vienna, where he took lessons from Rafael Joseffy. In 1876 he moved to Bucharest, where he was named pianist to the Roumanian court at fourteen years of age. In 1878 he began a concert tour, including Weimar, Paris, and St. Petersburg, and then returned to Vienna and continued his studies. In 1882 he began another concert tour which included New York, where he played two piano ensemble pieces with Joseffy, who had preceded him there. He returned to Europe, and again visited New York in 1896 and began a concert tour, but was taken ill in Chicago and had to give it up. In 1898 he again went to the U. S. and played throughout the entire season in various places. D. E. Hervey.

Rosenthal, Toby Edward: artist; b. in New Haven, Conn., Mar. 15, 1848; first studied art in San Francisco, then in Munich and other places in Europe; gained medals in Munich in 1870 and 1883, and in Philadelphia in 1876; has spent his professional life chiefly in Europe. Besides numerous portraits, he has painted *Spring's Joy and Sorrow*; *Morning Prayers in Bach's Family*, purchased by the Saxon Government; *Elaine*; *Young Monk in Refectory*; *Forbidden Longings*; *Who Laughs Last Laughs Best*; *A Mother's Prayer*; *Trial of Constance de Beverley*; *A Dancing Lesson during the Empire*; and *Out of the Frying Pan into the Fire*, popular and frequently engraved.

Ross, Alexander Milton, M. D.: b. in Belleville, Ontario, Dec. 13, 1832; went to New York while a boy, and worked in a newspaper office. He studied medicine and received his degree in 1855, and afterward became a member of the College of Physicians and Surgeons in Ontario and Quebec. After several years' service as surgeon in the U. S. army and in Mexico, he returned to Canada and devoted himself to the classification of the fauna and flora of Canada. Among his works are *Recollections of an Abolitionist* (1867); *Birds of Canada* (1872); *Butterflies and Moths of Canada* (1873); *Flora of Canada* (1873); *Forest Trees of Canada* (1874); *Ferns and Wild Flowers of Canada* (1877); *Mammals, Reptiles, and Fresh-water Fishes of Canada* (1878); *Vaccination a Medical Delusion* (1885); *Medical Practices of the Future* (1887). D. in Detroit, Mich., Oct. 27, 1897.

Rosseau, ros'sō', Rodolphe: French advocate and consulting lawyer; b. in Maubege, Mar. 24, 1849; called to the bar in Paris in 1868, and acted as justice of the peace of the third and tenth arrondissements 1879–90: during the Universal Exposition of 1889 was vice-president of the Congress of Societies, and afterward was made its general secretary. He pleaded a number of important cases for the societies or the administrations for which he was counsel, such as the state railways, telephone companies, cable from Paris to New York, submarine telegraph, etc., but he is best known by his writings on matters of jurisprudence, of which some of the more important are *Du trafic des billets de complaisance d'après la loi civile et la loi pénale* (2d ed. 1876); *Traité théorique et pratique de la correspondance* (1877); *Des Sociétés commerciales françaises et étrangères* (2d ed. 1876); *Dictionnaire théorique et pratique de procedure civile, commerciale, criminelle et administrative* (1879–80); *Questions nouvelles sur les sociétés commerciales* (1882); *Répertoire alphabétique de la doctrine et de la jurisprudence des dix dernières années en matière de sociétés commerciales* (1889); *Loi du I^er^ aout, 1893, sur les sociétés par actions* (1893). F. Sturges Allen.

Rosser, Thomas Lafayette: soldier; b. in Campbell co., Va., Oct. 15, 1836; entered the U. S. Military Academy in 1856, but before graduating resigned and entered the Confederate service as first lieutenant of artillery; was promoted to captain in 1861, and to lieutenant-colonel of artillery in 1862, when he was placed in command of a regiment of cavalry and attached to the Army of Northern Virginia; was advanced to brigadier-general in 1863, and given command of the Virginia cavalry in the Shenandoah Valley, serving under Gen. Jubal Early and winning distinction; became major-general in 1864. After the war he turned his attention to engineering, and had charge of the Dakota, Yellowstone, and Missouri divisions of the Northern Pacific Railway 1870–79; has been chief engineer of the Canadian Pacific Railroad, president and general manager of the New South Mining and Improvement Company, and consulting engineer of the Charleston, Cincinnati and Chicago Railroad Company. He served in the Spanish-American war in 1898.

Round, William Marshall Fitts: author; b. in Pawtucket, R. I., Mar. 26, 1845: received academic education, and entered the medical school of Harvard, which he left on account of ill health before graduating; was U. S. commissioner to the Vienna Exposition, having charge of the New England department; on his return made a study of prison reform, becoming corresponding secretary of the Prison Association of New York in 1883; was instrumental in organizing the National Prison Association of the U. S., was made its secretary, and was sent as a delegate from the U. S. to the international penitentiary congress in Rome 1886; formed the general scheme for the Burnham Industrial Farm. His publications include *Achsah: a New England Life Study* (1876); *Child Marion Abroad* (1876); *Torn and Mended* (1877); *Hal: the Story of a Clodhopper* (1878); and *Rosecroft* (1880).

Routhier, Adolfe Basile, Lit. D., LL. D.: judge and author; b. in St. Placide, province of Quebec, May 8, 1839; was educated at the College of Ste. Thérèse and at Laval University; studied law, and was called to the bar in 1861, taking up the practice of his profession at Kamouraska; was appointed puisne judge of the Supreme Court of the Province of Quebec in 1873, sitting in the Saguenay district until 1889, when he was transferred to the district of Quebec; was appointed judge of the court of vice-admiralty, Quebec, 1897. Before his appointment as judge he published, besides other books, the *Causeries du Dimanche* and *Portraits et Pastels Littéraires*, the latter under the name of Jean Piquefort. He has also published *À Travers l'Europe*; *En Canot*; *Les Echos*; *À Travers l'Espagne*; *Les Grandes Drames*; *Conferences et Discourses*; *De Québec à Victoria*.

Rowland, Henry Augustus, Ph. D.: physicist; b. in Honesdale, Pa., Nov. 27, 1848; graduated at Rensselaer Polytechnic Institute, Troy, N. Y., as a civil engineer, and in 1871 was employed in surveying for a railroad in Western New York; taught for a time in Wooster University, and in 1872 became instructor in physics in Rensselaer Institute, and in 1874 assistant professor; spent the year 1875 studying with Helmholtz in Berlin and examining European physical laboratories; Professor of Physics in Johns Hopkins University since 1876. He attended the electrical congress in Paris in 1881, and because of services there on the jury of the electrical exhibition was made a chevalier of the Legion of Honor. He is a permanent member of the international commission for establishing electrical units, is a corresponding member of the British Association for the Advancement of Science, is one of the twelve foreign members of the Physical Society of London, is an associate of the American Academy of Arts and Sciences and of the National Academy of Sciences. He is the author of many papers and addresses, some of the most important being *On Magnetic Permeability* (1873); *On the Magnetic Permeability and Maximum Magnetization of Nickel and Cobalt* (1874); *Studies on Magnetic Distribution* (1875); *On a Magnetic Effect of Electric Connection* (1876); *Research on the Absolute Unit of Electrical Resistance* (1878); *On the Mechanical Equivalent of Heat* (1880); *On Concave Gratings for Optical Purposes* (1883); *On the Relative Wavelengths of the Lines of the Solar Spectrum* (1886); *Photographs of the Normal Solar Spectrum* (1886).

Rug: a carpet-like textile, usually oblong, made in one piece, and used principally for floor service. The most artistic rug-makers of the world are the Persians, who learned the art of weaving such fabrics from the Babylonians many centuries before Christ; but whether the Babylonians or the Egyptians were the first to make rug carpets is not known.

1. Turkish.

2. Persian.

3. Indian.

RUGS.

Persian rugs were early used by the patricians of Greece and Rome, and were introduced into Spain by artisans from Shiraz, and they were distributed by the argosies of Venice throughout Europe, adorning the palaces and castles of the Middle Ages; they were spread over the rushes that covered the floor of Queen Elizabeth's presence-chamber. The work on these Oriental fabrics is still done by hand, and while the varieties do not greatly differ in the mode of weaving, each rug has its individuality, no two being exactly alike; hence their commercial value. They are woven on rude looms, the variations of design being infinite. Machinery has not yet been introduced for their manufacture, but latterly such patterns as have found favor abroad have been reproduced in certain districts. The Persian rug remains the most original and durable of all such fabrics, and is the parent stock of all the rugs made in the world, at least to the west of China, where such textiles, resembling those of India, have an unknown origin. Many of the rugs of Persia, especially the finer grades, are not intended to be laid on the floor, but to cover divans or tables, or to hang as tapestries and portières. Such are often made of silk. The colors formerly employed in the rugs of Persia were imperishable, fabrics a hundred or more years old showing no deterioration in tint. The introduction of aniline dyes at one time threatened to ruin the manufacture of textile fabrics in Persia, but the law against the employment of such dyes enacted by the Persian Government was rigorously enforced.

The Turkoman rugs, in some respects unsurpassed for texture and peculiar beauty of design, are not made within the Shah's dominions, but over the border, although they are included commercially among the Persian rugs, as the Turkomans were until recently subject to Persia. The prevailing color of the Turkoman rugs being red, the weavers have shown a disposition to use aniline dyes. Such dyes can easily be detected by the application of a wet cloth to the suspected tint.

In the making of Persian rugs tufts of colored woolen yarn are knotted into the warp with the fingers, and when a row of tufts has been knotted it is pressed down even and hard with a comb-like apparatus, the warp being wool or linen, and sometimes cotton.

The rugs of Feraghan and Teheran have a loose texture and a velvety pile of medium thickness, the center being generally of a mixed pattern of small, irregular figures surrounded by a rich border, though it is sometimes of a uniform color, red or blue. The rugs of Khorassan are of a richer texture than those of Feraghan, the patterns being celebrated for realistic flowers. In texture the Kerman rugs are more valuable than those of Khorassan and Feraghan, the designs including figures of men, animals, and flowers. The Shiraz rug, which resembles the Kerman, has a heavy pile. Undyed camels' hair is used in Southern Persia for the groundwork and border of rugs. The fabric made in Kurdistan is esteemed the best of Persian rugs, a common pattern representing flowers interwoven with the groundwork in impressionist style, the borders being designed to direct attention to the central ornamentation. There is a species of rug peculiar to Kurdistan, its texture suggesting knitted rather than woven work. It is called ghileem, or dorü. The pattern is identical on both sides, thus allowing the use of either side. The colors are firm and brilliant, and the designs often of extraordinary beauty. The lightness and flexibility of these rugs qualify them for use as portières or as covers for tables or sofas, and render them easy for transportation. The ghileems of Shuster are preferable for portières, while the Garrouste ghileems are more suitable for curtain-hangings. Those of Lauristan and Zerend are preferable for carpetings, while those of Kermanshah are famous for the originality and beauty of their patterns. The silk rug, once common in Persia, has been revived for foreign markets.

One of the choicest rugs made in the East is known to Americans as the Khiva, often called the Bokhara. They are made by the Turkomans. The colors are chiefly various shades of maroon, red, and blue, interwoven with a creamy white, the pattern consisting almost invariably of a many-angled conventional figure. The rugs of Daghestan have a closer pile than most Persian fabrics, with a surface rich and smooth. The Samarcand rug has a rich and heavy pile, soft as silk, the prevailing tone being a golden brown or a mellow gray. The figures of men and animals are never seen on Turkish rugs. Rugs made by the Uruks resemble the Kurdistan ghileems in texture, but are coarser, the designs being usually in stripes.

The Abnákee rug is the product of an American industry located at Pequaket, N. H. These rugs usually have plain centers of solid color, terra-cotta, old pink, tan, dark blue, gobelin blue, yellow, or olive, with borders worked in two or three harmonious colors, the designs ranging from the Saracenic, Gothic, and classic to conventionalized floral patterns and to Aztec and savage ornament. The rugs are all wool and hand-made. Each maker works an individual cipher on the rug woven. The cipher woven on the label of the Abnákee rugs is an Indian totem that appears on a treaty between the Abnákees and the English.

Rummell, Franz: pianist; b. in London, England, Jan. 11, 1853, the son of a German merchant; studied in Brussels under Brassin, and became one of the teachers in the conservatory there; made his first appearance as a pianist in Antwerp in 1872. In 1877–78 he made a concert tour through Holland with Minnie Hauck and Ole Bull, and made his first visit to the U. S. in 1878, his second in 1886, and his third in 1898, each time giving many concerts with great success. He is married to an American woman and resides in Berlin. D. E. Hervey.

Russell, Henry: singer and song-composer; b. in Sheerness, England, Dec. 24, 1813; studied in Bologna in 1825 and went to New York in 1832, remaining seven years, during which he married, and his son, W. Clark Russell, the sea-novelist, was born in New York. During his American visit he composed and sang many of the songs which made him famous. He composed more than 800 songs, to many of which he wrote also the words. Perhaps the best known is *A Life on the Ocean Wave*. His singing was intensely descriptive, and he always played his own accompaniments. He died in London, Dec. 6, 1900. In addition to his songs, he published a memoir in 1846 and a treatise on singing in 1860. His latest composition is a song, *Our Empress Queen*, which was written for Queen Victoria's jubilee in 1887. D. E. Hervey.

Russell, James Earl, Ph. D.: educator; b. in Hamden, N. Y., July 1, 1864; A. B., Cornell University, 1887; Ph. D., University of Leipzig, 1894; teacher and principal in secondary schools 1887–93; Professor of Philosophy and Pedagogy, University of Colorado, 1895–97; Professor of History of Education and dean of Teachers' College, Columbia University, since 1897. He is the author of *Extension of University Teaching in England and America* (1895); *German Higher Schools*; *The History, Organization, and Methods of Secondary Education in Germany* (1898).

Russell, William Eustis: lawyer; b. in Cambridge, Mass., Jan. 6, 1857; graduated at Harvard in 1877; admitted to the bar in 1880; elected to the Cambridge common council in 1881, alderman in 1883 and 1884, mayor in 1885, 1886, and 1887; defeated as a candidate for Governor of Massachusetts in 1888 and 1889, but elected in each of the next three years, and resumed his law practice after his third term; appointed as one of the board of Indian commissioners Nov., 1894. D. at Little Pabos, Canada, July 16, 1896.

Russia, History of: The last year of Czar Alexander III. witnessed one of the distressing famines which sometimes afflict the country. In 1893 there was a tariff war with Germany. (See Agrarianism.) Nicholas II. has maintained the old traditions and policy, while showing evidence of somewhat more liberal opinions. Conjointly with Germany and France, Russia applied pressure to Japan in 1895, after the Japanese victories over China. (See Japan.) The coronation of the czar in 1896 was the occasion of elaborate ceremonies.

Russia has of late years become allied with France, and has steadily pushed her colossal Trans-Siberian railway and her Asiatic schemes. Her influence is felt in China, where an agreement with England as to spheres of influence gives to the Russians the predominance in the north. The work of Russianizing Manchuria by railway and fortresses has begun. At home the Russianizing of Finland is (1899) in progress.

The repression of the Jews, of non-Russian bodies like the Finns, and of the Nihilists presents one side of Russian endeavor. Great interest attaches to the peace proposals made by the czar in 1898, which resulted in the international conference at The Hague in 1899.

Edmund K. Alden.

Rylance, Joseph Hine, D. D.: clergyman; b. near Manchester, England, June 16, 1826; graduated at King's Col-

lege, London, in 1861; after serving as curate in London, removed to the U. S. in 1863, becoming rector of St. Paul's church, Cleveland, O.; was rector of St. James's, Chicago, 1867–71, in the latter year becoming rector of St. Mark's, New York city; received the degree of D. D. from Western Reserve College in 1867; belongs to the school of Christian rationalists. Among his works are *Preachers and Preaching* (1862); *Essays on Miracles* (1874); *Social Questions: Lectures on Competition, Communism, Co-operation, and Christianity and Socialism* (1880); and *Pulpit-talks on Topics of the Times* (1881).

Sadlier, Anna Theresa: author; daughter of Mary Anne Sadlier; b. in Montreal, Canada, Jan. 19, 1854; received education in New York city, and graduated at the convent of Ville Marie, near Montreal, in 1871. Besides contributing freely to the Roman Catholic press, translating numerous tales and poems from the French and Italian, and compiling *Gems of Catholic Thought* (1882), she has written *The King's Page* (1877); *Seven Years and Mair* (1878); *Women of Catholicity* (1885); and *The Silent Woman of Alood* (1887).

Sadlier, Mary Anne (*Madden*): author; b. in Cootehill, Ireland, Dec. 31, 1820; was educated privately; removed to Montreal, Canada, in 1844; has translated considerably from the French, and has written a number of stories for Roman Catholic Sunday-schools. Her publications include *Alice Riodan, or the Blind Man's Daughter* (1851); *New Lights, or Life in Galway* (1853); *The Blakes and Flanagans* (1855); *The Confederate Chieftains, a Tale of the Irish Rebellion of 1741* (1859); *Bessy Conway, or the Irish Girl in America* (1862); *The Daughter of Tyrconnell* (1863); *Maureen Dhu, the Admiral's Daughter* (1870); and *Purgatory, Doctrinal, Historical, and Political* (1886).

St. Ignatius College: a Catholic institution of learning in Chicago, Ill., chartered in 1870, and conducted by the Fathers of the Society of Jesus. It has four departments—collegiate, academic, commercial, and preparatory. Courses in the collegiate department lead to the usual degrees. The degree of bachelor or doctor of philosophy is granted only to masters of arts after successful post-graduate courses in philosophy and science. All courses include religious instruction. Non-Catholics are admitted. The college has no endowment, and is entirely dependent on tuition fees. The material equipment is good. In addition to a library of 20,000 volumes, a smaller select library for students, a scientific library, chemical and physical laboratories, apparatus and dynamo rooms, music-rooms, and lecture-halls, there are valuable mineralogical and zoölogical museums. Since the college is intended only for day scholars, there are no dormitories, and students living at a distance are not encouraged to take lodgings in the city, unless they are of mature age and steady disposition. Twenty-two professors and instructors make up the faculty. The attendance in the different departments is (1899): collegiate, 143; academic, 214; commercial, 90; preparatory, 30; total, 477. Rev. James F. X. Hoeffer, S. J., is president.

Sajous, saa'zhoo', Charles Eucharist: physician; b. in Paris, Dec. 13, 1852; early removed to the U. S., receiving private education; attended lectures in the medical department of the University of California and at Jefferson College, Philadelphia, receiving his diploma in 1878; became Professor of Anatomy and Physiology in the Wagner Free Institute of Science and lecturer on diseases of the nose and throat in the Philadelphia School of Anatomy; was made clinical chief in the throat department of Jefferson College hospital, and finally lecturer in the college proper; has invented numerous instruments widely used in nose and throat treatment. Besides many articles contributed to medical journals, he has published *Curative Treatment of Hay-fever* (1885); *Diseases of the Nose and Throat* (1886); and in 1888, assisted by sixty-six associate editors, prepared the large *Annual of the Universal Medical Sciences*.

Salvador: A financial crisis in 1897–98 was largely the result of the low price of coffee, which inflicted great hardship upon the planters. Four of the six banks in San Salvador suspended payments. The large resources of the country promise prosperity. With a population of 89 to the square mile, which is 14 times the density in Guatemala and 20 times the average density in the Central American republics, and with a very productive soil and an enlightened policy, the prospects of the state are regarded as excellent. The people are frugal and industrious. The imports from the U. S. in 1900 were $679,440 (gold); from England (1899) $910,222. The exports to the U. S. were $738,674; to England (1899) $474,669. Germany and France also have important trade relations with Salvador. Complaint has been made that goods from the U. S. are not adequately packed for the rough usage received from Colon and beyond. The chief imports are cotton goods, spirits, ironware, flour, and silk goods and yarn. The chief exports are coffee, tobacco, indigo, and balsams. C. C. A.

Salzmann, Christian Gotthilf: educator; b. in Rohrborn, near Erfurt, Saxony, June 1, 1774. After attending the gymnasium at Langensalza and the University at Jena, he entered the ministry, and remained in it for several years, meantime engaging in literary work. At the same time he entered into relations with Basedow and his associates in the Philanthropinum at Dessau, and in 1781 went to Dessau to take charge of the religious instruction in the institute. Here he continued his literary labors, and also conceived the idea of founding an institute of his own. In the latter enterprise he enlisted the interest of Duke Ernest II. of Saxe-Gotha, and in 1784 opened an educational institution in Schnepfenthal, which, though never a large school, became one of the famous schools of Europe. D. in Schnepfenthal, Oct. 31, 1811. Among the most important of his numerous writings are a romance, *Karl von Karlsburg* (1780–86), which it is said occupies in his life a position analogous to that of *Leonard and Gertrude* in the life of Pestalozzi; *Volks- und Jugendschriften* (12 vols., 1845–46); *Pädagogische Schriften* (2 vols., 1887). Salzmann belonged to the so-called philanthropic school of pedagogy of the eighteenth century, of which school he is one of the principal representatives, and, on the whole, the most meritorious one. In his writings one finds most of the principles of which Pestalozzi later made use, and Salzmann's works may yet be read with profit by modern educators. C. H. Thurber.

Sampson, William T.: naval officer; b. in Palmyra, N. Y., Feb. 9, 1840; graduated at the Naval Academy, Annapolis, in 1860. During his first cruise he was promoted master, and on July 16, 1862, was commissioned lieutenant. He was on the practice-ship John Adams the following year, and at the Naval Academy in 1864. In 1865, while executive officer of the ironclad Patapsco, of the South Atlantic blockading squadron, he was ordered by the admiral to enter Charleston harbor and destroy the submarine mines and torpedoes placed there, and the Patapsco was destroyed in the attempt. He was assigned to the Colorado, flag-ship of the European squadron, 1865–67, being commissioned lieutenant-commander July 25, 1866; was at the Naval Academy until 1871, and the following year was ordered to special duty on the Congress. He commanded the Alert 1874–75, receiving the commission of commander Aug. 9, 1874; returned to the Naval Academy for two years, and was in command of the Swatara, of the Asiatic station, 1879–82. After serving at the Naval Observatory for three years he was put in charge of defenses in 1885, and the next year was made superintendent of the Naval Academy, where he remained until 1890. He served as delegate to the international maritime conference in Washington in 1889. He was promoted captain Mar. 26, 1889. In 1890 he was put in command of the San Francisco, and in 1893 became chief of the Bureau of Ordnance, which position he held until 1897, when he was ordered to the command of the Iowa. He was president of the board of inquiry regarding the cause of the destruction of the Maine in the harbor of Havana, Feb. 15, 1898. At the outbreak of the war with Spain he was made acting rear-admiral in command of the North Atlantic squadron sent to blockade the Cuban ports. He was commissioned commodore July 3, 1898, and rear-admiral Aug. 10 of the same year.

Samuels, Arthur Warren, LL. D.: Irish lawyer and publicist; b. in Ireland, May 19, 1852; was educated at the royal school in Dungannon, and at Trinity College, Dublin, subsequent to which he read law, and was called to the Irish bar in 1877; during his college and post-graduate course he devoted himself especially to the study of classics, modern literature, history, and political economy, and received the gold medal of the Historical Society. He was Professor of Personal Property at King's Inns 1891–94, in which latter year he was made queen's counsel; was called to the English bar in 1896. He has been prominent in the various movements set on foot for the procuring of Irish private bill procedure reform, and for reforms of Irish financial matters. He has published numerous articles and pam-

phlets on the Irish financial question and procedure in the Irish courts, including *The Fiscal Entity Question*; *The Financial Report, and What it Finds*, etc.

F. Sturges Allen.

Sanborn, John Benjamin: soldier; b. in Epsom, N. H., Dec. 5, 1826; was educated at Dartmouth; studied law, and was admitted to the bar in 1854, after which he settled in St. Paul, Minn.; as adjutant-general and quartermaster-general of Minnesota, was active in organizing and equipping military forces at the outbreak of the civil war, and became colonel of the Minnesota volunteers in 1862; was noted for gallantry in the many actions in which he participated; on the recommendations of Gens. Grant and McPherson, was promoted to brigadier-general in 1863; conducted a campaign against the Indians of the Southwest in 1865, terminated hostilities with the Comanches, Kiowas, Cheyennes, Arapahoes, and Apaches, and freed all lines of communication to Colorado and New Mexico; under the appointment of President Johnson, settled the difficulties growing out of the war between the Cherokees, Choctaws, Chickasaws, Creeks, and Seminoles and their slaves, and made the slaves of these tribes free; was designated by Congress one of an Indian peace commission in 1867; has several times been a member of the General Assembly of Minnesota, serving in both houses.

Sanborn, Katharine Abbott: author; b. in Hanover, N. H., in 1839; after teaching English literature in various seminaries, held that chair in Smith College, resigning in 1886; has lectured on literary history and kindred subjects, published articles on education, and served as a newspaper correspondent in New York city; has edited holiday books and calendars. Her books, published under the name of Kate Sanborn, include *Home Pictures of English Poets* (1869); *Round Table Series of Literature Lessons* (1884); *The Vanity and Insanity of Genius* (1885); *Wit of Women* (1886); and *A Year of Sunshine* (1887).

Sanday, William, D. D., LL. D.: Church of England clergyman; b. in Holme Pierrepont, near Nottingham, England, Aug. 1, 1843; graduated B. A. at Oxford 1865; was fellow of Trinity College 1866–73; rector of Barton on the Heath, Warwickshire, 1873–76; principal of Bishop Hatfield's Hall, Durham, 1876–83; became Ireland Professor of Exegesis of Holy Scripture, Oxford, 1882; Lady Margaret Professor of Divinity and canon of Christ Church, Oxford, 1895. He is the author of *Authorship and Historical Character of the Fourth Gospel* (London, 1872); *The Gospels in the Second Century* (1876); *Appendices to the Greek Testament* (1889); *The Oracles of God* (1st and 2d ed. 1891); *Inspiration* (Bampton lectures, 1893; 3d ed. 1896); *The Conception of Priesthood in the Early Church and in the Church of England* (1898). He contributed the commentary on Romans and Galatians to Bishop Ellicott's *Commentary* (1878); was joint editor of the *Variorum Bible* (1880) and of *Old Latin Biblical Texts* (1886). S. M. J.

Sandham, Alfred: author; b. in Montreal, Nov. 19, 1838; for many years secretary of the Canadian Young Men's Christian Association; has devoted most of his leisure time to numismatics and book-illustrating. Among his published works are *Ville Marie, or Montreal, Past and Present*; *Coins, Tokens, and Medals of Canada*; *Medals Commemorative of the Visit of the Prince of Wales to Canada*; and *The Trade Tokens of Montreal.*

Sandham, Henry: artist; b. in Montreal, May 24, 1842; began his art studies under leading Canadian artists; studied in Europe, and on returning to America in 1880 made his home in Boston. He is well known as an illustrator of books and magazines. Among his paintings are *Battle of Lexington*; *March of Time*; and *Founding of Maryland.*

San German: a town of Southwest Puerto Rico, situated in an elevated position above the river Guanajibo, in a district that has more than 20,000 fairly well-to-do inhabitants. The town has a seminary, a hospital, and a Dominican convent. The surrounding farm-lands have been very productive, but have somewhat deteriorated, owing to imperfect tillage.

Sangster, Margaret Elizabeth (*Munson*): b. in New Rochelle, N. Y., Feb. 22, 1838. She was educated at Paterson, N. J., and at Williamsburg, N. Y.; was associate editor of *Hearth and Home* 1871–73, of the *Christian at Work* 1873–79, and afterward of the *Christian Intelligencer*; was editor of *Harper's Young People* 1882–89, and became editor of *Harper's Bazar* in 1889. Her principal published books are *Poems of the Household* (1882) and *Home Fairies and Heart Flowers* (1887).

Santa Clara: a province of Cuba (usually called in Cuba *Las Villas*, from Las Cinco Villas, the five towns that were first founded in it). It is one of the richest regions in Cuba, and contains some of the largest sugar plantations and factories. All the special products of Cuba thrive there, and fruits of the temperate zone are cultivated on the mountain slopes. Pop. (1899) 356,536.

Santa Clara: a city; capital of Santa Clara province, Cuba. Popularly known as Villa Clara. Connected with Havana, 248 miles distant, by rail. The city has many cultured inhabitants, and its situation is charming. Gold, plumbago, and copper have been found in the neighborhood, and an excellent quality of asphaltum is exported. The city suffered greatly in the insurrection of 1895. Pop. (1899) 13,763.

Sartain, Emily: artist; daughter of John Sartain; b. in Philadelphia, Pa., Mar. 17, 1841; studied and practiced engraving under her father, afterward studying painting at the Pennsylvania Academy and in Paris, devoting herself chiefly to portraiture; was awarded a medal for her *Reproof* at the Centennial Exhibition in 1876, and the Mary Smith prize at the Philadelphia Academy in 1881 and 1883; was art editor of *Our Continent* 1881–83, and became principal of the Philadelphia School of Design for Women in 1886.

Sartain, Samuel: engraver; son of John Sartain; b. in Philadelphia, Pa., Oct. 8, 1830; has chiefly devoted himself to engraving portraits and other illustrations for books, having begun work at the age of sixteen under his father's direction. Among his noted prints are *Clear the Track*; *Christ Blessing Little Children*; *One of the Chosen*; *Christ Stilling the Tempest*; *The Song of the Angels*; and *Evangeline.*

Sartain, William: artist; son of John Sartain; b. in Philadelphia, Pa., Nov. 21, 1843; studied and practiced engraving under his father, producing some notably good plates; studied painting privately and at the Pennsylvania Academy 1867–68, and afterward in Paris; returned to the U. S. in 1877, settled in New York city, and became an associate of the National Academy of Design; is one of the founders of the Society of American Artists; paints both landscape and figure subjects. Among his paintings are *Tombs of the Saints at Bouzareah*; *Italian Boy's Head*; *Italian Girl's Head*: *Narcissus*; *A Nubian Sheik*; *A Quiet Moment*; and *A Chapter of the Koran.*

Satterlee, Henry Yates, D. D.: clergyman; b. in New York city, Jan. 11, 1843; graduated at Columbia College in 1863, at the General Theological Seminary of New York city in 1866, in which year he was ordained deacon in the Protestant Episcopal Church, and became priest in 1867; after serving as assistant rector at Wappingers Falls 1865–75, became its rector; took charge of Calvary church, New York city, in 1882; received the degree of D. D. from Union College in 1882; declined the assistant bishopric of Ohio in 1888; has been active in the interests of the Episcopal Church, especially in the home and foreign missionary work.

Satterlee, Walter: artist; b. in Brooklyn, N. Y., Jan. 18, 1844; studied art privately and at the National Academy, of which he became an associate in 1879; gained the Clark prize at the Academy in 1886. His oil-paintings include *Contemplation*; *Extremes Meet*; *The Convent Composer*; *Good-bye, Summer*; *The Cronies*; and *Fortune by Tea-Leaves.* Among his water-colors are *Solitaire*; *Old Ballads*; *Two Sides of a Convent-Wall*; *The Net-mender*; and *The Lightened Load.* He has frequently sketched illustrations for books.

Sauer, Emil: pianist; b. in Hamburg, Germany, Oct. 8, 1862, and received his first lessons in music from his mother, herself an accomplished musician. When fourteen years old Anton Rubinstein heard him play, and recommended him to study under his brother, Nicholas Rubinstein, under whom he made rapid progress. He made his first appearance in public in 1878 in Germany, and in 1879 went to London. Up to 1883 he made several concert tours. In 1884 he studied again, under Liszt, in Weimar, and in 1885 made his *début* in Berlin. Since then he has played in all the great European capitals. His first appearance in the U. S. was on Jan. 10, 1899, in the Metropolitan Opera-house, New York. D. E. Hervey.

Saunders, Alvin: b. in Fleming co., Ky., July 12, 1817; accompanied his father to Illinois in 1829, where he worked on a farm and received a common-school education; removed to that part of Wisconsin Territory which is now Iowa in 1836, and studied law, but did not practice, engaging in business as a merchant and banker; was a member of the convention that framed the constitution of Iowa in 1846, a State Senator for eight years, a commissioner to organize the Pacific Railroad Company, and was Governor of Nebraska Territory from 1861 until 1867; served in the U. S. Senate 1877–83. D. Nov. 1, 1899.

Saunders, Thomas Bailey: English lawyer and philosophical writer; b. in Alice, Cape Colony, South Africa, Dec. 2, 1860; received his university education at King's College, London, and University College, Oxford, and was made a fellow of King's College, London; spent some years in Germany, and then, returning to England, read law, and was called to the bar at the Inner Temple in 1886; practiced for a time, but gave up the practice of his profession for literature, and devoted himself to the study of philosophical and literary subjects: was appointed secretary of the statutory commission for the reorganization of the University of London in 1898. He has published *Translation of Schopenhauer's Essays*; *The Wisdom of Life*; *Studies in Pessimism*; *The Art of Literature*; *On Human Nature, etc.* (1889–96); *Goethe's Maxims and Reflections* (1893); *The Life and Letters of James Macpherson* (1894); and a *Version of Professor Harnack's Christianity and History* (1896). F. Sturges Allen.

Sauret, sō′rā′, Emile: violinist; b. in Dun-le-roi, France, May 22, 1852, and took up the study of the violin at a very early age, so that when eight years old he played in concerts in Germany, and in 1862 in London. In 1866 he met Wieniawski. Later he traveled with Titiens, Mario, and Bottesini, and made extended tours through Germany, Russia, Austria, Italy, and the U. S. in 1872, 1874, and 1877. He then settled in Berlin, remaining there ten years. He married the pianist Teresa Carreño, being her first husband, but the marriage was soon dissolved and he married again. Saurct's own compositions are very many, and entirely for the violin. D. E. Hervey.

Saussier, sō′syā′, Felix Gustave: soldier; b. in Troyes, Aube, France, Jan. 16, 1828; passed from the military school at St.-Cyr into the infantry Oct. 1, 1850; lieutenant Feb. 25, 1854; captain Aug. 1, 1855; major Oct. 10, 1863; lieutenant-colonel Mar. 6, 1867; after serving in the Crimea, in Italy, in Mexico, and in Africa, was made colonel Dec. 23, 1869; commanded a regiment of infantry in the siege of Metz in 1870, and, having been made a prisoner, escaped and rejoined the Army of the Loire; promoted to be general of brigade Jan. 5, 1871. Elected to represent Aube in the National Assembly, Nov. 16, 1873, he was relieved from his command and took a prominent part in the discussions relating to reorganization of the army. He was called in May, 1876, to the command of a brigade, and on July 6, 1878, was made general of division, and served in Tunis and Algeria. On Mar. 24, 1884, he became commander-in-chief of the army and military governor of Paris. He retired, under the age limit, Jan. 16, 1898, and was appointed a permanent member of the supreme council of war.

Sauzet, sō′zā′, Marc: French deputy and lawyer; b. in Tournon, Ardèche, Feb. 18, 1852; took up the study of law, and received his doctor's degree; was made an advocate of the court of appeals, and a fellow in 1881 of the faculty of law of Lyons, and in 1891 of that of Paris; he was elected as a Republican member of the legislature in 1893 over the Marquis of Tourette, the Conservative candidate. He has been a constant contributor of articles to the *Revue Critique de Législation et de Jurisprudence*, including important studies entitled *Sur la Responsabilité des patrons*; *Le Livret et les Assurances des ouvriers*; *La Personnalité civile des Syndicats*; *La Juridiction des Conseils des Prud'hommes*, etc. (1883–91). F. Sturges Allen.

Savart, Félix: French physician and physicist; b. in Mézières, June 30, 1791; in 1816 he received the degree of M. D. from the University of Strassburg; in 1819 he went to Paris, where he prosecuted extensive researches on the vibrations of solid, liquid, and gaseous bodies, the mechanism of speaking, and the constitution of the organ of hearing; in 1827 was made member of the Académie des Sciences. In 1838 he succeeded Ampère in the chair of Physics at the Collège de France, Paris. His writings appeared as articles in the *Annales de physique et de chémie;* an outline was published in 1827 entitled *Analyse des travaux de M. Savart.* His principal invention was the toothed wheel which bears his name. (See Recording Apparatus, Psychological.) D. in Paris, Mar. 16, 1841.

Scadding, Rev. Henry, D. D.: author; b. in Dunkeswell, England, July 29, 1813; received part of his education at Upper Canada College, where his work earned for him a free course at an English university. He graduated at St. John's College, Cambridge, in 1837, and returned to Canada the following year. There he was engaged in teaching and in organizing the first free church in Toronto. He took his M. A. in 1840, and when he returned to Cambridge in 1852 received the degree of D. D. His publications have been chiefly historical. Among them are *Shakespeare—The Seer—The Interpreter* (1864); *Truth's Resurrections* (1865); *The First Bishop of Toronto, a Review and a Study* (1868); *Early Pioneer Life in Canada* (1887); *Seneca's Prophecy and its Fulfillment*, etc. (1897).

Scalchi, skaal′kee, Sofia: singer; b. in Turin, Italy, June 8, 1852, of a musical family; made her *début* in opera in her fifteenth year, and after singing in the principal Italian cities made a tour of Great Britain; then went to St. Petersburg for five consecutive seasons. Next she sang in Madrid, Vienna, and Warsaw. Then she went to Rio de Janciro, and finally to New York, where she has sung season after season, first in the Academy of Music and then in the Metropolitan Opera-house. She is married to Count Lolli, but retains her well-known name for the public. Her voice is a rich and pure contralto, and she has a very large repertory of operas. D. E. Hervey.

Schaeffer, Nathan C., D. D., Ph. D., LL. D.: educator; b. in Maxatawney township, Berks co., Pa., Feb. 3, 1849; educated in Maxatawney Seminary (now Keystone State Normal School), Franklin and Marshall College, Theological Seminary, Mercersburg, and the Universities of Berlin, Tübingen, and Leipzig; taught in Mercersburg College and Franklin and Marshall College; was for sixteen years principal of the Keystone State Normal School; superintendent of public instruction, State of Pennsylvania, since 1893. C. H. Thurber.

Schalk, Franz: conductor; b. in Vienna in 1863, and entered the conservatory when twelve years old, taking up the violin, and proceeding to counterpoint and composition; made his *début* as a violinist in 1881. In 1888 he was called to Graz, Bohemia, as kapellmeister, remaining eight years, and was then engaged as conductor at the Landes theater, in Prague, as the successor of Anton Seidl. Next he conducted opera and concerts in Berlin. In the summer of 1898 he was engaged by Maurice Grau to conduct the German presentations of opera in New York and London for the season. He signed a ten-year contract, beginning Sept. 1, 1899, with Count Hochberg, director of the Berlin Opera. D. E. Hervey.

Schleswig-Holstein: The Prussian legislature in 1898 voted an appropriation to build further defenses to protect the low western coast of Schleswig and its islands from the invasion of the North Sea. One of the largest features of the work is a breakwater between the small island of Oland and the mainland, which with other works is expected to keep the sea within bounds for many miles. The new works are to give complete protection to the Halligen islands, which rise only a few feet above high water. The encroachments of the sea had compelled the inhabitants to live in small cabins on artificial mounds, and many had sought refuge on the mainland. Since the Middle Ages the sea has gnawed the coast away to a depth of 20 miles, and the existing islands are merely the ruins of what was a part of the mainland. In six hundred years Schleswig has thus lost a third of its area.

Schmid, Joseph: educator, pupil and collaborator of Pestalozzi; b. in Tyrol in 1786, his people being honest peasants. In 1801, at an uncle's expense, he was placed in Pestalozzi's institute at Burgdorf, where after two years he became teacher of mathematics. He followed the school in its changes until it settled at Yverdun, gradually winning the highest place in Pestalozzi's esteem and a dominant influence in the direction of the school. He published a considerable number of works devoted to the application of Pestalozzi's ideas to the teaching of mathematics. In the difficulties that broke out in the school between Pestalozzi and his teachers, Schmid remained faithful to his master;

but finally, in 1810, he withdrew from the institute, publishing soon afterward a brochure in which he publicly explained the reasons which had led him to this step. The publication of this work has been characterized as an act of black ingratitude toward Pestalozzi, but it seems that Pestalozzi did not so regard it, and those who speak of it in such unqualified terms certainly never have read it. After traveling in Austria, South Germany, and Switzerland, Schmid became head of a public school in Bregenz, Bavaria, and in 1815 re-entered the Yverdun institute, now threatened with ruin, and from that time to 1827 his work was most intimately united with that of Pestalozzi in the institute. After the death of Pestalozzi Schmid lived in Paris, engaging in various professional and literary projects, but occupying no prominent position. D. in Paris, Feb. 14, 1851. Schmid was the most famous of Pestalozzi's assistants, and about his connection with and influence upon the institute at Yverdun a vast amount of controversy has taken place. That he was a man of great sincerity and enthusiasm there can be little question. He was almost totally uneducated, in the accepted sense of the term. Had he been favored with opportunities for a liberal education, no doubt much of the rudeness and lack of taste with which he has been charged, perhaps justly, would have disappeared. But at any rate he enjoyed the confidence and esteem of Pestalozzi in a far higher measure than any other of his associates. C. H. Thurber.

Schmidt, Karl: educator; b. in Osternienburg in 1819; studied in the gymnasium in Koethen and at the Universities of Halle and Berlin; became in 1845 professor at the gymnasium in Koethen, and then was for a time pastor, but returned and taught in the gymnasium from 1850 to 1863. In the spring of 1863 he was nominated director of primary education in the duchy of Saxe-Gotha, and also director of the Teachers' Seminary in Gotha. The energy with which he set to work to reform the schools of the duchy undermined his health, and he died in Gotha, Nov. 8, 1864. He was the author of a considerable number of pedagogical works, the most important of which is his *Geschichte der Pädagogik* (History of Pedagogy), first published in four volumes in 1862, and in several revised editions since that time. C. H. Thurber.

Schönefeld, Henry: musician; b. in Milwaukee, Wis., Oct. 4, 1857, and began the study of music at the age of seven years. He became proficient on both violin and piano, and when he was fifteen he had composed a trio for piano, violin, and violoncello. In 1874 he went to Leipzig and stayed there three years, studying and composing. Then he went to Weimar, and returned to his native country in 1879, settling in Chicago. At the competition of 1897 at the National Conservatory of Music, New York, he won the prize of $500 for a symphony, which was performed by the orchestra, conducted by himself. He has composed much for orchestra, piano, violin, and voices, both solo and concerted. D. E. Hervey.

School Diseases: a term used rather loosely to indicate diseases prevalent among school-children; more accurately used to denote diseases caused or specially aggravated by the conditions of school life. As it is impossible to determine how many of the former are included in the latter, and as disease among school-children, whatever the cause, affects the welfare of the school, the investigations thus far made have generally had regard to school diseases in the broader sense.

Contagious Diseases.—The school does not cause contagious diseases, but it spreads them. Observation has given manifold evidence of this, and statistics could be cited if it were necessary. For example, Körösi found during the three quarters of the year when the school was in session an average of 4,000 to 4,400 cases of measles per month, but for the vacation month of August only 780 cases; for the month of September, the first of the school year, only 639, and only 1,695 for October. Taking the four quarters of the year, there were for the three months of vacation only 3,054 cases, while for the first quarter of the year there were 11,865; for the second, 13,258; for the third, 13,147. In part this might be accounted for by the influence of the seasons; but further proof of the causal relation between school attendance and the spread of measles was found in the fact that when the time of vacation was changed, as occurred one year on account of the cholera, the period of minimal number of cases of the diseases was altered correspondingly. Similar statistics could be cited for other contagious diseases. Scarlet fever and diphtheria especially are spread by the school. But while the conditions of school life favor the spread of such diseases, with competent medical supervision the school affords also favorable opportunity for checking disease. With all the children collected inspection is easy, and cases are detected and isolated in the early stages that otherwise might pass unnoticed until a whole neighborhood was exposed to infection. In regard to the period that children suffering from different diseases should be excluded from the school there is some difference of opinion. The only safe rule is that no child recovering from a contagious disease should be readmitted except upon a certificate by competent medical authority that all danger of communicating the disease is over. Conservative authority places the minimum for several of the more common diseases as follows: Whooping-cough, 30 days; mumps, 3 weeks; rash, 14 days; scarlet fever, 6 weeks; diphtheria, 7 weeks; in all cases reckoning from the first appearance of the disease. In case of measles, scarlet fever, and diphtheria, as well as smallpox, the brothers and sisters of the patient should also be excluded from the school; some authorities demand this in case of whooping-cough and certain other diseases. In cases of diphtheria, as the Klebs-Loeffler bacillus, the recognized cause of the disease, may remain in the nose or nasopharynx for some time after convalescence, no child should be readmitted until after culture tests indicate that danger of communicating the disease is over.

Some only of the States have special laws concerning contagious diseases in the school, and legislation varies in the different States. The Massachusetts law represents a minimum demand. It is as follows:

"The school committee shall not allow a child who has not been duly vaccinated to be admitted to or connected with the public schools."

"The school committee shall not allow any pupil to attend the public schools while any member of the household to which such pupil belongs is sick of smallpox, diphtheria, or scarlet fever, or during a period of two weeks after death, recovery, or removal of such sick person; and any pupil coming from such household shall be required to present to the teacher of the school the pupil desires to attend a certificate from the attending physician or board of health of the facts necessary to entitle him to admission in accordance with the above regulation." The Ohio law rightly includes in the list that excludes from the school, "measles, whooping-cough, or other dangerous communicable diseases." As regards tuberculosis, now recognized as a contagious disease, there is no special school legislation, and authorities differ; but there appears to be ample reason for excluding pupils suffering from this disease, although provision should sometimes be made for their instruction in special classes.

Chronic Diseases.—The first investigation of the health of a large number of school-children was made by Hertel, and the results published in 1881. This embraced reports of 3,141 boys and 1,211 girls in the higher schools of Copenhagen, mostly from the well-to-do classes. Printed lists of questions, inquiring in regard to the age of the pupils, class, number of hours of school work, home study, state of health, hours of sleep, capacity, etc., were distributed, and answered by parents and teachers. The result showed 31·1 per cent. of the boys and 39·4 per cent. of the girls to be suffering from chronic diseases, not including defects of sight and hearing. Children suffering from acute diseases were reckoned among the well. In 1882 commissions were appointed both in Denmark and Sweden to study the subject. The two commissions worked by much the same plan, and the results, so far as disease is concerned, were as follows: The Danish commission reported on the health of 17,595 boys and 11,646 girls, partly from the higher schools, partly from the people's schools, including pupils from schools in the country as well as from Copenhagen. Of the total number of boys 29 per cent. were found ill; of the girls, 41 per cent. The report of the Swedish commission concerned the health of more than 18,000 pupils of the higher schools. Axel Key, a distinguished Swedish physician, prepared the report for this commission, and he gives the following statistics: The reports of 11,210 pupils of the higher boys' schools were studied. Of these 44·8 per cent. were afflicted with chronic disease. The largest percentage of illness was found on the classic side. Here the percentage of illness amounted to one-half, 50·2 per cent. In the common course, as it is called, the percentage was 40·9; in the real course, 39·6. In the other schools the proportion was similar. Of 3,072

pupils in the higher girls' schools the percentage of illness was 61·7. The main features of the curves of disease found by these different investigators is significant. The Danish commission found that upon entering school 20 per cent. of the boys were ill. The curve of illness rises rapidly to 28 per cent. in the eighth year, then slowly to the tenth year; then there is a small plateau between the tenth and eleventh years; then a rise till the twelfth year, when the maximum is reached with 31 per cent. Then there is a slight fall till the sixteenth year, then a slight rise again. The same general course of the curve appears more or less marked in each investigation. The curve for girls is similar in its main features. Whatever the cause, it is a noteworthy fact that half of the girls (51 per cent.) were chronically ill in the thirteenth year, when just on the threshold of puberty.

These investigations in Scandinavian schools are based on 50,000 children, and, while these results might not be paralleled in other countries, they suggest grave questions in regard to the conditions of school life. Scrofula, anæmia, and habitual headache were the most frequent diseases, according to the Danish commission. In Sweden, anæmia, headache, and nose-bleeding formed the majority among the boys. Among the girls, anæmia, headache, loss of appetite, spinal curvature, and nervous diseases were frequent. These are, with the exception of scrofula—of which a large percentage was found by the Danish commission, although but few cases by the Swedish commission—diseases that might naturally be expected to be caused by the conditions of school life. How far the school was responsible is not evident; but it does seem clear that the conditions of school life, together with the home study and inadequate supply of sleep, were largely responsible. The Swedish commission found, further, that the time devoted to sleep decreased from nine hours to seven hours, or a trifle more in the highest classes. Prof. Key found in Stockholm that those children who slept less than what he deems a normal period (namely, ten to eleven hours for younger children, eight to nine hours for older ones) showed in the upper classes 5 per cent., in the lower 8 per cent., more cases of illness than the others. The children investigated by the commissions were also weighed and measured, and it appeared that in general periods of maximum rate of growth are periods of maximum power to resist chronic diseases. This is specially noteworthy, according to Key, at the beginning of puberty. With the marked increase in the rate of growth at this time, there was a decided decrease in the percentage of disease. Unfortunately, no similar investigation of the health of large numbers of school-children has been made in the U. S.; but in regard to the point last mentioned corroborative evidence has been furnished by Dr. Hartwell's study of the death-rates of Boston school-children. He has found the death-rate least at those periods when the growth-rate is greatest.

The number of pupils with defective vision has been found to be very large. The first test of the vision of a large number of school-children was made by Dr. Cohn in Breslau some thirty years ago. He found an average of about 30 per cent. of myopic eyes, and did not make tests for astigmatism. Many other investigations made since in Germany and other European countries have shown a large number of children with defective vision. Key in Sweden found that among pupils who took the Latin course the percentage of near-sighted pupils increased from 6·1 per cent. in the lowest classes to 37·3 in the highest. The Danish commission found an increase in the classical course from 14·7 per cent. in the lowest class to 45·5 per cent. in the highest. Tests made in the London elementary schools, under the direction of Carter, showed only 39 per cent. with normal vision, and it was found that more than half of the defectives suffered from astigmatism. The number of children with defective eyes in the U. S. seems to be less than in Germany, but a number of investigations have been made in the U. S., and a large percentage of defective eyes has been found. Allport, for example, who has tested the eyes of 23,000 children in the Minneapolis schools, found more than 30 per cent. defective, exclusive of those already wearing glasses. Special stress has been placed upon the fact that the percentage of myopia seems to increase from the lower to the higher grades of the school. Especially the Continental investigators have found that the number of emmetropic or normal eyes decreases from the lower to the higher grades: that likewise the number of hypermetropic eyes (the hypermetropic eye being merely an undeveloped eye, and regarded by some as the normal condition of the eye in infancy) decreases from grade to grade; and that, conversely, the number of myopic eyes increases from the lower to the higher grades. While this seems to be demonstrated for the German schools, it is not universally true. Carter, for example, did not find any such progressive increase in the London elementary schools. Two theories are in conflict as to the cause of myopia (or, more accurately, two classes of theories): one, the older and more widely accepted, lays the blame chiefly upon the school and unhygienic conditions of work; the other, which has recently come into prominence, finds the cause in innate structural peculiarities of the eye. The former is held by Cohn and others; the latter by Stilling, Schnabel, Carter, and others. Both innate structural peculiarities and the school must probably be looked upon as causes. Which is chief we can not say. But the influence of the school as one factor can hardly be denied, in view of the great increase in myopia from the lower to the higher grades. The evidence, of course, is not conclusive. The crucial test would be to investigate the eyesight of a large number of children outside the school. If a similar progressive increase in myopia were found among them, the result would indicate that some other cause than the school must be sought. If no such increase were found, then it would appear that the conditions of school life were the chief cause. It is needless to say that it is difficult to make such an investigation. Some data of this kind have been obtained. The examination of German recruits indicates that those who have been to school least show a smaller percentage of defective eyes. But which of the various theories in regard to the cause of myopia will be substantiated by further investigation remains to be seen. The effect of recent studies and discussions, however, has been to modify opinion very largely in regard to the influence of the school in producing this defect. How far innate structural peculiarities are the cause of myopia, and to what extent it may be caused without such predisposition, is not clear. For practical purposes it does not matter. It does appear that something can be done to retard the development of myopia, and there is no reason to relax stringent hygienic rules in regard to care of the eyes in school.

The number of school-children with defective hearing is also large. Many investigations have been made in different countries. An examination of the hearing of children in the Prussian secondary schools showed only about 2 per cent. with defective hearing; but the tests were made by the teachers, and the pupils in these schools are largely a select class. Most investigators have found 20 per cent. or more of the children defective in one or both ears. Bezold, perhaps the best authority on the subject, in a test of 1,918 children in Munich, found 25·8 per cent. with defective hearing. Studies in the U. S. and in Europe have shown a large percentage of defective teeth among school-children. Pedley in England found among 3,145 children that 77·5 per cent. had defective teeth. Röse, in an investigation of the teeth of German school-children, found the number with defective teeth varied from 79 per cent. to 98·7 per cent. as the regions were rich or lacking in lime. At the international dental congress in Copenhagen a few years ago a report was made to the effect that the number of school-children suffering from defective teeth in civilized countries amounts nowhere to less than 80 per cent., and rises to 98·5 per cent. The prevalence of nasal diseases in the school has been shown by Bresgen, Kafemann, Chappell, and others. Dr. Chappell tested 2,000 children in New York city, 645 of them from a grammar school, the remainder from asylums and other places. Of these children, 1,231 were found to have some nasal defect; 60 were suffering from adenoid growths. The frequency of this disease did not seem to be determined by social conditions. There were as many cases among the children of the grammar school as among those from the asylums; but the cases were more frequent among the boys than among the girls. Of 1,292 boys 49 had adenoids. Among the 708 girls there were only 11 cases. Knowledge of this disease is of special importance to the teacher, as the adenoid often causes deafness and also interferes with the nutrition of the brain, causing inattention, loss of memory, and stupidity. Many cases of marked improvement in mental ability following the removal of the adenoid growth have emphasized the necessity of special examination of dull pupils that show the characteristic symptoms, among which are impaired nutrition, the dull, sleepy, inquiring look, and the habit of keeping the mouth open.

Nervous Diseases.—The most important investigations of nervous disorders among school-children have been made in European countries. From investigations of 100,000 English school-children Warner has found 11·8 per cent. of the boys and 8·8 per cent. of the girls suffering from nervous disorders of various kinds. A still higher percentage has been found by several Continental investigators. There is some evidence of a decided increase from the lower to the higher grades. Nesteroff, for example, found in a Moscow gymnasium that the number suffering from nervous disorders was much larger in the higher grades, in case of the day pupils the increase being from 8 per cent. in the preparatory class to 69 per cent. in the highest class. The number of cases studied, however, was relatively small, and the conditions perhaps unusual. Many of the nervous disorders of school-children are neuroses of development, and would occur whether or not the pupils went to school; but such disorders are often aggravated by the conditions of school life, and in some cases can be directly traced to the school as a cause. Of special disorders it may be said that idiocy, insanity, epilepsy, and other more pronounced forms of nervous disease are relatively rare among school-children. Children afflicted with these diseases are usually kept at home or sent to special institutions. In all cases they should be excluded from the school. Headache in its various forms has been found very common among school-children. Virchow as long ago as 1869 noticed its frequency, and many investigators since have found from 11 per cent. to 80 per cent. of the children suffering from it. Some investigators, holding the school directly responsible, have called the disorder *cephalalgie scolaire*; but it is often incident to some neurosis of development, and diseases of the nose, ears, teeth, and eyes are frequent causes. Investigation of several forms of nervous disorder—especially chorea, stuttering, and hysteria—among school-children indicate the danger of spreading such diseases by psychic contagion. Especially is this true of certain forms of hysteria. A number of epidemics of this order have been reported where it became necessary to close the school. The studies and observations made indicate the necessity of excluding from the school pronounced cases of stuttering, chorea, hysteria, and epilepsy.

Among the most important of recent studies of school life in relation to health should be mentioned that made by Dr. Schmid-Monnard, who has investigated the growth and health of children at Halle, in Germany. More than 8,000 children were studied by him—5,100 boys, 3,500 girls. Some of the children attended school, some did not. Among the conclusions from his study in regard to the influence of school life on the physical condition and health of the children are the following: That in the first period of school life directly after entering school there is a retardation of the rate of growth both in the weight and height; that acute diseases appear most frequently in the first school years, and that, in general, they are more frequent and more permanent with boys from the less well-to-do families; that acute diseases occur more frequently where there are unsatisfactory arrangements for lighting and ventilation; that the amount of chronic disease is greater among girls than among boys; that the number of pupils with chronic disease increases in the course of the year, more sick children leaving the school on an average than entering it; that chronic diseases are specially frequent where instruction extends over the whole day, and where the pupils have little or no free time for going out of doors; that the amount of chronic disease goes hand in hand with the amount of work and with unfavorable division of the work, also with shortening of the time of sleep and with increase of the elective work of the pupils—hours in music and the like; that in the thirteenth and fourteenth years of life there is a decrease in the amount of disease among the boys and girls of the middle schools which have little home work, but no such decrease is found in the higher boys' and girls' schools with greater amount of work.

Thus there is considerable evidence to show that the school is a factor of considerable importance in determining the growth of school-children. It appears that the rate of increase in weight is affected more by the school than growth in height, the latter being determined chiefly by other factors. It seems natural enough that this should be so, because the increase in weight is so largely dependent on nutrition and the like, and the conditions of school life affect nutrition; and then, too, the conditions are less favorable for exercise. It appears also that prolonged school work is detrimental to health. This has been well shown, too, by Schmid-Monnard's results, since he found that the percentage of disease among children who attended school in the afternoon as well as in the forenoon was much greater than in case of those who had no afternoon school work.

No extended investigations concerning the health of school-children have been made in the U. S., but observation and the minor investigations that have been made indicate that a large percentage have defective senses or suffer from chronic diseases. It appears from observation and special investigation both in the U. S. and in Europe that one-third of the pupils in school are likely to have defective eyes, that a fourth are likely to have defective hearing, and that from 12 to 50 per cent., according to grade and locality, suffer from nervous and other disorders. The question of the responsibility of the school for this large amount of disease has been much discussed. The tendency in so many cases for the curve of disease to rise rapidly immediately after the children enter school, and then continuously from the lower to the higher grades, is noteworthy; but it is not clear that the curve of disease would not have risen if the children had not attended school. It is impossible justly to divide the responsibility between the home and the school. But this is unessential. The school is clearly one factor; and the chief causes of ill health in the school appear to be, on the one hand, uncleanliness and bad air, and, on the other, bad methods of study and instruction. The competition, the marking system, examinations, punishments, and the hurry and strain often induced by teachers who feel compelled to produce certain prescribed results—all these things tend to produce nervous disorders and to lay the foundation for other diseases.

Whatever the cause of the illness among school-children, the fact remains that a large proportion of them are sickly, and this makes special regard for hygiene necessary. Courses of instruction, periods of study, and methods adapted to pupils who are strong and well may be injurious to the weak. To determine the fitness of individual children for school work, to test physical and mental ability for certain tasks, and to judge of the effect of given conditions upon the health, demands some degree of expert knowledge. To meet this demand two plans are advocated by different authorities. One is to require special knowledge of school hygiene as a part of the professional equipment of teachers, requiring perhaps from a physician a certificate of health when children enter school, but leaving the general supervision of the health of the school to the teacher. The other plan provides for systematic medical inspection by regular physicians.

Medical supervision of the schools has been strongly advocated by physicians for many years. Dr. Hermann Cohn, of Breslau, has fought for it for twenty years. In 1877 the hygienic congress in Nuremberg advocated it, and many scientific and medical congresses since that time have taken similar action. Medical supervision has been tried in Sweden, France, Belgium, Austria, and several other countries, in the German cities of Leipzig, Karlsruhe, Dresden, Wiesbaden, Darmstadt, Berlin, etc., and in some American cities. The duties of a school physician, as they are prescribed by law in some European countries, illustrate the scope of the plan. The law in Austria-Hungary, for example, requires the school physician to investigate the school buildings, walls and surroundings, playgrounds, the floors, doors, windows, stairways, corridors, and the like. He tests further the air and the drinking-water, has charge of disinfecting the school when necessary, and so on. When the children enter the school he tests their health, giving a physical examination, noting the condition of the heart and lungs, any tendency to spinal curvature, any symptoms of contagious diseases, nerve signs, and the like. He tests the eyes and ears, and examines the teeth, hair, skin, etc. Further, when the physician has reason to suspect that the pupils live in an unhealthy home, or are not properly fed, he causes the director of the school to look after the parents or guardians in this respect. He has supervision of the plays and sports of the pupils, baths and swimming-tanks, etc.; and he reports each year to the director in regard to the hygienic condition of the pupils.

The advantages of having a school physician have been shown in many places; but frequently the success has been only partial, because physicians busy with their regular practice, or lacking knowledge of school hygiene, have been employed; and often the number of children—4,000 or more in Berlin—allotted to one physician has been too

large. In no country has the problem of health supervision been satisfactorily solved. There is a growing demand, however, for greater regard for hygiene in the schools. Periodic tests of the physical condition of the pupils are now deemed necessary by the best authorities. Tests of the senses are being made. A new law in Connecticut requires that the eyes of all school-children shall be tested. As the state requires children to attend school, it is maintained that it should safeguard their health. Hence it seems essential both that teachers should be instructed in school hygiene by prescribed courses in all training schools and that there should be medical inspection by competent physicians.

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WM. H. BURNHAM.

School Gardens: As early as the fourteenth century institutions were found in a few cities of Italy (for instance, in Salerno and Venice) in which plants from all the parts and climates of the world were raised or cultivated for purposes of education and the enhancement of science; but these institutions, called *botanical gardens*, did not come into general use until natural science experienced the revival that astonished the world by its suddenness and brilliant results. The wealthy cities of Italy, led by Ferrara, vied with each other, early after the revival, in establishing such gardens. The universities of France and Spain followed this example. It is true the establishment of a botanical garden in Paris at the close of the sixteenth century had its cause in the trivial desire to furnish new floral designs to the embroiderers of court gowns. Not until 1626 was the garden transformed into an institution for scientific purposes, in which most plants of the world were raised. Later it received the name "Jardin des Plantes." In Germany a lively interest in botanical gardens was manifested during the closing decades of the sixteenth century. Their establishment was usually contemporaneous with the foundation of universities. At present no German university is without a botanical garden that furnishes the material for instruction in botany, biology, and physiology, and such gardens are frequently also used as experimental stations for raising and cultivating agricultural plants.

In view of these facts, it seems curious that it did not occur to any one to demand such gardens for lower schools. The first who expressed the idea was Comenius, who said that every school should have a garden in which "the pupils may let their eyes 'graze,' by watching the trees, flowers, and herbs." He recognized in the school garden the means of awakening and promoting the desire for knowledge. Pestalozzi also demanded that the young, purely for purposes of education, should be occupied in field and garden. Fröbel laid much stress upon having gardens for the infants' pleasant occupation. He even called his institutions for infants *Kindergärten* (children's gardens). But the school garden as a means for instruction in horticulture, agriculture, and natural history (chiefly botany) in the lower schools is an idea of rather recent origin, and one that is not well understood even at the present day.

Sweden, of all civilized countries, is the one in which the school garden is found in general use. The leading authorities in that country have recognized the fact that the elementary school may lend its aid in upbuilding national wealth by offering practical instruction in some branches of horticulture and agriculture. In 1876 Sweden had 1,602 school gardens; in 1881 this number had increased to 2,000. At present it is safe to say that there is scarcely an elementary school in Sweden without a garden.

The considerable wealth of the rural population of Belgium arises from the cultivation of vegetable gardens for the markets of the numerous cities of that densely populated country, a state of affairs which is chiefly attributable to the establishment of school gardens and the systematic and practical knowledge gained in them by the children.

Since 1885 France has given special attention to the introduction of instruction in agriculture into primary schools. In Switzerland, since 1885, the federal Government has made appropriations annually for maintaining school gardens. In the latter country the utilitarian view has been kept in the background and pedagogical considerations have dictated both the establishment and management of these gardens. Austria, in 1869, by imperial law, introduced instruction in agriculture into the normal schools, and ordered the establishment of school gardens for every country school, and in 1870 decreed that instruction in natural history in the elementary schools should be given in connection with practical exercises in the school gardens. This made the establishment of such gardens a necessity, and the result of the movement in Austria has been most gratifying. The states of Bavaria and Oldenburg have been particularly prominent in encouraging school gardens in the German empire; but such gardens are now common everywhere in Germany. While in the U. S. vast amounts of money are appropriated yearly for use, in one way or another—largely by scattering seeds—for promoting interest in agriculture, the matter of direct education of the pupils, through the school, to a greater knowledge, interest, and capacity in relation to agricultural activities has been astonishingly neglected. "Much the largest class of the workers of this country is engaged in agriculture. The environments of their children are rural. The rural school should aim especially to make country life more attractive and beautiful, and should pay more attention to rural industries. Every normal school should have, as a means of instruction, a school garden, planned and conducted not merely to teach the pure science of botany, but also the simple principles of the applied science of agriculture and gardening, and every rural school should also have its garden, through which the training of the normal school may reach the home." See *Report of the U. S. Commissioner of Education, 1889–90*, vol. i.; *Educational Review*, Mar., 1889; *Report of the Committee of Twelve on Rural Schools*.

C. H. THURBER.

School Hygiene: the art of fostering the normal functioning and development of the child's organism so far as determined by the conditions of school life. According to this broad conception school hygiene is concerned with every aspect of the school—even curricula, methods, and discipline—so far as it may affect health. It is based upon general hygiene and upon the physiology and psychology of development. Child hygiene differs from adult hygiene because the child's body is a growing organism. Its special characteristic is that it considers the effect of school environment and all educational conditions and methods with regard to their effect on a growing organism. The child is a different creature from the adult. The proportions of the body are different in the two. The pulse-rate is not the same; respiration is not the same; the constituents of the body are not the same. Besides the more obvious physical differences there are great differences in the nervous system, both anatomical and functional, a large part of the child's brain, as shown by the investigations of Flechsig, being "unripe" at birth. In general the child's organism is uneven, unstable, provisional. Many errors in hygiene have resulted from ignoring the obvious differences between the child and the adult.

It is just because a child's organism is in process of development that such questions as that of the period of study, amount of sleep, posture during school exercises, care of the eyes, and the like are of special importance. Thus domestic hygiene and school hygiene are the most important chapters of special hygiene. And during the last thirty years the whole environment of the child in school has been studied with regard to health, and a very rich literature has accumulated relating not only to school sanitation, but also to the wider field of school hygiene, including studies of growth and development, the senses, mental activity, and the hygiene of instruction in the different school subjects.

The Schoolhouse.—The site for the schoolhouse should be chosen carefully. The grounds should be well drained, free from foreign admixtures, pervious to water and air, the soil natural, not worked over by the hand of man. The best soils are gravel, sand, sandy clay, and marl containing lime and dolomite. The more sand the soil contains and the less of clay the more suitable it is. The ground should be level, there should be some slope to facilitate drainage, the space should be as large as possible but free, and, if possible, somewhat elevated in order to admit light from all sides. There should be no large amount of ground-water, and tests by expert chemists and others should be made if there are no adequate reports in regard to the nature of the soil. The locality should be removed from high buildings, noisy industries, disagreeable exhalations, markets, hotels, barracks, and the like. In the country a site should be chosen where there are no swamps, ponds, or standing water in the neighborhood. The size of the ground depends upon the kind of school, but in determining it space should be provided for a playground, at least 3 square meters for each child; and if there is no gymnasium, for a covered open space. The yard should be so paved that it will dry very quickly after a rain. An ideal ground contains a school garden as well as playgrounds. In choosing the site the question of lighting the rooms as well as ventilation should be considered. All the schoolrooms must have sufficient light. The best frontage for the schoolrooms is toward the southeast, east, and northeast; toward the south is good in winter; toward the west is not so favorable, being in summer too hot, and exposed to rain and snow. Position toward the north and northwest is deemed unfavorable on account of the cold and tendency to moisture. But such rooms can be used for drawing, and as anterooms and the like.

The plan of the schoolhouse must be determined by considerations of climate, locality, kind of school, etc. In general it may be said that school buildings should not be more than two, or at the most three stories high. In case of very large buildings they may advantageously be built around large open quadrangles like those of the Lycée Janson de Sailly in Paris. The entire building should be undercellared, and the cellar should be thoroughly ventilated, the floor cemented or asphalted, and isolating layers should be used to prevent moisture. The lower floor should be at least a foot and a half above the surface of the ground. The walls should contain vertical air-chambers, and the floors and ceiling sound-deadening layers. The roof should be fire-proof; the halls large; the stairways wide, light, ventilated, broken by landings, and of fire-proof material when possible. The steps should not be more than 8 inches high, and hand-rails should be provided on both sides. The material for the building should be dry, solid, and as little hygroscopic as possible, and the woodwork sound and well seasoned. The doors should be noiseless, open outward, and the windows large and simple in their adjustment. Ample fire-escapes in large buildings must be provided. Every new building should be thoroughly dry before it is occupied by the children. It is recommended that a new schoolhouse should not be used for at least six months after completion. The surroundings of the schoolhouse should be arranged with regard to keeping the house as clean as possible. The approach should be of concrete or paved, and according to some of the newer plans the entrance is through a court covered with gravel or concrete, in order that as little dust as possible may be carried into the building by the pupils. Separate, well-ventilated rooms should be furnished for wraps, umbrellas, etc., and where possible individual lockers. Outbuildings and water-closets should be the best possible and thoroughly ventilated, the plumbing the same for the schoolhouse as for other buildings.

The size of the separate schoolrooms must be determined by the number of pupils and the grade. The length of the room must be determined by the possibilities of seeing clearly what is written on the blackboards and hearing by the teacher and pupils. For ordinary purposes of instruction in the lower grades, the length may be about 30 feet; the breadth not more than 20 feet, in order to insure sufficient light; the height at least 12 or 14 feet. The walls should be smooth in order to retain as little dust as possible; the ceiling smooth and of pure white color; the floor of the best possible material, at least hard, splinterless, oiled boards, in order that they may be easily cleaned.

The Air.—A large number of investigations in different localities in Europe and in the U. S., notably in the cities of Boston, Philadelphia, and Buffalo, have shown that the air of schoolrooms is usually bad. There is a consensus of opinion in regard to the ill effects of bad air. Both statistics and observation have given evidence that continued sojourn in rooms where the air is vitiated is very injurious to health; and, further, there is evidence that bad air greatly decreases the ability to do mental work. The various impurities which are likely to be found in the air of a schoolroom may be roughly classified as follows: First, CO_2 when in excess of 4 parts in 10,000; second, solid particles of dust from the hair, clothes, wood, coal, chalk, and the like; third, organic matter from the lungs, skin, etc.; fourth, living micro-organisms of various kinds; fifth, bad odors, especially from clothing, bodies, mouths, and teeth of the children; sixth, small quantities of carbon monoxide and other impurities from the heating apparatus. There is no consensus of opinion at present in regard to which of these various impurities is the chief cause of the ill effects experienced in unventilated rooms. The CO_2 used to be regarded as the injurious element. It is still taken as the most convenient gauge of the other impurities, but is not itself deemed injurious in the small quantities in which it is found, even in the worst-ventilated rooms. That it is not poisonous in small quantities has been shown by numerous experiments, notably by that of Haldane and Smith, who confined a person in an air-tight chamber 6 ft. 2 in. high, 2 ft. 11 in. wide, and 3 ft. 11 in. long. When a person remained in this chamber until the CO_2 was from 10 to 20 times as great as in the most crowded and worst-ventilated public buildings, and when the air was vitiated to such an extent as completely to prevent a match from burning, it had no appreciable effect upon the subject of the experiment. Again, the organic matter supposed to be contained in expired air was deemed specially injurious. In 1887 Brown-Séquard and D'Arsonval reported experiments which seemed to demonstrate the existence of a volatile organic poison in expired air. This injected into rabbits caused death. Further experiments seemed to corroborate this view. But recent experiments by Lehman and Jessen, by Haldane and Smith, and others, notably those by Dr. Bergey, working under the direction of Drs. Billings and Mitchell, have made it doubtful whether there is any organic matter in exhaled breath that is harmful. The Brown-Séquard and D'Arsonval experiments, upon which recent theories in regard to expired air have been based, have been repeated by these investigators with negative results. There is plenty of organic matter in schoolroom air from the skin, etc.; but what has been supposed a chief source of such impurity—namely, the expired air—it now seems that we may rule out. Other impurities, especially some which have often been neglected—such as dust, bacteria, and bad odors, together with excessive moisture and the products of overheating and the diminution of oxygen—are probably the chief sources of danger and of discomfort in unventilated rooms; and, consequently, it appears that some of the principles upon which our theories of ventilation have been based are doubtful, and most of the handbooks on school hygiene need to be revised, in the light of these recent investigations.

Heating and Ventilation.—The problem of ventilation can not be considered apart from that of heating. Both are technical subjects of great complexity. (See VENTILATION.) But the general principles that specially concern school heating and ventilation may be stated briefly. The method of heating must be determined largely by local conditions. But whether it be by stove, hot-air furnace, hot water, or by steam, the aim is to furnish and distribute an amount of heat sufficient to warm all parts of each schoolroom, and with constant change of air to maintain a uniform temperature of 68° or 70° F. The air brought into the schoolroom must be pure, the sources of contamination reduced to a minimum, and the air of the room constantly diluted to a degree well within the limits of danger to health.

Considering recent studies and the views of experts, the general rules that lie at the foundation of school ventilation may be summarized as follows:

(1) While at present there is some doubt about the injurious elements in expired air, there is no reason to diminish the present standards of air-supply. From 2,000 to 3,000 cubic feet of fresh air per pupil should be brought into the schoolroom each hour; 30 cubic feet per minute is the minimum. The cubic air-space per pupil should be 200 to 300 cubic feet; never less than 200 cubic feet.

(2) Sources of contamination that have often been disregarded—dust, bad odors, excess of moisture, overheating, and the like—appear to be of very grave significance. The CO_2 is the most convenient gauge of the various impurities. The maximum limit of impurities is represented by 10 parts of CO_2 in 10,000. All practicable means of removing the sources of contamination of the air should be adopted. One of the most important means of avoiding these sources of danger, however, is a good system of heating and ventilation.

(3) The system of heating and ventilation should be determined beforehand, and incorporated in the plan of the building. The Massachusetts law provides that architects or others who prepare plans for or superintend the construction of buildings of this class shall include in them the plans for the ventilation, all of which shall be filed with the inspector of the district in which the building is located. The plans, after having been approved, can not legally be changed without obtaining a new certificate of approval. The contractor should sign a contract like the following:

"To guarantee to furnish at least 30 cubic feet of fresh, properly warmed and circulated air per minute for each pupil, allowing (any given number, say 50) pupils to each room, and to remove an equal quantity of vitiated air per minute for each pupil. To maintain a temperature of at least 70° in each room in the coldest weather, the temperature not to vary more than 3° between any two points in the room on the same level at the same time. The whole to be done subject to the approval of the State inspector of public buildings for the district in which the building is situated; said inspector to examine and give a written approval of the work before more than half the contract price is paid to the contractor or his agent."

(4) The ventilation should not be subsidiary to the system of heating. It may be either by the so-called gravity system, usually by aspirating chimneys, or mechanical means may be used to exhaust the air. The latter method has the advantage of permitting a regulation of the amount of air exhausted.

(5) The fresh air must be warmed before being introduced into the schoolroom. The temperature of this fresh air as it comes into the room should not, as a rule, much exceed 100° F. This indirect system of heating may be combined with a direct system where climatic conditions make this necessary.

(6) The warm-air supply ducts should be large, at least 1 square foot in area for 10 pupils.

(7) In regard to the introduction and exhaustion of the air, every room presents its own problem, but there is a general consensus that in an ordinary schoolroom the inlet should be about 7 or 8 feet above the floor on an inner wall or corner of the room, and that the outlet should be near the floor on the same side.

(8) The attempt should be made to supply adequate means of ventilation without opening windows; but investigations indicate that, except with the best systems of ventilation, it is impossible to have pure air in a schoolroom without draught ventilation from windows and doors. This, however, should be at recess, and chiefly at the close of school. The importance of this draught ventilation is emphasized by recent investigations, which indicate the necessity of removing the dust.

(9) The same principles should be followed in heating and ventilating a small schoolhouse of one room as in case of larger buildings. The stove should be surrounded with an air-space inclosed by a jacket of sheet iron. Fresh air should be introduced into this space through a flue connecting with the outer air. The bad air should be exhausted by an outlet into the chimney near the floor.

(10) As many teachers are obliged to teach in schoolhouses that have no proper means of heating and ventilation, they should learn to make the best of bad conditions. This can be done by greater regard for cleanliness, and by considering the general laws of air-currents. Each room presents each day a new problem in ventilation, to be solved only by considering many factors—as the position of the windows in relation to the heating apparatus, the direction of the wind, the humidity of the atmosphere, the difference between the outdoor and indoor temperature. If the conditions are so bad that the room can not possibly be ventilated properly, then the way to keep the pupils in good health and to make them do the maximum amount of work is to have frequent recesses, during which the room is flooded with fresh air by opening the windows.

(11) The best possible system of heating and ventilation is desirable for pedagogical as well as hygienic reasons; but even this is not enough to make the schoolroom atmosphere hygienic unless great care is also taken for the highest degree of cleanliness of the children, of the furniture, the blackboards, the books, etc., and for removing dust, avoiding overheating, bad odors, etc.

(12) All the essentials of hygiene in regard to the air-supply must be regarded.

Lighting.—Dr. Cohn maintains that too much light can not be had in a school, and Javal insists that the schoolroom should be flooded with light. The amount of light usually deemed sufficient is indicated by the norms of different countries. It is usually required that the window-surface in a schoolroom should be from one-quarter to one-sixth of the floor-space. Dr. Billings maintains that the ratio should be 1 square meter of window-surface to 4 square meters of floor-surface. It is necessary also that there should be plenty of light at each desk irrespective of this ratio. Hence photometric determinations are often required. Photometers have been invented by Weber and others by which the amount of light at any pupil's desk can easily be determined. The standard of measurement is the "meter-candle"—that is, the amount of light cast on a paper exposed to a normal candle at a distance of 1 meter; spermaceti candles weighing one-sixth of a pound are taken as normal. Dr. Cohn's standard, that the minimum brightness on dull days for any seat should be 10 normal meter-candles, may be adopted, but tests have shown that to enable the eye to read as readily as in clear daylight an illumination of 50 meter-candles is necessary. To insure sufficient light it is necessary to follow Javal's rule, that if the schoolhouse is near other buildings the distance of the latter should be equal to twice their height, and the French norm, that the height of the windows in a schoolroom should be equal to two-thirds the width of the floor, is a safe one. It should at least be required that each pupil can see some portion of the sky from his seat.

Most writers on school hygiene favor unilateral lighting, or at least demand that the greater part of the light should come from one side, and it is necessary that the seats should be so arranged that this light come from the left. The objection to bilateral lighting from the left and rear can be met by the use of suitable curtains. With the unilateral lighting the bottom of the windows should be about a meter above the floor, and they should be as near together as possible and should extend to the top of the room. The ideal plan advocated by some is to have a glass roof. The color of the light determines to considerable degree the effect upon the eye. Blue has been found by many a most agreeable color, and every-day experience indicates that blue, gray, and light shades of lavender and green are pleasant to the eye. The whole subject of the influence of light of different colors upon the eye has not been accurately studied; but, as regards the practical point for school hygiene, opinion seems to favor use of gray or a light shade of blue-gray or greenish gray for the walls of the schoolroom. Indirect sunlight is the best kind of light, but it should be regulated by suitable curtains, and these should always be arranged to run up from the bottom as well as to let down from the top. Artificial light should also be indirect and thoroughly diffused throughout the room. The electric light is best; but whenever work in drawing or the like must be done by artificial light, individual lights at each desk are necessary, because the draughtsman depends upon the shadows, and these are lacking when there is only general diffused artificial light. The amount of light actually found in schoolrooms is often deficient. Careful measurements in different German schools showed that a large number of the pupils sat at desks with very inadequate light, and in some classrooms the light in the dark places was found less than 1 meter-candle on dull days. Most of the new school buildings in the U. S. are well lighted, but in many of the older buildings the light is often far from adequate.

Cleanliness.—Recent studies indicate the prime importance of cleanliness in the school. The subject has been put on a scientific basis by bacteriological study in the schools, for dust offers a favorable medium to the bacteria. Meyrich, a teacher in a Leipzig school, has tested the dust by exposing a plate with a suitable medium for five minutes during the period of instruction, the children remaining in the room, and counting the micro-organisms that developed in seventy-two hours in a temperature equal to that of the schoolroom. The number that developed in the schoolroom cultures was enormous as compared with the number that developed under similar conditions from Herr Meyrich's private rooms. The investigation was carried out with German thoroughness. Tests were made to determine the number of micro-organisms in the dust that was swept up. Meyrich estimated that there were at least a million micro-organisms to a gramme of dust. The fine dust that settles on the seats and furniture was also tested, and the number to a gramme was estimated at 4,354,635. Now from these tests it appears than an enormous number of micro-organisms adhere to the dust and pass into the air. The significance of the figures cited is seen by comparison with the number found in mountain or sea air. It is said that in tests of the air on the high mountains in Switzerland Freudenreich often had to seek through two or three cubic meters of air before he found a single bacterium. The studies of other investigators have shown that the number of micro-organisms stands in inverse ratio to the adequacy of the means of ventilation, the cleanliness of the room, and the cleanliness of the children.

Hygiene now demands regard for cleanliness in the whole planning, construction, and management of the schoolhouse. It is not satisfied with diluting the bad air to a certain standard of CO_2, but it requires the removal as far as possible of all sources of contamination. It is necessary not only to observe the obvious rules of cleanliness as regards frequent sweeping with moist sawdust, wiping furniture with moist cloths, cleaning of floors and windows, and the like, and special care of outhouses, but the books when used by different classes should be disinfected periodically. Investigations by Lion have shown that large numbers of micro-organisms are likely to be found on books, especially on the dirty pages, and that many varieties can live for a long time on paper. Tests by the same investigator and by others indicate that the best means of disinfection is by the use of formalin. The children also must be clean. Sometimes the presence of a single child with dirty clothing vitiates the air of a whole room, and the best system of ventilation is insufficient with a roomful of dirty children. The most efficacious means of cleanliness is the school bath. School baths, usually shower-baths, have been introduced into schools in Berlin, Frankfort, Breslau, Cologne, and several other German cities, and one or two cities in the U. S. have new buildings provided with them. The experience with them has generally been reported as satisfactory, and many officials are demanding that they be placed in all new schoolhouses.

School Furniture.—In most schools the larger part of the time is spent in sedentary occupations; consequently, school seats and desks are the most important articles of school furniture. During the last fifty years there has been a vast improvement in school seating. Before the appearance of Barnard's classic work on *School Architecture* (1848) the principle followed in choosing and arranging school seats and desks seems to have been one in the interest of discipline by the teacher. In some of the schoolhouses a row of desks was placed around the three sides of the room, and inside a plank served for a seat, so that the pupils sat facing the wall with their backs to the teacher. In others the pupils were boxed up so that when sitting only their heads were visible. Barnard was the first in the U. S. to prepare a scale for seats and desks adapted to the height of pupils at different ages. This was based on measurements of children begun as early as 1838. In Germany, during the sixties, Fahrner, Prof. Hermann Meyer, and others explained the principles that must determine the making of hygienic seats. And since that time there has been a perfectly definite conception of the essential features. The fundamental rule, as formulated by Uffelmann, is that the school seat and desk in all parts should be adjusted to the corresponding measurements of the child's body when clothed. Measurements have been made by Fahrner, Cohn, Geissler and Uhlitzsch, and others to determine the height of children at different ages, and the relative length of different parts of the body, with the special purpose of finding the proper dimensions for seats and desks, and tables based on such measurements have been made by different authorities.

The determination of average height for different ages is not sufficient, as is seen by noting the great range of individual variation found by different investigators. For example, the tallest boy over fourteen measured by Geissler and Uhlitzsch was 176 cm. in height; the shortest of the same age, 97 cm.; the tallest girl, 167 cm.; the shortest of the same age, 109 cm. And, moreover, such differences between the sexes are found that the same scale of measurements should not be used for both. The ideal is to have the seat adapted to the individual child, the seat and desk fitting him like his clothes. An attempt, often very crude, has been made during the last few years to attain this ideal by providing adjustable seats and desks. Many of these have been placed upon the market, each one of the many patterns having some good features, but none of those yet devised being altogether satisfactory. The determination of the proper kind of seat and desk is a problem by no means simple. The seats should be so adjusted that the body may be held in equilibrium with the minimum muscular effort, so that a pupil while writing would retain his position if the desk were suddenly snatched away. Under these conditions the spine is in normal position, there is no abnormal pressure on the abdomen, and with a suitable desk the eyes may be kept at proper distance from the paper. There is a definite conception in regard to the essential features of a seat and desk that will render this position natural. The main points are as follows: (1) The height of the seat should equal the length of the child's leg from the bend of the knee to the sole of the foot. (2) The width of the seat should equal about three-quarters the length of the upper leg. (3) The seats should have a backrest for the small of the back above the hip-bones opposite the last lumbar vertebra. This is specially important. (4) There should be a support for the back under the shoulders. (5) The seats should be sufficiently large to enable the child to change position, and the front edge of the seat should be a little higher than the back and rounded off. (6) The dimensions of the desk should be sufficient for the accommodation of books and the like. (7) The slope should be about 45 degrees for reading and 15 degrees for writing. (8) The *difference*, or distance from the seat to the edge of the desk, should be such that the child, when sitting erect, can easily place both arms on the desk without lowering or raising the shoulders. A convenient rule is that the difference should equal the distance from the seat-bone to the elbow plus 1·5 cm. (9) The distance of the seat from the desk may be zero, plus, or minus. For convenience in taking the seat and in standing a plus distance is required; for writing a minus distance of 2 inches is necessary. Such are the essential features, and there is practically a consensus of all authorities in regard to them. To insure them, both seat and desk must be adjustable to different heights. And it is of prime importance not only to have the seat of the right height, but also to have the correct difference and the proper distance, since upon these chiefly depends a correct sitting posture. That the distance may be plus for reading and minus for writing, it is necessary to have either a movable seat or a sliding desk. For obtaining a slope of 45 degrees for reading and 15 for writing, the desk must be adjustable to different angles; and an ideal seat would have a backrest adjustable to the individual, such as some teachers' chairs are provided with. In a word, the seat and desk should be automatically adjustable as regards height, difference, distance, back-rest, and desk-slope. While there is a consensus of opinion in regard to these essentials, and the best adjustable seats and desks on the market, although not altogether satisfactory, are still a vast improvement upon the ordinary means of seating, still in most schools the majority of children are misfitted, and frequently are required to sit in seats which are far from hygienic.

Hygiene of Instruction.—School hygiene in the broad sense, or pedagogical hygiene, is concerned, on the one hand, with school sanitation—heating, lighting, ventilation, drainage, etc., and the general principles of somatic hygiene; on the other, with mental hygiene and the hygiene of the nervous system, including not only the hygiene of the brain, but also that of its tools, the senses and motor organs. The hygiene of instruction comes under this second head, and presupposes good sanitation and observance of the general principles of somatic hygiene. It has to do with the

conditions that favor the normal functioning of the child's psycho-physic mechanism so far as they are determined by methods of study, school programmes, manner of teaching, text-books, and the like. The studies in somatic and cerebral hygiene throw light directly upon this subject; but these investigations should be supplemented by special observation and systematic study of children while at work upon their different school subjects. Upon the results of such studies, and upon the principles of somatic and cerebral hygiene, the hygiene of instruction is based. This newer branch of hygiene points out that every subject of instruction and every pedagogical method have important hygienic aspects that must be studied before their true value can be estimated. It is, however, in the deepest harmony with true pedagogy, for the aim of both alike is the normal guidance of development.

The first principle of the hygiene of instruction is that the sequence of the different forms of instruction and training should be adapted to the sequence of the stages of the child's development. The great difference between the child and the adult is due to the fact that the child's organism is in process of growth and development. We know only in a general way what the course of development is. We can not give a series of pictures even of the physical child at the different stages of its career. A new physiology is needed which shall show the sequence of the different stages of growth and their relation to the development of organic, sensory, and motor functions. But some very important studies have been made in recent years in regard to physical growth by numerous investigators in Europe, and by Bowditch, Peckham, Porter, Boas, West, and others in the U. S. For the period of school life it appears that from six or seven to ten or eleven in girls, and to twelve or thirteen in boys, is likely to be a period of decrease in the rate of growth; from the eleventh or twelfth year in girls to the fifteenth, and from the twelfth or thirteenth to the sixteenth or seventeenth in boys, is one of rapid growth. But even here so many conditions affect growth—heredity, food, climate, care, exercise, etc.—that it is not easy to interpret data. And when we come to consider the nervous system, we know relatively little about its development. We can distinguish three periods in the development of the brain after birth. Those for boys are as follows: During the first seven or eight years the brain attains almost its maximum weight. The next period, until the age of fourteen, is one of moderate growth and development. The third, from fourteen to twenty-five, is characterized especially by development of function. We know too in a general way that the order of development is from the fundamental to the accessory. The nerve-centers that function the larger and more central organs are developed first; those that function the smaller and more peripheral ones later. Again we find that development is by parts, not uniform, and we have reason to believe also that different nerve-centers have nascent periods when their functional development proceeds at a relatively rapid rate. Not all parts of the nervous system develop at the same time, any more than all parts of the skeletal structure are growing equally at the same time. Beyond such general statements we can not go very far. But even the relatively meager and general knowledge we now possess is of vital importance. If once for all one grasps the point of view of development, it changes one's whole attitude toward the child. Even the obvious facts of physical growth are of great practical significance. In general such studies have emphasized the danger of any premature or unrelated developments. Instruction or training of any organ or faculty before the nerve-centers involved are ripe for it is not only questionable pedagogically, but likely to be injurious to health. And, on the other hand, unduly delayed training is loss of opportunity, and may mean arrest of development.

There is a general consensus that children should not begin school work before the age of six or seven. Some physiologists—Mosso, for example—would not have intellectual work begun before the age of ten. For the younger children the school day should be short, not exceeding two or three hours for children under ten, four for children between ten and twelve, and five for those twelve to fourteen years of age. In regard to the length of each period of study practice differs greatly. At the London Congress of Hygiene and Demography, in 1891, a resolution was passed to the effect that until the matter has been further studied no school period should exceed three-quarters of an hour in length, and that each period should be followed by a quarter of an hour for rest. The numerous studies of fatigue in school-children (see MENTAL HYGIENE) throw light on this problem. It appears that the matter is largely relative to the age and ability of the individual, the kind of work, the time of day, the work that has preceded and is to follow, the character of the teacher, etc. A much shorter period is required for the younger pupils; a longer one may sometimes be an advantage for older ones. Chiefly regard must be had for individual peculiarities. In general the amount of time devoted to recess in the U. S., especially in the secondary schools, is too small. In Germany, in the secondary schools, at least forty minutes for recess in a five-hour session is prescribed by law, and after many years of experience there seems to be no tendency to decrease the amount. Where possible the recess should be spent in free play out-of-doors. Gymnastics is not to be regarded as a means of recreation, but as an important subject demanding its own place in the curriculum. Hence gymnastic exercise should not take the place of the outdoor recess. The question of one session a day, or two, must be determined largely by local conditions. Some observations indicate that the afternoon session is of little value, and it interferes with exercise out-of-doors. But if the one-session plan is adopted, care must be taken that the pupils eat their breakfasts, opportunity for a wholesome lunch should be provided, and recesses should be given as in the German schools.

Such are some of the important chapters in school hygiene, a subject which has so developed in recent years that it now affords opportunity for research to many experts, and whose contributions are already so important that no teacher should be ignorant of their practical bearings. It remains to be noted that all the demands of hygiene are interrelated. The best of schools can not keep children from being ill if the homes are unhealthy. Healthy homes can not keep children well if the schools ignore hygiene. And it is necessary to regard all the essentials of hygiene in the school.

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School Laws: As used in the American decisions and statutes, the term *school laws* generally designates those which relate to and regulate the conduct of the common or public school existing under the laws of the State and maintained at the expense of the public. Most of these laws are purely statutory and constitutional, but they have a general resemblance, due to similarity of subject-matter, and their enforcement is covered by certain general principles applicable to the various laws in the different States which are of the same nature.

Laws as to Teachers.—In most of the States the statutes provide that a teacher shall, before entering upon his duties, obtain from a designated official a certificate of his qualifications to teach. It is held that only average qualifications are required, and only reasonable attention to the discharge of his duties, and that the teacher's certificate is *primâ facie* evidence of these. It is generally held that the contract for enrollment as a teacher of one who does not hold such a certificate is void, and that any service rendered by an uncertificated teacher under such a contract does not create a right to be paid. The right of the teacher to payment, however, is not affected by the inadvertent withholding of a certificate to which he was entitled, and it has been held that a teacher whose certificate has been maliciously or wantonly withheld or revoked has a right of action against the parties refusing to issue it to him. The laws usually provide that the teacher shall be employed by school directors or trustees in a certain prescribed manner, but the individual members of the board have not the power of binding the board or the district which they represent by their individual acts when not convened as a board, and any contract made by one or more members of the directors or trustees when not thus convened is void unless it be subsequently ratified by the board in legal session. The statutory regulations as to the manner of the making of the contract for the employment of teachers must be strictly complied with. The board of directors or trustees may in good faith make contracts for the employment of teachers for a term extending beyond their own term of office; but if it can be shown that this action was taken with the intention of forestalling their successors or the subsequent action of the board, the contract is voidable if the teacher be in complicity with them in this intent.

The rights of the teacher to compensation are governed by the same rules as those which govern the rights of any other person employed to render services for a given period. The contract can not be nullified or the term of service shortened by abolishing or removing the school where the teacher was to have taught, or in any other way rendering it impossible for him to perform his services. The teacher may also recover damages to the amount of his stipulated wages, subject to mitigation, by proof either of earnings or of their possibility, if he be discharged without sufficient cause.

Generally speaking, the same person can not be at once a teacher and a school trustee, and if he be employed as a teacher he forfeits and vacates his office of trusteeship.

The authorities have a lawful right to discharge a teacher for incompetency, neglect of duty, immoral conduct, or any other cause for which the teacher is responsible, and which prevents him from properly performing his duties. If the contract of employment, however, provides that he may be discharged if he does not give satisfaction, the employing authorities may discharge him at pleasure. In some States the statutes provide that a teacher can not be dismissed, even for cause, except upon notice and being given opportunity for trial.

The Rights of Pupils, and School Regulations.—The public schools must provide accommodations and instruction for all children of legal school age whose parents reside within the school district. If the parents reside without the school district the children may be prohibited from attending the school if the school authorities see fit.

The fourteenth amendment of the Constitution of the U. S., which provides that no State shall deny to any person within its jurisdiction the equal protection of the laws, does not prohibit the establishment of separate schools or systems of schools for white and colored children, provided the schools afford equal privileges and educational facilities to white and colored pupils; but if such schools are not provided the colored pupils can not be legally excluded from the other schools, and a writ of mandamus will be issued to compel the reception of pupils who are so deprived of their educational privileges.

The relation existing between the teacher and the pupil and the right of the teacher to enforce the lawful rules and regulations adopted for the conduct and government of the school are governed both by the common law and by the statute law. The teacher has a right to maintain reasonable discipline and compel obedience to reasonable regulations in any lawful manner, and to this end he may, in the absence of statutory prohibition, inflict corporal punishment upon the pupil. It is held that the teacher is *in loco parentis* to the pupil, and by virtue of this has, by way of delegation, the power of imposing such restraint and administering such punishment as may be required for proper exercise of the duties of his office. A mistake of judgment on the part of the teacher in the exercise of this right of correction, if his acts be done in good faith and do not inflict lasting injury, does not give rise to an action for damages for the injury suffered from such punishment; but punishment can not be legally inflicted except by way of correction of some specific offense committed by the pupil in violation of a reasonable rule or regulation, for which violation he is given to understand that the punishment is inflicted.

Exclusion from the school or suspension of school privileges may be resorted to as a means of enforcing discipline and compliance with the school rules and regulations, and the power of expulsion or suspension has been in some States conferred upon the school directors; but this power is inherent in the teacher, and may be exercised by him whenever necessary to the preservation of the interests of the school, unless he be deprived of it by statute or by legal action of the proper authorities. The teacher's power of punishment extends not only to acts committed during school hours, but also to acts detrimental to school discipline while going to or returning from school, and in some cases even to acts done at other times. The power of making rules and regulations may be vested in the trustees or in the school directors by a statute, but rules made under such power must be reasonable. In the absence of such rules established by the trustees or other proper authority, the teacher is vested with the right to make and establish such rules and regulations as may be necessary and proper for the good conduct of the school; and in either case he has the authority to enforce such rules as may be necessary to the actual administration of the affairs of the school, provided they do not conflict with any express rules of the trustees. The question of what constitutes reasonableness in a rule is a matter which varies so widely with circumstances and the statutory regulations as not to admit of any exact definition. It may be stated, however, that a rule requiring scholars to be vaccinated under penalty of exclusion; a rule requiring the pursuance of particular studies; a rule making it the duty of the teacher to keep a record of the standing of each pupil, and that this shall be forwarded to the parent and signed and returned by them; a rule authorizing the expulsion of a scholar for absence, even under the direction of the parent and the spiritual adviser of the child, in order to attend religious services; a rule providing that the pupils absent six half-days in four consecutive weeks without satisfactory excuse shall be suspended, are all reasonable and proper. Among rules which have been held to be unreasonable are one requiring that pupils shall be suspended for failing to bring into the schoolroom each day a stick of wood for the fire; a rule that a scholar living with his parents shall not go to a party; a rule requiring a pupil to pay for damage done to school property, under penalty of expulsion, etc. A general statement has been made that "any rule of the school not subversive of the rights of the children or parents, or in conflict with humanity and the precepts of divine law, which tends to advance the object of the law in establishing public schools, must be considered reasonable and proper."

The right of the school authorities to require the reading of the Scriptures in school has in some cases been held as unconstitutional, on the ground that it is sectarian instruction. The decision of the question depends upon the construction of the State constitution and its legislative acts,

but such a rule is generally sustained as being constitutional.

The rules and regulations affecting the subject of textbooks, school districts, formation of schools, and other matters affecting the physical property and being of the school, are so specific in their nature as not to admit of treatment in a work of this character.

F. Sturges Allen.

Schools of Fine Arts: Instruction in the fine arts follows a well-determined course in all the prominent art schools in Europe and the U. S. The pupil is first taught to exercise the eye and the hand by copying drawings or by drawing from simple objects cast in plaster. This is the elementary stage, and is often learned outside the classrooms. Drawing from plaster casts from various portions of the human figure taken from the antique statues is then followed by drawing from casts of the whole figure. Large sheets of white paper and charcoal or crayon are the materials generally employed. From this the pupil advances to drawing in the same manner from the nude model. Good instruction prescribes a long drill in drawing from the life, and painting from life follows. When the pupil has attained proficiency he may undertake creations of his own. In sculpture the instruction is similar, except that modeling is begun sooner after drill in drawing than painting. During the practice in drawing and painting from life the student attends courses in composition, makes trial sketches, and receives instruction in perspective and anatomy. In the summer vacations he is at liberty to make studies from nature out of doors; and while some landscape-painters have never attended any other school than that of nature, most of those in modern times who have achieved prominence have studied drawing and painting from the human figure. This study, it is agreed, is the best for the development of the artistic faculties; and while methods vary somewhat under different masters, it is and has been since the Italian Renaissance the basis of all art instruction.

In New York, the art center of the U. S., the most popular school for instruction in the fine arts, and the one with the widest reputation throughout the county, is that of the Art Students' League. It was established in 1878, and is maintained by art students of New York for the purpose of giving academic instruction in drawing, painting, modeling, and composition. Its studios and offices are in the building of the American Fine Arts Society, No. 215 West Fifty-seventh Street, the league being joint owner of the edifice with the Society of American Artists and the Architectural League of New York. The Art Students' League is incorporated, and is governed by a board of control, elected annually by its members. The average attendance in all the classes is from 1,000 to 1,200 pupils. Several distinguished artists have been or are now in the lists of instructors. Among those who have retired are William M. Chase, Augustus St. Gaudens, J. Alden Weir, H. Siddons Mowbray, George de Forest Brush, and J. Carroll Beckwith. In the season of 1899–1900 the life classes were taught by Kenyon Cox, George B. Bridgman, and Joseph de Camp. No examination is required for the antique classes, but applicants for admission to the life classes must submit a drawing of a full-length nude figure from cast or life. The fees for instruction in the various classes range from $4 to $12 a month. Four scholarships and three cash prizes are awarded annually.

The National Academy of Design has maintained a school for instruction in the fine arts since 1825. The classes are taught by prominent instructors chosen by the council from the body of Academicians and Associates. The Academy building, at the corner of Twenty-third Street and Fourth Avenue, New York, having been vacated in 1899, the schools are now established in a large and commodious building on the Academy's property on Cathedral Heights, corner of Amsterdam Avenue and 109th Street. The season, as in most of the principal art schools in the U. S., runs from the first of October to the latter part of May. The "schools committee" consists of H. Bolton Jones, J. Carroll Beckwith, and H. Siddons Mowbray. The life classes are taught by Edgar M. Ward and George W. Maynard. The painting classes in still life are under Francis C. Jones, etching is taught by James D. Smillie, and lectures on perspective are given by Frederick Dielman, president of the Academy. The antique classes are free, and are instructed by F. C. Jones and E. M. Ward. The Suydam and Elliott medals in silver and bronze and the Cannon, Hallgarten, and Baldwin money prizes are awarded annually. A high standard is maintained in the various classes, and the school equipment, while always adequate, is constantly being added to. A department of medal and coin engraving is among the new features in contemplation. The average attendance of pupils is about 300.

The New York School of Art resembles somewhat in its organization the Art Students' League. Douglas John Connah is the director and William M. Chase the chief instructor. The schoolrooms are at No. 57 West Fifty-seventh Street, and the average attendance of pupils is about 350. The life classes are under the instruction of William M. Chase, J. Carroll Beckwith, Frank V. Du Mond, D. J. Connah, and F. Luis Mora. The monthly fees range from $5 to $15. The Julian scholarship, entitling the holder to one year's tuition in the Académie Julian, Paris, and four other scholarships are awarded each year. The Shinnecock Summer School of Art, at Shinnecock Hills, near Southampton, Long Island, is closely allied with this school. Mr. Chase is its president and instructor and Mr. Connah its director. Open-air classes in painting from the model and landscape are held daily. The fees are $20 a month, or $65 for the season, from June 1 to Sept. 1. The attendance averages 125 in all the classes.

The Cooper Union for the Advancement of Science and Art, founded and endowed by Peter Cooper in 1857, maintains in its building at Astor Place, New York, free art classes for women and free night classes for men. R. Swain Gifford is the art director of the women's classes, and other instructors are Douglas Volk, Willard L. Metcalf, Miss Elizabeth A. Talbot, J. H. Twachtman, and Frederick Dielman. Miss Mary A. Vinton is the principal. Instruction is given in oil-painting, antique and life drawing, design, pen-and-ink illustration, miniature-painting, etc. The average attendance is about 300. Pupils are selected from the applicants, who must be at least sixteen and not over thirty-five years of age. In the night classes for men the same system is observed, and applicants must be at least fifteen years of age. The instruction in these classes covers mechanical drawing, architectural drawing, cast drawing, decorative designing, modeling, and perspective. Young women are admitted to the classes in perspective and in elementary architectural drawing. Pupils in all the classes at the Cooper Union have free access for study to the Museum for the Arts of Decoration, of which Miss Sarah Cooper Hewitt is chairman of the committee of management, and which possesses a valuable collection of casts, stuffs, costumes, embroideries, metal-work, and other objects of art. The reading-room and library of the Cooper Union are also open to students. The Pratt Institute in Brooklyn has art classes for men and women under the direction of Arthur W. Dow, and special attention is given in this institution to composition and to teaching industrial art. At the Metropolitan Museum of Fine Arts in New York free lectures on art subjects are delivered each winter by prominent artists under the auspices of Columbia University. Many small art schools and private classes in drawing, painting, and modeling exist in New York, and a few prominent artists take pupils in their own studios.

The Pennsylvania Academy of Fine Arts, Philadelphia, is the oldest art institution in the U. S., having been founded in 1805, and its art schools date from the same year. The schools are managed by a faculty whose members consist of officers of the institution and instructors of the classes. Edward H. Coates is president of the Academy, Harrison S. Morris is the managing director, and John H. Packard, M. D., is chairman of the faculty. The classes include drawing and painting from the antique and from life, modeling, perspective, composition, etc., and among the instructors are William M. Chase, Charles Grafly, Miss Cecilia Beaux, Henry J. Thouron, Thomas P. Anschutz, and Hugh H. Breckenridge. The Academy disposes of a traveling scholarship of $800 providing for a year's study abroad, of the Toppan, Stewardson, and other money prizes, the value of which is from $50 to $200. They are awarded at the opening of the spring exhibition of students' work. The fees for instruction range from $10 to $30 for each of two terms of seventeen weeks. A student's ticket entitles the holder, during and after attendance at the schools, to the use of the galleries, special exhibitions, the library, the print collection, and the courses of lectures given from time to time under the auspices of the Academy.

The school of drawing and painting connected with the Museum of Fine Arts, Boston, was established in 1876. Miss

Elizabeth Lombard is the manager. The committee in charge is composed of directors of the museum, prominent Boston artists, and patrons of the fine arts. Among the instructors are Edmund C. Tarbell, Frank W. Benson, Philip Hale, Bela L. Pratt, and Mrs. William Stone. The last named conducts a class in decorative design. Diplomas are given, upon application, to those students who have fulfilled the requirements of the committee. The fees are $45 for each of the first two terms of twelve weeks and $35 for the third term of nine weeks, but pupils who have paid the fees for the first two terms of any one year are entitled to free instruction for the third term of that year. The school awards ten scholarships annually and the Paige traveling scholarship providing $800 a year for two years to be spent in study abroad. The Hamblen scholarship gives the holder, who must be a young woman, a year's tuition and $100. The Sears and Thayer money prizes are worth from $25 to $75 each. The number of pupils in the school is limited to 200. In Boston also is the Cowles Art School, which has flourishing classes under a corps of competent instructors.

The art schools of the Art Institute of Chicago, of which Charles L. Hutchinson is president and W. M. R. French director, has a large annual enrollment of pupils, the total, including 300 Saturday special students, children and schoolteachers, reaching 1,800. The standard of the work is high and the facilities open to students include the collections of the institute, the passing exhibitions, the library, and courses of lectures. The schools are housed in the fine building of the institute and date from 1866. The instructors include Frederick W. Freer, Lorado Taft, Albert Herter, of New York, John H. Vanderpoel, and Miss Pauline A. Dohn. The school of architecture is an important department and has as instructors, besides others, Louis J. Millet, Walter F. Shattuck, William K. Fellows, and Albert Fleury. The fees for tuition are $75 per year, or less, and in 1897–98 the total received amounted to more than $34,000.

The St. Louis School of Fine Arts, St. Louis, Mo., is, with the art museum, a department of Washington University. The director is Halsey C. Ives, and among the instructors are Edmund H. Wuerpel, Robert P. Bringhurst, Charles Percy Davis, and Lawrence Ewald. The average of students enrolled in the classes is 350. Instruction is given in drawing, painting, modeling, composition, architectural and mechanical drawing, perspective, and anatomy. The fees are $25 for each of the three terms, or smaller charges for single classes. There are classes for public-school teachers and in design as applied to glass, mosaic, etc. The schools are housed in spacious quarters and the facilities include the collections of the museum, the library, and courses of lectures.

The Art Academy of Cincinnati is a department of the Cincinnati Museum Association, and is well endowed. The building is upon a hilltop in Eden Park, Cincinnati, O., and a summer school of art is also maintained for a term of ten weeks from June to September. The director is A. T. Goshorn, and the instructors include Prof. Thomas Noble, principal, Vincent Nowottny, J. H. Sharp, L. H. Meakin, and O. W. Beek. The average attendance of pupils is about 450. Besides the instruction in drawing, painting, and modeling there are classes in wood-carving, painting on porcelain, and photography. The fees for a year's instruction range from $5 to $25. The collections and library of the museum are accessible to students.

Some other schools of fine arts in the U. S. are those of the Corcoran Art Gallery, Washington, D. C., with 250 pupils; the Minneapolis Academy of Fine Arts, the Pittsburg School of Design for Women, and the academies at San Francisco, Cleveland, Buffalo, and Worcester, Mass. At Columbia University, New York, there is a fine school of architecture in which Profs. William R. Ware and A. D. F. Hamlin are the chief instructors. At Harvard and Princeton Universities lectures on the fine arts are regularly given, and in the scientific schools connected with these institutions there is instruction in free-hand drawing. At Yale University is the well-known Yale School of Fine Arts. It was founded under the Street endowment in the sixties, and gives complete instruction in the various branches of the fine arts. Prof. John F. Weir is the director and Prof. John H. Niemeyer one of the principal instructors. Women are admitted to any of the classes. Money prizes and the English traveling scholarship with an income of $2,000 for two years' study abroad are in the gift of the school. The Fine Arts building is on the college campus, and besides the schoolrooms contains several galleries which hold a valuable permanent collection of ancient and modern paintings as well as casts from the antique.

The American Academy at Rome, whose foundation in 1895 was largely due to the efforts of Mr. Charles F. McKim, of New York, occupies the Villa dell' Aurora, Rome, Italy, and has painters, sculptors, and architects sent from the U. S. as resident students. The recipients of the Columbia University and University of Pennsylvania scholarships in architecture, the Lazarus, Rhinehart, and other scholarships in painting and sculpture, are among the students. These scholarships are awarded by committees of artists, architects, and laymen residing in New York, Baltimore, and Philadelphia, and annual exhibitions of the work sent home by the students at the Villa dell' Aurora are held in one of the galleries of the Metropolitan Museum, New York.

The most noted school of fine arts in Europe is the École des Beaux-Arts, Paris, where many prominent art instructors in the U. S. received their education. Its school of architecture is easily the first in the world. The instructors in drawing and painting are leading masters in the French school of painting, and lectures are given by famous critics of art. The school is under the control of the French Government. An annual competition, or *concours*, is held in painting, sculpture, architecture, and engraving, and the winners of the first prizes, or *grands prix*, are sent at the public expense for from three to five years' further study at the French Academy at Rome. In Paris also are numerous art schools such as the Académie Julian, which has a large following of American students and numbers its pupils by hundreds, and *ateliers* or students' classes conducted—often without compensation, though pupils pay the expenses of rent, models, and heating—by prominent painters and sculptors. In Great Britain the chief art school is that of the Royal Academy, London. The Kensington Museum schools afford instruction in decorative and applied arts. There are art academies at Glasgow, Edinburgh, Dublin, Manchester, and other large cities. The Royal Academy schools at Munich, Bavaria, are the most famous in Germany, and during the period from 1870 to 1885 there were many American students there. Other noted German art schools are at Berlin, Düsseldorf, and Dresden. The Antwerp Academy is a famous school in Belgium, but its attraction for foreign students, like that of Düsseldorf, has long since departed. There is a flourishing art school at Brussels. In Italy the Academy of Saint Luke, and the schools at Florence, Turin, Venice, and Naples are the most prominent. At The Hague, Vienna, St. Petersburg, Madrid, and other European capitals there are art academies each with a large attendance of pupils. Something like our American summer schools are the painters' colonies in France, England, and Italy in the country districts. In these colonies, however, there are generally more artists with established reputations than there are pupils. Where the climate permits, many of these artists work the year round out of doors. Such art colonies in France are at Grez, Barbizon, and Marlotte, near the forest of Fontainebleau, at Giverny on the Normandy coast, and Pont-Aven and Concarneau in Brittany. In England there are painters and pupils at St. Ives and Newlyn on the Cornish coast, and in Italy at the island of Capri. Similar colonies in the summer season in the U. S. are at Windsor, Vt.; Easthampton, Long Island; Gloucester, Mass.; Mount Desert, Me.; and at various mountain villages in the Eastern and Middle Atlantic States.

WILLIAM A. COFFIN.

School Statistics: Of the earlier periods, no trustworthy school statistics are available. The social consciousness was late in awakening to the necessity of recording accurate information in regard to schools. With the development of the modern national systems of education, attention has been more and more directed to this point by Government officials. In the U. S. the State superintendent publishes an annual or biennial report upon the school system of the State, in which a large amount of statistical matter is included; but in few States have such reports been issued consistently over a long period of years. The same is true of the city superintendents. The U. S. Bureau of Education was established for the purpose of collecting statistics and disseminating information. This bureau, however, does not possess any authority to compel statistical returns, and, as a consequence, many of the blanks it sends out for information are not returned. This branch of its work has been developed with continually increasing efficiency, however, and new items are added almost yearly to the list of those subjects on which statistics are collected. In the matter of

educational reports, there is as yet no uniformity concerning returns which are of importance, and therefore there are few subjects upon which information may be found in all of the State and city reports. The adoption of a uniform system for educational reports would be of great service. The following items are taken for the U. S. from the *Report of the United States Commissioner of Education*, covering the years 1898–99.

For foreign countries, returns, unless other authority is given, are taken from the *Statesman's Year-book* for 1899.

United States—State Common-School Systems.

School ages in the several states—state school censuses.

State or territory.	Age for free attendance at the public schools.	Age for compulsory attendance.	School Census.				
			Date of latest school census reported.	Age of children enumerated.	Number of children enumerated.		
					Boys.	Girls.	Total.
North Atlantic Division:							
Maine	5–21	7–17	1899	4–21	.....	.....	210,192
New Hampshire	Over 5	8–14	1899	5–16	34,903	34,880	69,783
Vermont	5–21	8–15	1899	5–21	45,697	43,699	89,396
Massachusetts	No limit	7–14	1898	5–15	.....	.....	449,099
Rhode Island	Over 5	7–15	1899	*a*5–15	39,929	39,896	79,825
Connecticut	Over 5	4–16	1898	4–16	.....	.....	189,717
New York	5–21	8–16	1899	5–18	777,570	772,509	1,550,079
New Jersey (1898)	5–20	7–15	1898	5–18	236,293	230,421	466,714
Pennsylvania	6–21	6–16	....	6–16	.....	.....	.....
South Atlantic Division:							
Delaware (1893)	6–21	(*b*)	1893	6–21	15,827	17,758	33,585
Maryland	5–20	(*b*)	(*c*)	....	.....	.....	.....
District of Columbia	6–18	6–15	1897	6–18	.....	.....	60,306
Virginia	5–21	(*b*)	1895	5–21	339,725	326,140	665,865
West Virginia (1898)	6–21	8–14	1898	6–21	157,345	145,009	302,354
North Carolina	6–21	(*b*)	....	6–21	303,712	303,675	607,387
South Carolina	6–21	(*b*)	(*c*)	....	.....	.....	.....
Georgia	6–18	(*b*)	1898	6–18	333,039	327,831	660,870
Florida (1898)	6–21	(*b*)	1896	6–21	78,666	73,932	152,598
South Central Division:							
Kentucky	6–20	7–14	1896	6–20	375,259	360,846	736,105
Tennessee	6–21	....	1899	6–21	385,290	374,872	760,162
Alabama	7–21	(*b*)	1899	7–21	.....	.....	404,757
Mississippi (1897)	5–21	(*b*)	1896	5–21	270,789	281,678	552,467
Louisiana	6–18	(*b*)	1899	6–18	.....	.....	404,757
Texas	8–17	(*b*)	1899	8–17	360,470	345,580	706,050
Arkansas	6–21	(*b*)	1899	6–21	240,396	232,021	472,417
Oklahoma	6–21	(*b*)	1899	6–21	59,560	55,176	114,736
Indian Territory	....	....	....	....	.....	.....	.....
North Central Division:							
Ohio	6–21	8–15–16	1899	6–21	620,553	589,182	1,209,735
Indiana	6–21	*a*6–14	1899	6–21	391,353	364,345	755,698
Illinois	6–21	7–14	1899	6–21	775,439	763,706	1,539,145
Michigan	5–20	*d*7–16	1898	5–20	361,271	352,469	713,740
Wisconsin (1898)	4–20	7–13	1898	4–20	359,198	349,337	708,535
Minnesota	5–21	8–16	(*e*)	....	.....	.....	.....
Iowa	5–21	(*b*)	1899	5–21	369,135	358,640	727,775
Missouri	6–20	(*b*)	1899	6–20	500,813	480,909	981,722
North Dakota (1898)	6–20	8–14	1897	6–20	39,111	37,540	76,651
South Dakota	6–21	8–14	1899	6–21	61,375	58,204	119,579
Nebraska	5–21	8–14	1899	5–21	190,659	182,105	372,764
Kansas (1898)	5–21	8–14	1898	5–21	251,562	244,387	495,949
Western Division:							
Montana (1898)	6–21	8–14	1898	6–21	25,190	24,308	49,498
Wyoming (1898)	6–21	7–16	(*c*)	....	.....	.....	.....
Colorado	6–21	8–14	1899	6–21	72,297	70,109	142,406
New Mexico (1898)	5–20	8–16	1898	5–20	26,899	23,768	50,667
Arizona	6–18	8–14	1899	6–18	10,143	9,680	19,823
Utah	6–18	8–14	1899	6–18	42,406	42,013	84,419
Nevada (1898)	6–18	8–14	1898	6–18	4,535	4,461	8,996
Idaho (1898)	5–21	8–14	1898	5–21	23,703	24,257	47,960
Washington (1898)	6–21	8–15	1898	5–21	60,373	58,118	118,491
Oregon	6–21	8–14	1899	4–20	66,529	65,879	132,408
California	6–20	*c*6–17	1899	6–17	176,961	173,163	350,124

a Inclusive. *b* No compulsory attendance law. *c* No school census.
d 8–16 in the country. *e* Law defective and inoperative.

Number of pupils enrolled in the common schools at various periods, and the relation of the enrollment to the school population.

	Number of different pupils enrolled during the school year, excluding duplicates.				Percentage of school population (5 to 18 years of age) enrolled.			
	1870–71.	1879–80.	1889–90.	1898–99.	1870–71.	1879–80.	1889–90.	1898–99.
United States	7,561,582	9,867,505	12,722,581	15,138,715	61·45	65·50	68·61	69·34
North Atlantic Division	2,743,344	2,930,345	3,112,622	3,621,226	77·95	75·17	70·45	69·44
South Atlantic Division	603,619	1,242,811	1,785,486	2,141,132	30·51	50·74	59·22	62·97
South Central Division	767,839	1,371,975	2,293,579	2,938,744	34·17	46·43	60·14	63·59
North Central Division	3,300,660	4,033,828	5,015,217	5,685,866	76·87	75·84	76·46	74·71
Western Division	146,120	288,546	515,677	751,747	54·77	64·96	70·01	76·35

The average daily attendance at various periods.

	Average number of pupils attending school each day.				Number in daily attendance for each 100 enrolled in 1898–99.
	1870–71.	1879–80.	1889–90.	1898–99.	
United States	4,545,317	6,144,143	8,153,635	10,389,407	68·63
North Atlantic Division	1,627,208	1,824,487	2,036,459	2,617,693	72·29
South Atlantic Division	368,111	776,798	1,126,683	1,293,526	60·42
South Central Division	535,632	902,767	1,467,649	1,983,624	67·52
North Central Division	1,911,720	2,451,167	3,188,732	3,957,198	69·60
Western Division	102,646	188,924	334,112	537,366	71·50

NUMBER OF PUPILS ENROLLED IN THE COMMON SCHOOLS OF THE UNITED STATES SINCE 1870-71.

School year.	Pupils.	School year.	Pupils.	School year.	Pupils.	School year.	Pupils.
1870-71	7,561,582	1877-78	9,438,883	1884-85	11,398,024	1890-91	13,050,132
1871-72	7,815,306	1878-79	9,504,458	1885-86	11,664,460	1891-92	13,255,921
1872-73	8,003,614	1879-80	9,867,505	1886-87	11,884,944	1892-93	13,483,340
1873-74	8,444,251	1880-81	10,000,896	1887-88	12,182,600	1893-94	13,995,357
1874-75	8,785,678	1881-82	10,211,578	1888-89	12,392,260	1894-95	14,201,752*
1875-76	8,869,115	1882-83	10,651,828	1889-90	12,722,581	1895-96	14,424,500*
1876-77	8,965,006	1883-84	10,982,364				

* Subject to correction.

(1) AVERAGE LENGTH OF SCHOOL TERM AT VARIOUS PERIODS. (2) AGGREGATE NUMBER OF DAYS' SCHOOLING GIVEN TO ALL PUPILS. (3) THE SAME COMPARED WITH THE SCHOOL POPULATION AND THE ENROLLMENT.

	AVERAGE NUMBER OF DAYS THE SCHOOLS WERE KEPT DURING THE YEAR.				Aggregate number of days' schooling given in 1898-99.	Average number of days' schooling given for every child 5 to 18 years of age in 1898-99.	Average number of days attended by each pupil enrolled in 1898-99.
	1870-71.	1879-80.	1889-90.	1898-99.			
United States	132·1	130·3	134·7	143·2	1,488,076,102	68·2	98·3
North Atlantic Division	152·0	159·2	166·6	174·0	455,388,717	87·3	125·8
South Atlantic Division	97·4	92·4	99·9	112·6	145,654,202	42·8	68·1
South Central Division	91·6	79·2	88·2	103·2	204,778,536	44·3	69·7
North Central Division	133·9	139·8	148·0	152·2	602,323,273	79·1	105·9
Western Division	119·2	129·2	135·0	148·7	79,931,374	81·2	106·4

NUMBER AND SEX OF TEACHERS—PERCENTAGE OF MALE TEACHERS.

	WHOLE NUMBER OF DIFFERENT TEACHERS EMPLOYED.			PERCENTAGE OF MALE TEACHERS.			
	Male.	Female.	Total.	1870-71.	1879-80.	1889-90.	1898-99.
United States	131,793	283,867	415,660	41·0	42·8	34·5	31·7
North Atlantic Division	19,160	82,552	101,712	26·2	28·8	20·0	18·8
South Atlantic Division	20,603	27,713	48,316	63·8	62·5	49·1	42·7
South Central Division	30,758	32,023	62,781	67·5	67·2	57·5	49·0
North Central Division	54,804	124,246	179,050	43·2	41·7	32·4	30·6
Western Division	6,468	17,333	23,801	45·0	40·3	31·1	27·2

PERCENTAGE OF THE WHOLE NUMBER OF TEACHERS WHO WERE MALES.

YEAR.	United States.	YEAR.	United States.	YEAR.	United States.
1870-71	41·0	1879-80	42·8	1888-89	34·9
1871-72	41·3	1880-81	41·7	1889-90	34·5
1872-73	41·2	1881-82	39·7	1890-91	33·5
1873-74	41·6	1882-83	38·2	1891-92	32·5
1874-75	42·2	1883-84	37·9	1892-93	32·0
1875-76	42·3	1884-85	37·4	1893-94	32·2
1876-77	42·8	1885-86	37·4	1894-95	32·6
1877-78	43·1	1886-87	37·4	1895-96	32·6
1878-79	43·3	1887-88	36·4	1896-97	32·6

TEACHERS' SALARIES—NUMBER OF SCHOOLHOUSES—VALUE OF SCHOOL PROPERTY 1898-99.

	AVERAGE MONTHLY SALARIES OF TEACHERS.		Number of buildings used as schoolhouses.	Estimated value of all school property.
	Males.	Females.		
United States	$45.25	$38.14	244,527	$524,689,255
North Atlantic Division	$56.91	$41.20	41,933	$203,372,776
South Atlantic Division	29.23	28.27	35,766	33,979,584
South Central Division	39.39	31.11	49,934	24,400,840
North Central Division	47.00	38.19	104,114	223,007,368
Western Division	61.04	50.58	12,780	39,928,687

SCHOOL MONEYS RECEIVED 1898-99.

	Income of State school funds and rent of school lands.	FROM TAXATION.			From other sources, State and local.	Total revenue (excluding balances on hand and proceeds of bond sales).
		From State taxes.	From local taxes.	Total from taxation.		
United States	$9,019,375	$36,197,338	$143,371,150	$179,568,488	$15,429,749	$204,017,612
North Atlantic Division	$908,519	$12,273,611	$60,234,180	$72,507,791	$5,891,303	$79,307,613
South Atlantic Division	507,883	4,751,975	6,457,440	11,209,415	880,099	12,597,397
South Central Division	959,274	7,749,605	4,704,338	12,453,943	808,207	14,221,424
North Central Division	5,744,839	6,874,450	63,514,214	70,388,664	6,461,607	82,595,110
Western Division	898,860	4,547,697	8,460,978	13,008,675	1,388,533	15,296,068

PROGRESS OF SCHOOL EXPENDITURE.

	TOTAL AMOUNT EXPENDED FOR SCHOOLS.				EXPENDED PER CAPITA OF POPULATION.			
	1870-71.	1879-80.	1889-90.	1898-99.	1870-71.	1879-80.	1889-90.	1898-99.
United States	$69,107,612	$78,094,687	$140,506,715	$197,281,603	$1.75	$1.56	$2.24	$2.67
North Atlantic Division	$29,796,835	$28,538,058	$48,023,492	$76,205,008	$2.38	$1.97	$2.76	$3.70
South Atlantic Division	3,781,581	5,130,492	8,767,165	12,661,418	.63	.68	.99	1.27
South Central Division	4,854,834	4,872,829	10,678,680	13,736,140	.73	.55	.97	1.03
North Central Division	28,430,033	35,285,635	62,823,563	80,425,645	2.14	2.03	2.81	3.09
Western Division	2,244,329	4,267,673	10,213,815	14,253,392	2.15	2.41	3.37	3.50

(1) EXPENDITURE PER PUPIL (BASED ON AVERAGE ATTENDANCE). (2) AVERAGE DAILY EXPENDITURE PER PUPIL. (3) PERCENTAGE ANALYSIS OF SCHOOL EXPENDITURE 1898-99.

	AVERAGE EXPENDITURE PER PUPIL (FOR THE WHOLE SCHOOL YEAR).				AVERAGE DAILY EXPENDITURE PER PUPIL.		PERCENTAGE OF THE TOTAL EXPENDITURE DEVOTED TO—		
	For sites, buildings, etc.	For salaries.	For all other purposes.	Total per pupil.	For salaries only.	Total.	Sites, buildings, etc.	Salaries.	All other purposes.
					Cents.	Cents.			
United States	$3.20	$12.39	$3.40	$18.99	8·6	13·3	16·9	65·2	17·9
North Atlantic Division	$6.41	$16.85	$5.85	$29.11	9·7	16·7	22·0	57·9	20·1
South Atlantic Division	1.00	7.34	1.45	9.79	6·5	8·7	10·2	75·0	14·8
South Central Division	.46	5.82	.64	6.92	5·6	6·7	6·7	84·0	9·3
North Central Division	3.21	13.55	3.56	20.32	8·9	13·4	15·8	66·6	17·6
Western Division	2.88	18.43	5.21	26.52	12·4	17·8	10·8	69·5	19·7

British Empire.

SUMS EXPENDED FROM PARLIAMENTARY GRANTS FOR PRIMARY SCHOOLS.

	1896.	1897.	1898.	1899.	1900.
England	£6,514,955	£6,820,062	£7,565,359	£8,021,391	£8,234,531
Scotland	1,004,113	1,042,690	1,072,195	1,177,727	1,190,283
Great Britain	506,033	544,245	565,280	599,464	624,584
Ireland	1,275,985	1,331,426	1,311,670	1,321,777	1,338,376
U. Kingdom	£9,301,086	£9,738,423	£10,514,504	£11,120,359	£11,387,774

Middle-class education in England is entirely unorganized, and is mainly left to private enterprise; no complete trustworthy statistics are available. There are a number of endowed public and grammar schools, but over the conduct of these schools Government has no control.

TOTAL NUMBER OF VOLUNTARY AND BOARD DAY-SCHOOLS UNDER INSPECTION DURING THE LAST FIVE YEARS IN ENGLAND.

YEARS ENDED AUG. 31.	Schools Inspected.	Accommodation.	Average attendance.	Children on school registers.
1895	19,739	5,937,288	4,325,030	5,299,469
1896	19,848	6,072,374	4,422,911	5,422,989
1897	19,958	6,215,199	4,488,543	5,507,039
1898	19,937	6,316,866	4,554,165	5,576,866
1899	20,064	6,417,514	4,636,938	5,654,092

TOTAL NUMBER OF DAY-SCHOOLS INSPECTED IN SCOTLAND.

YEARS ENDED SEPT. 30.	Schools inspected.	Accommodation.	Average attendance.	Children on school registers.
1895	3,034	789,126	575,305	692,202
1896	3,083	824,448	592,934	709,478
1897	3,086	843,769	605,389	716,893
1898	3,067	847,876	605,776	717,747
1899	3,062	866,066	612,457	731,272

ELEMENTARY SCHOOLS IN IRELAND.

YEARS ENDED DEC. 31.	Schools in operation.	Average on rolls.	Average attendance.	Pupils examined.
1895	8,557	826,046	519,515	561,247
1896	8,606	815,248	534,957	578,012
1897	8,631*	816,001	521,141	560,187
1898	8,651	808,467	518,799	560,170
1899	8,670	796,163	513,852	.....

The German Empire.

The total number of children of school age in 1890 was 8,694,887.

No official statistics of the number of schools, pupils, teachers, etc., are issued for the entire empire: but particulars on these heads will be found under some of the separate states. The number of elementary schools was estimated in 1891 at 56,560, of pupils attending them 7,925,000, and of teachers 120,030. The immediate expenditure on elementary schools was about 242,400,000 marks, of which 69,305,000 marks came from state funds (Brachelli, *Statistische Skizze des Deutschen Reichs*, 7th ed.). In 1897 the number of secondary schools was as follows:

Gymnasia	439	Realschulen	198
Progymnasia	92	Höhere Bürgerschulen	2
Realgymnasia	198	Other public schools	32
Realprogymnasia	93	Private schools	56
Oberrealschulen	40		

Elementary Schools in France (including Algeria).

	Public schools.	Private schools.	Total.	Pupils.
Infant schools	2,574	3,109	5,683	729,648
Primary and superior	67,579	16,075	83,654	5,531,418
Total	70,153	19,184	89,337	6,261,066

Austria.

	Elementary schools.	Teachers.	Pupils.	Children of school age.	Training colleges.
1895	19,277	69,778	3,378,832	3,872,695	87
1896	19,440	71,601	3,430,456	3,919,750	87

	GYMNASIA.			REALSCHULEN.		
	No.	Teachers.	Pupils.	No.	Teachers.	Pupils.
1895	181	3,746	56,152	80	1,610	23,600
1896	186	3,787	57,408	86	1,728	24,953

Elementary (including Normal) Schools in Italy.

	Number.	Teachers.	PUPILS.		
			Males.	Females.	Total.
Asili for infants (1896)	2,813	6,884	160,485	156,632	317,117
Public schools (1895-96)	50,526	51,505	1,296,461	1,082,888	2,379,349
Private schools (1896)	9,000	9,565	69,424	140,650	210,074
Evening, etc., schools (1896)	4,687	4,848	110,468	40,901	151,369
Normal schools (1896)	148	1,622	1,836	22,316	24,150
Licei (1896)	332	1,852	.....	.....	17,689
Ginnasi (1896)	708	4,739	.....	.....	59,578
Technical inst. (1896)	74	1,314	.....	.....	10,274
Technical schools "	381	2,755	.....	.....	37,193
Naval mercantile "	21	183	.....	.....	917

See also article on Illiteracy, in Appendix.

C. H. Thurber.

Schreiner, Olive (Mrs. Cronwright): pseudonym "Ralph Iron"; b. in Cape Town, in the early sixties; daughter of a Lutheran minister and sister of the Hon. W. P. Schreiner. She went to England when twenty years old and there published her first novel, *The Story of an African Farm*. She has since published *Dreams* (5th ed. 1893), *Dream Life and Real Life* (1893), *Trooper Peter Halket of Mashonaland* (1897), and *An English South African's View of the Situation* (1899).

Schreiner, W. P.: South African lawyer and politician: b. in Cape Colony about 1855; was educated at South African College, Cape Town, and Downing College, Cambridge, England, where he was senior in the law tripos of 1882; read law, and was called to the bar at the Middle Temple. He became prominent in Mr. Rhodes's second ministry in 1893, when he was made attorney-general; in 1896 was made a delegate to conduct negotiations as to railway and customs difficulties between Cape Town and the Orange Free State; was a witness before the British South African committee in the House of Commons in 1897; premier of the Cape Parliament in 1898. F. Sturges Allen.

Schürer, Emil, D. D.: Protestant German theologian; b. in Augsburg, May 2, 1844; studied at Erlangen, Berlin, and Heidelberg; became tutor at Leipzig 1869; professor extraordinary 1873; ordinary professor at Giessen 1878, at Kiel 1890, at Göttingen 1895. He is the author of the *Lehrbuch der Neutestamentlichen Zeitgeschichte* (Leipzig, 1874), which in much enlarged form was republished under the title

Geschichte des jüdischen Volks im Zeitalter Jesu Christi (1886–90, 2 vols.; 3d ed., in 3 vols., 1898–99); English translation, *A History of the Jewish People in the Time of Jesus Christ* (Edinburgh, 1885–91, 6 vols.). In 1876 he founded the *Theologische Litteraturzeitung* (Leipzig), and has ever since been its editor, but since 1881 in connection with Prof. A. Harnack, now of Berlin University. S. M. J.

Schweinitz, Emil Alexander, de, M. D., Ph. D.: chemist; b. in Salem, N. C., Jan. 18, 1865; son of Bishop E. A. de Schweinitz; graduated at the University of North Carolina in 1882, where he remained as an instructor until 1884, when he went to Germany and studied chemistry in the University of Göttingen, where in 1886 he received the degree of Ph. D. On his return to the U. S. he became connected with the chemical laboratory of the U. S. Agricultural Department in Washington, and is now director of the biochemic laboratory of that department. For some years he has held the chair of Chemistry in the Columbian University Medical School, and is now dean of that institution. He is a member of numerous scientific societies, including the American and German Chemical Societies, and in 1896 he was president of the Washington Chemical Society. He represented the U. S. at the tuberculosis congress held in Berlin in 1899. He was a member of the jury of hygiene at the Tennessee Centennial Exposition, and received the honorary degree of M. D. from Columbian University in 1894. He is the author of many papers, most of which have been along the lines of biochemistry. Marcus Benjamin.

Schytte, Ludwig: pianist; b. in Aarhuus, Jutland, Denmark, Apr. 28, 1848: after studying chemistry, devoted himself to music in his twenty-second year; studied under several teachers of piano, then under Gade in composition. In 1884 he was in Berlin, and in 1885 was appointed teacher of the highest class in Horak's music academy in Vienna. Here he became associated with Moriz Rosenthal, who plays many of his compositions. These enjoy considerable popularity, but are mostly for the very advanced pianist, abounding in difficulties. D. E. Hervey.

Scots Law, or **Law of Scotland**: The municipal law of Scotland consists, like that of most other countries, partly of statutory or written law, which is embodied in the statutes and decisions of the courts, and partly of the customary or unwritten law, which derives its validity from presumed or tacit consent.

In their earliest form the laws of Scotland are closely analogous to those of Anglo-Saxon England and the other Teutonic nations of Northern Europe. Its present form is the result of modifications due chiefly to the intimate connection which existed for several centuries between Scotland and the Continent of Europe, especially France; and the union of Scotland and France, arising out of the French connection, resulted in a large infusion of the Roman civil law of marriage, guardianship, contract, and the like, and the adoption of several peculiarly French judicial arrangements, such as the constitution of the college of justice, and the model of the parliament of peers, the institution of a public prosecutor of crimes, and the adoption of much of the legal and official terminology common to the legal and judicial systems of the Continent. These peculiarities were also heightened by the custom of the Scotch lawyers of going to the universities of Italy and Holland for legal instruction.

The modifications of the laws of Scotland arising from the union of Scotland and England are most perceptible in the different departments of the mercantile law and in the law of evidence; and the assimilation of the laws of the two countries is continually going on.

The statute law of Scotland may be divided into two distinct, and in many respects dissimilar, portions, the first consisting of those enacted by the Parliament of Scotland from the time of James I. down to the union with England in 1707, and the second of those enacted by the Parliament of Great Britain subsequent to 1707. The public general statutes enacted by the Parliament of Great Britain are presumed to apply to the whole United Kingdom, but this presumption may be overcome by express provision, or by implication. In those cases where an enactment applicable to Scotland is expressed in the English legal terminology, in its interpretation the Scotch words most closely analogous should be applied. The unwritten or customary law of Scotland is commonly held to include the laws made prior to the reign of James I., it being held that these "have gradually lost their statutory force, by their not having been preserved from interpellation by any public record."

The ordinances made by the court regulating the forms of proceeding to be observed in questions of practice commonly called the law of sederunt are also generally considered to be a part of the written law of Scotland, the Court of Sessions having had a delegated power from Parliament to "make such acts, statutes, and ordinances as they shall think expedient for ordering of process and hasty expedition of justice."

The most ancient of the written laws of Scotland are contained in the books of *regiam majestatem*, now considered to be a private transcription of Glanvil's treatise on the laws of England, altered so as to adapt them to recognized practice in Scotland, but feigned to have been compiled by order of David I.; the burgh laws enacted by David I., the statutes of William, Alexander II., David II., and the three King Roberts, all of which were collected and published by Sir John Scheene, clerk register in the beginning of the seventeenth century.

The decisions of the Court of Sessions are commonly considered to be a part of the customary law, and only binding upon the litigating parties; but where they embody a ground of judgment and not a mere *obiter dictum*, the judgment of a superior court is binding in a similar case upon an inferior or co-ordinate court unless itself modified by the statute.

The civil and canon laws, although they have had a very great influence upon the laws of Scotland, are not deemed to be properly parts of its written law. Nevertheless, their influence was such that the powers exercised by the sovereigns and judges of Scotland have been justified upon the ground that they were conformable to the civil or canon laws; and until the time of the Reformation, when a statute was passed rescinding so much of the constitution of Scotland as was repugnant to the Protestant doctrine, they were of great weight in matters of interpretation or the adjudication of the unwritten law. From the time of the Reformation the canon law has been little respected, and it does not now obtain except where it has been acknowledged by a statute or a decision of the courts, or has been adopted in the canons of a provincial council. The Roman law, however, still continues to have great weight in all cases where it is not contrary to statute or custom, and where its application accords with the genius of the Scots law.

For a full treatment of the history and specific provisions of the law of Scotland, see Lorimer's *Handbook of the Law of Scotland* (6th ed. 1894); Erskine's *Principles of the Law of Scotland* (19th ed. 1895); Bell's *Principles of Law* (1890).

F. Sturges Allen.

Scots Money: a term applied specifically to the money used in Scotland before her union with England. When money is mentioned in the acts of Parliament of Scotland or in judicial or public proceedings prior to the union, and for some time after that, Scots money is meant, unless the contrary be expressly stated. This money is one-twelfth the value of sterling money. The following is a table showing the relative value of Scots money and sterling money:

Scots.	Sterling. £	s.	d.
1 doyt, or penny	0	0	$0\frac{1}{12}$
1 bodle, or twopence	0	0	$0\frac{2}{12}$
1 plack, groat, or fourpence	0	0	$0\frac{4}{12}$
1 shilling	0	0	01
1 merk, or 13*s.* 4*d.* (two-thirds of a pound)	0	1	$1\frac{4}{12}$
1 pound	0	1	8
100 pounds	8	6	8

F. Sturges Allen.

Scott, Colin Alexander, Ph. D.: educator; b. near Ottawa, Ontario, Feb. 11, 1861; studied in New York city grammar schools, College of the City of New York 1878–79, Toronto Normal School 1880; graduated at Queen's University, Kingston, with honors in chemistry and biology, in 1886; fellow in psychology, Clark University, 1895–97; Ph. D., Clark University, 1897; supervisor and teacher of drawing, Kingston public schools, 1886–87; science master, Ottawa Collegiate Institute, 1887–95; head of department of psychology and child-study, Chicago Normal School, since 1896. He is author of *Sex and Art* and *Old Age and Death* (*American Journal of Psychology*, 1896); *Psychology and Adolescence* (N. E. A. *Proceedings*, 1897); and various poems and magazine articles; as an artist has been an exhibitor at Royal Canadian Academy, Boston Art Club, Art Institute, Chicago, etc. C. H. Thurber.

Scott, Rev. Frederick George: author; b. in Montreal, Apr. 7, 1861; educated at Bishop's College, Lennoxville, and at King's College, London. He entered the ministry in 1886, and ten years later became curate of St. Matthew's, Quebec. Besides a novel, *Elton Hazelwood* (1893), he has published three volumes of poetry: *My Soul's Quest, and other Poems* (1888); *My Lattice, and other Poems* (1894); and *The Unnamed Lake, and other Poems* (1897).

Scott, Sir John, K. C. M. G., D. C. L.: English lawyer; b. in Wigan, Lancashire, in 1841, his father being a solicitor of that place; was educated at Bruce Castle School, Tottenham, and at Pembroke College, Oxford, receiving his degree of bachelor of arts in 1865, and of master of arts in 1868; read law in the Inner Temple, and was called to the bar in 1865, and took up the practice of his profession on the northern circuit. He was appointed a judge and afterward vice-president of the international court of appeal in Egypt 1874–82; judge of the high court at Bombay 1882–90; and was judicial adviser of the Khedive of Egypt 1890–98. He has received decorations of several honorary societies, including the grand cordon of the Medjidieh and the grand cordon of the Osmanieh. In 1898 he was appointed deputy judge-advocate-general to the royal forces of Great Britain. He was knighted in 1894. F. Sturges Allen.

Scott, Julian: artist; b. in Johnson, Vt., Feb. 14, 1846; entered the Union army at the outbreak of the civil war; studied art at the National Academy in 1863, and afterward under Emmanuel Leutze; became an associate of the Academy in 1871, and was made life fellow of the American Geographical Society in 1873. Among his paintings, which chiefly portray army life, are *Rear-Guard at White Oak Swamp*; *Battle of Cedar Creek*; *The Recall*; *Battle of Golding's Farm*; *On Board the Hartford*; *Old Records*; *Duel of Burr and Hamilton*; *Reserves Awaiting Orders*; *In the Cornfield at Antietam*; *Charge at Petersburg*; *The War is Over*; and *The Blue and the Gray*. D. July 4, 1901.

Screw Propeller: an appliance whereby may be obtained the thrust necessary for the propulsion of a ship through the water. Geometrically, a screw propeller may be defined as consisting of one or more blades having on the rear or driving side an approximately helical surface, such blades being joined to a common boss or central portion through which they receive their motion of rotation in a transverse plane relative to the ship. Fig. 1 shows a four-bladed right-hand propeller. A propeller is said to be *right-hand* or *left-hand* according as it turns with or against the hands of a watch when viewed from aft and driving the ship ahead. The *face* or *driving-face* of a blade is the rear face. It is that face which acts on the water, and which in return receives the excess of pressure which gives the driving thrust. The *back* of a blade is on the forward side. The *leading* and *following edges* of a blade are respectively the forward and after edges. The *diameter* of a propeller is the diameter

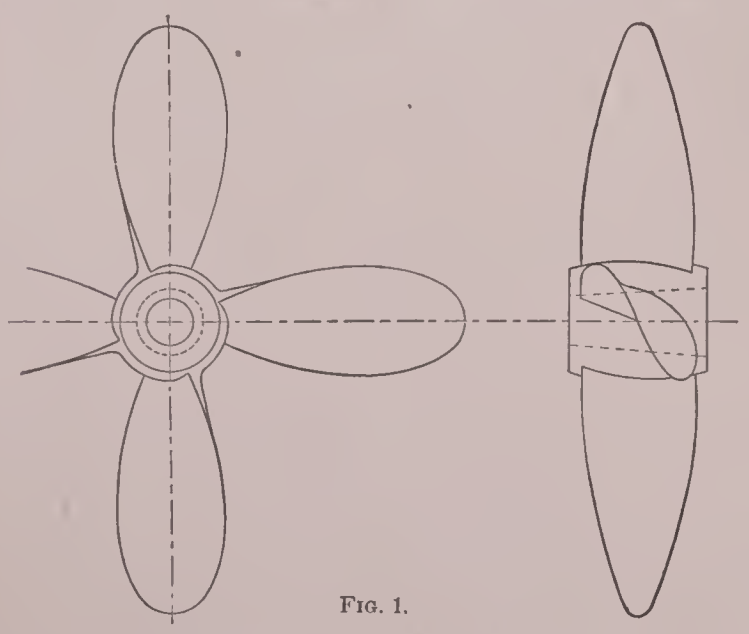

Fig. 1.

of the circle swept by the tips of the blades. The pitch is the axial distance between two successive convolutions of the helical surface. In an actual propeller the term should be understood as strictly referring to a small element of the driving-face only. With this understanding the pitch may be defined as the longitudinal distance which the ship would be driven were such element to work on a smooth, unyielding surface, as the corresponding helical surface of a fixed nut. Pitch is thus seen to be purely a geometrical function of the propeller. Its value may vary from point to point over the entire driving-face, or it may be constant. In the latter case the propeller is said to be of uniform pitch. If it increases as we go from the hub toward the outer circumference, the pitch is said to increase radially. If it is greater on the following than on the leading edge, the pitch is said to increase axially. The latter mode of variation is usually implied by the simple term *increasing* or *expanding pitch*. The *pitch ratio* is the ratio of pitch to diameter. The *slip* of a propeller is the difference between the distance which the ship would go were the propeller to work with its face on a smooth, unyielding surface and the distance traveled in the actual case. For one revolution the former distance is the pitch as above defined. The *slip ratio* is the slip for one revolution divided by the pitch. The *area*, *developed area*, or *helicoidal area* of a blade is the actual surface of the driving-face. For the propeller it is, of course, the sum of the areas of the blades. The *projected area* is, correspondingly, the area of the projection, on a transverse plane, of one blade or of all the blades. The *disk area* is the area of the circle swept by the tips of the blades. The *boss* or *hub* is the central body to which the blades are all united, and which in turn is attached to the shaft.

Returning now to the geometry of the propeller, we will consider the principal forms which may be produced. Taking

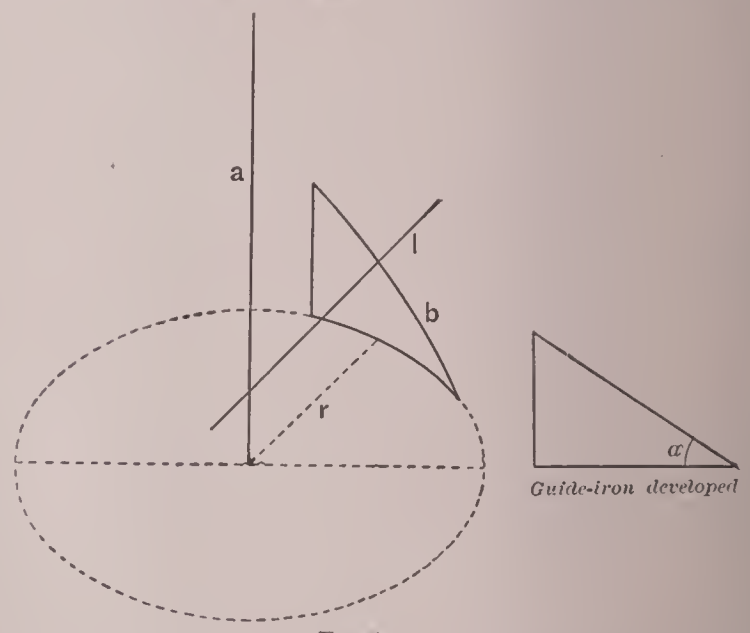

Fig. 2.

the common helical surface of uniform pitch as standard, we may generate such a surface by a line, l, Fig. 2, moving so as to touch the axis a and the guide b, and remain always at a fixed angle of 90 degrees with the axis. The guide b, or *guide-iron*, as it is termed, lies in the surface of a cylinder of which a is the axis. The surface of this cylinder being developed, we have the actual or developed form of the guide-iron. In the present case this will be a straight line inclined to the transverse, or development of the circumference, at an angle α, and if r is the radius of the cylinder containing the guide-iron the pitch p will have the value $p = 2\pi\ r \tan \alpha$. The surfaces for most of the forms of propellers may be generated by variations in the generatrix l, or in the guide-iron b, or in the duplication of the latter. The variations found in l are as follows: (1) Straight and at right angles to a; (2) straight and inclined to a; (3) bent or curved in an axial plane; (4) bent or curved in a transverse plane. The developed guide-iron may have its edge either straight or curved. The curvature is usually such that the angle α, and hence the pitch, increases from the forward to the after edge. Where two guide-irons are used corresponding to different values of the pitch near the hub and tip, there will be a continuous radial change in the pitch. We may have also other forms of helicoidal surface which can not be generated by a rigid line in any manner. We may most readily conceive of such a surface as made up of the summation of an indefinite number of guides, b, and thus as generated by a variable guide moving radially, and perhaps angularly and longitudinally as well, and taking at the same time the successive shapes and inclinations as determined by the nature of the pitch at the successive radial locations. In this way any form of blade and any distribution of pitch, no matter how complex, may be geometrically determined,

and by the use of a reasonable number of guides actually produced in the form of a pattern, or moulded direct in the foundry.

It is thus possible to form an indefinite variety of propellers as regards shape of blade and distribution of pitch, and to use either two, three, or four, or even more blades for a propeller. But few among this great variety of forms are, however, in practical use. The propeller of uniform pitch with blades at right angles to the axis, generated as described above, is most commonly met with. Instead of making a right angle with the axis, the blades are often bent back from the plane of rotation. The surface for such a blade may be generated by inclining the generatrix at an appropriate angle, usually from 5 to 15 degrees from the perpendicular. The pitch, instead of being uniform, is often caused to vary over the surface of the blade according to some more or less definite law. The most common variation of pitch is an increase from the forward or leading edge to the after or following edge. Such a surface may be generated by giving to the edge of the developed guide-iron an appropriate curvature, as noted above. The pitch may also be given a radial variation, in such case being usually made less near the hub than at the tip of the blade. As noted above, such a surface requires two guide-irons, one near the hub and the other near the tip, each adapted to the pitch at that part of the blade. In some cases the distribution of pitch is still more complex. For a certain distance from the hub outward, for example, the pitch may remain constant, then increase rapidly by some 15 or 20 per cent., and then decrease again to a smaller value near the tip. In such case the surface can not be generated by a rigid line, but, as noted above, may be considered as an aggregate of an indefinite series of guide-irons varying in such manner as to give the distribution of pitch desired.

There is at present little or no scientific foundation for the various departures from a uniform pitch. Theoretical examination can not settle the question of the best distribution of pitch, and it has not yet been made the subject of experimental investigation. So far as experimental results seem to indicate, the uniform pitch is quite as efficient as other distributions more or less irregular in character.

In modern practice the screw propeller is usually of either three or four blades. There is little scientific ground for choosing between the two, except that for the same work under the same conditions the propeller of three blades will be necessarily some 10 per cent. greater in diameter than that of four. The actual area of the blades, or *helicoidal area*, is usually made a certain fraction of the *disk area*, or area of the circle swept by the tips of the blades. This proportion is usually found between ·25 and ·35 for three blades and between ·35 and ·50 for four blades. The shape of the blades has undergone considerable modification in the course of the development of the typical modern screw propeller. The earlier forms of blades were more or less trapezoidal in form, widening toward the tips and with only slightly rounded corners. The modern form of blade is distinctly oval or elliptical in form, as shown in Fig. 1.

Fig. 1 shows the propeller cast entire, or with the blades fast to the hub. Most large propellers in modern practice are made with blades and hub cast separately. The blades are then attached to the hub by bolts, or by some form of dovetailed and keyed joint. This type of construction has advantages where a large number of propellers are to be made, but its chief feature lies in the readiness with which a broken or damaged blade may be removed and replaced by a new one, instead of by a new propeller entire, as would be necessary with the solid type of construction. When the blades are bolted to the hub, it is also usually so arranged that they may be twisted about a radial axis a little way on either side of a mean position, thus effecting within moderate limits any desired change of pitch.

It should be noted that such a rotation is in the nature of a distortion, and does not equally affect the pitch, so that if it is normally uniform it will not so remain after the change, and the surface will have undergone geometrically an entire change of character. The amount of variability is slight, with the usual amounts of rotation, so that the method is available as a practicable way of effecting moderate changes in the effective or average pitch of the propeller.

Propulsive Action.—The fundamental problem in propulsion is to find a thrust whereby we may overcome the resistance which the ship meets when moving through the water. The action of a screw propeller in developing this propulsive thrust may be viewed from two standpoints, as follows:

We know that the production of a change of momentum requires the action of a force and the expenditure of energy, and that conversely the matter acted on will react on the agent producing the change of momentum, such reaction being, in fact, the resistance opposed to the change of momentum. If, therefore, we provide an agent attached to the ship which shall produce a change of momentum in matter of any kind, such change of momentum being directed astern, or at least having a sternward component, there will result on the agent a reaction having a forward component, such reaction being then available as a propulsive thrust.

Viewed from this standpoint it is the office of the propeller to act on the water as a convenient medium, and to impart to it an accelerated motion having at least a sternward component. It will then receive the corresponding forward reaction, and thus will be developed the propulsive thrust desired.

Turning now to the second view, it is a fact of common experience that no body can be moved through a liquid without experiencing a resistance. Let us then consider the pair of bodies formed by the ship and propeller, the latter being given motion relative to the former. Such motion will meet with a resistance which is simply the resultant of the distributed systems of pressures and tangential forces acting on the surface of the moving body. This resistance, as a resultant force, is not, in general, in a line directly opposed to the direction of motion. Especially with the form given to the propeller-blade, as shown in section in Fig. 3, the resulting total resistance has a direction somewhat as indicated by A B, lying only slightly inclined to C B, the perpendicular to the surface. The force A B which thus acts on the blade has a longitudinal component D B, which acts directly as a propulsive thrust. The mathematical investigation of the action of the screw propeller from the first standpoint would require a determination of the relation between the propeller and its motion, on the one hand, and the amount of water acted on and the sternward acceleration imparted to it, on the other. The investigation from the second standpoint would require a determination of the relation between the propeller and its motion, on the one hand, and the resulting distributed system of surface forces, or at least the resultant total resistance, both in direction and amount. None of these determinations in general terms is possible, with any satisfactory degree of accuracy, and it thus follows that, from the standpoint of pure mathematics and mechanics, the investigations are necessarily limited to ideal cases, which are of interest and value as giving the results for certain hypothetical or limiting conditions, but which require to be modified by factors derived from experimental investigation before they can be made of use for purposes of design. By this combination of theoretical and experimental investigation a fairly satisfactory working theory of the propeller has been derived. It thus appears that we may take the thrust developed by the propeller as directly proportional to the square of the diameter, the square of the pitch, and the square of the revolutions; as increasing with the slip ratio rather more slowly than in direct proportion; as decreasing with increase of pitch ratio rather more rapidly than in inverse proportion; as increasing with increased area of blade very slowly beyond the usual area proportions; and as varying with the shape of blade nearly in the ratio of the moment of inertia of the blade area about the axis of rotation.

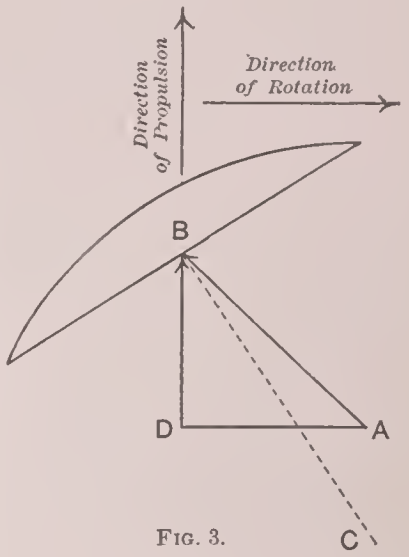

Fig. 3.

The product of the thrust by the distance traveled gives the useful work, while the total work will equal the useful work divided by the efficiency. The latter term, which in engineering always means a proportion of returns to expenses, means here, of course, the ratio between the return in the shape of useful work and the expense in the shape of total work furnished to the propeller.

The efficiency is chiefly dependent on the pitch ratio and

slip. Under favorable circumstances it is found between ·65 and ·70. For a pitch ratio of about 1 the highest efficiency, with normal area and shape of blade, corresponds to a slip ratio of about 18 per cent.; for a pitch ratio of about 2 the highest efficiency corresponds to a slip ratio of about 23 per cent.

Fig. 4 shows three efficiency curves derived from experimental results, and corresponding to pitch ratios as indicated. All propeller efficiency curves show the same leading

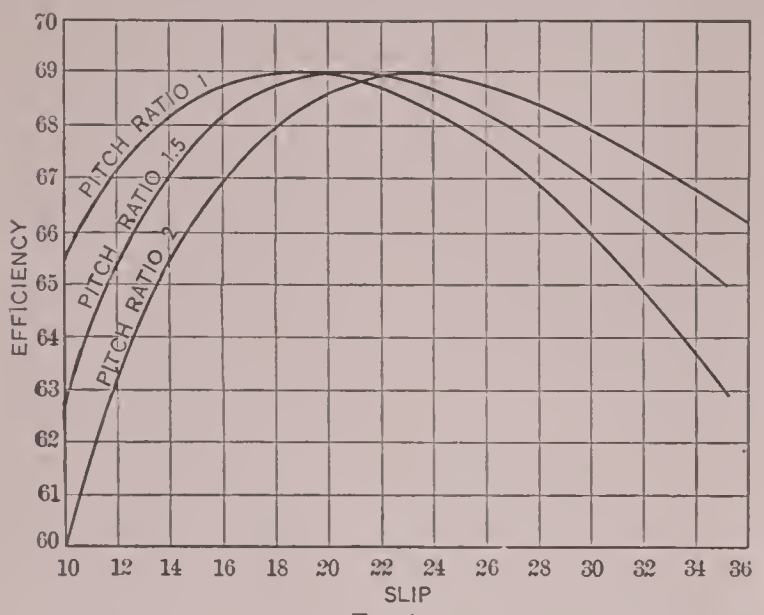

Fig. 4.

characteristics. The value falls off from the maximum much more rapidly for a decrease of slip than for an increase, while for a considerable range of slip variation the change in efficiency is but slight, thus making possible a fairly good economic performance, even with some uncertainty in the conditions.

At excessively high rotative and peripheral speeds such as are occasionally met with in cases of advanced practice, especially when combined with a large slip, a phenomenon has recently presented itself to which the term *cavitation* is applied. In the case of a moving immersed body, the water behind the body closes in and fills up the open space in the wake which the motion would tend to form. The water thus closes in by virtue of the static pressure head, and its velocity will depend on such pressure, and hence on the depth. If the velocity of the body be sufficiently high, it will exceed the rate at which the water can flow in behind it, and thus will be formed an open or partly vacuous space in the wake of the moving body. This result is occasionally reached with propeller-blades at very high speeds, and it is found, under such circumstances, that but little additional thrust is gained by an increase in revolutions, while the efficiency undergoes serious loss.

It is always desirable, therefore, to avoid the conditions giving rise to the phenomenon of cavitation. This can usually be attained by appropriate design. In some cases the difficulty has been obviated by the use of two or three screws on one shaft, and two or more shafts, thus subdividing the power among several screws, for which the conditions will be less trying than with one or two of larger diameter.

Reaction between the Ship and Propeller.—The action of the propeller as discussed above involves the slip ratio as one of the determining conditions. Considering the propeller as working in undisturbed water, the meaning of this term is without ambiguity. In the actual case, however, the propeller works behind a ship, and in the wake produced by its motion through the water. The constitution of this wake must be briefly noted. The surface of the ship through molecular forces, and by reason of its slight irregularities, sets in forward motion a thin layer of water, of which that near the surface moves with nearly the velocity of the ship itself, while as the distance from the surface is increased the velocity rapidly decreases. The water thus acted on by the skin of the ship is finally found at the stern, where, influenced still further by wave and stream-line motion, it forms the so-called wake. The forward velocity in the wake at different points in a transverse plane at the stern is quite variable, rising as high as 50 or 75 per cent. of that of the ship at points near the stern-post at the surface, and decreasing both outward and downward to nothing as the outlying water is reached. For single-screw ships the average value in that part of the wake influenced by the propeller is usually found between 10 and 20 per cent. of the speed of the ship. For twin-screw ships the propellers are located somewhat outside the strongest part of the wake, and the average value for that part influenced by them is usually found between 6 and 10 per cent. of the speed of the ship.

It follows that the actual propeller works in a stream of water flowing forward relative to the surrounding body of still water with an average velocity from 5 or 6 to 20 per cent. or more of the velocity of the ship. It is clear that the performance of the propeller will depend fundamentally upon the water in which it works and on which it acts, rather than upon the outlying body of undisturbed water. Hence the value of the slip as related to the thrust developed and to the efficiency must be reckoned relative to the wake, and not to the outlying undisturbed water. The slip relative to the outlying water is, however, of importance in the process of design, so that we have thus two different slips to be taken into consideration. Their relation may be seen as follows: Taking all velocities relative to the outlying still water, let u be the velocity of the ship and v that of the wake, both in feet per minute. Then $(u - v)$ is the speed of the propeller through the wake. Also let p denote the pitch of the propeller and N the revolutions per minute. Then, if there were no slip, pN would be the speed through the water in which the propeller works. The difference $pN - u$ is called the apparent slip, and is evidently the slip relative to the outlying still water. The difference $pN - (u - v)$ or $(pN + v) - u$ is the true slip, or the slip relative to the water in which the propeller works. The difference between the two is readily seen to be the wake velocity, as we should expect—the true slip being greater than the apparent by the amount of this difference. When the term slip is used in a loose or popular way, it is usually the apparent slip which is intended. When it is used as one of the conditions controlling the performance of a propeller, the true slip is implied. The statements made above regarding the relation of the slip of the propeller to its performance refer solely to the true slip.

The ship is thus seen to exercise, through the wake which it causes, a modifying influence on the performance of the propeller. On the other hand, the propeller, by the nature of its action, exercises an influence over the resistance of the ship. This arises in the following manner: As we have already seen, the action of the propeller is to produce an acceleration in the water acted on. In the actual propeller this is produced partly in front of the propeller and partly in and aft of the propeller. That part of the acceleration produced in front of the propeller arises from a defect of pressure extending some little distance forward, and in answer to which the water flows aft toward the propeller and in the direction of decreasing pressure with increasing velocity. It follows that extending throughout the water for some little distance forward of the propeller is a region of decreased liquid pressure. This will result in a decreased forward pressure on the stern of the ship, and in a virtual increase in the resistance to be overcome. (See Resistance.) Somewhat more popularly the action of the propeller may be likened to a pump drawing water away from the ship and delivering it sternward with an accelerated velocity. This results in the same decrease of liquid pressure about the stern, and in the increase of resistance as before.

The true resistance to the motion of a ship is considered as the tow-line resistance—that is, the resistance measured by the pull on a tow-line necessary to move the ship at the given speed. The actual resistance, including this effect due to the propeller, is known as the augmented resistance, and the increase chargeable to the action of the propeller is correspondingly termed the augmentation of resistance.

The actual thrust developed by the propeller must, of course, equal the augmented resistance. The augmentation effect implies, therefore, a loss in efficiency corresponding to the increase in thrust which must be developed, as compared with the true or tow-line resistance.

On the other hand, the location of the propeller in the wake enables it to regain part of the energy spent in forming the wake, and thus to develop the necessary thrust with a lesser expenditure of power than if it worked in the outlying still water. This action is known as the *wake-return*, and implies a gain in efficiency due to the location of the propeller within the wake. Experiment shows that for all normal conditions the loss due to augmentation and the

gain due to the wake increase and decrease together, and at all times very nearly balance each other, leaving the net work of the propeller nearly the same as that which would be required to move the ship at the same speed by means of a tow-line. The power required for the latter is known as the *effective horse-power*, and is usually from 50 to 60 per cent. of the indicated horse-power. The remaining 50 to 40 per cent. represents the power lost in the friction of the engine and line-shaft, and in the propeller as an instrument of propulsion.

Number and Location of Propellers.—The number of propellers fitted will depend on the desired subdivision of power, the available draught, and the desired number of revolutions of the engines. In many cases the total power is more than is readily transmitted with one shaft, and thus two or more shafts and propellers are fitted. Considerations of safety against breakdown and increase of manœuvring power point also toward subdivision of the power and two or more propellers. Again, the draught may be so limited, or the power so great, that a single screw would be of too large a diameter for the needed immersion of the blades. In such cases, also, two or more propellers may be fitted, thus reducing the diameter to a value suited to the draught of the ship.

The location of the propeller depends on the question of augmentation of resistance, on its relation to the wake, and on structural considerations. If single it is usually placed directly aft of the stern-post, at such distance as the necessary structural arrangements make convenient. Twin screws are located one on each side, close about the stern-post or slightly forward, usually, though not always, in the same transverse plane.

With the cut-up form of stern commonly found on torpedo-boats, fast yachts, etc., the propeller or propellers come entirely underneath the structure of the boat. This favors a full and free flow of water to the propeller, and tends to decrease augmentation of resistance.

Materials.—For the material of screw propellers cast iron, cast steel, brass, gun-metal, and the various bronzes are used. Cast iron is the cheapest, but, being relatively weak and brittle, the blades are necessarily thicker and less efficient than with steel or bronze. The strength available is usually from 20,000 to 25,000 lb. per square inch of section.

Cast steel is stronger than cast iron, its ultimate strength in castings suitable for propeller-blades ranging from 50,000 to 60,000 lb. per square inch of section. The sections may therefore be made thinner, and a better efficiency obtained in so far as dependent on this feature. The surface is naturally not as smooth as that of cast iron, but with improved methods of production the difference in this feature is insignificant.

Bronzes have naturally a smoother surface, and seem, furthermore, to have a lower coefficient of skin resistance. This, added to their strength and good casting qualities, makes possible a relatively smooth, thin blade with sharp edges, all of which are features favorable to good efficiency. The strength available with the best bronzes varies from 40,000 to 60,000 lb. per square inch of section. With ordinary gun-metal from 25,000 to 35,000 lb. per square inch of section may be allowed, while with common brass not more than 20,000 to 25,000 lb. should be depended upon. Of these various alloys, manganese bronze is probably more used than any other, because of its better combination of desirable qualities, resistance to corrosion, etc. Its greater relative cost restricts its use, however, to war-ships, yachts and launches, ocean-liners, and other cases where the importance of a saving in propulsive efficiency is considered worth obtaining at a slight increase in first cost.

The durability of propeller-blades is, in the order, bronze, cast iron, cast steel. The last two usually deteriorate by general corrosion and local pitting, the average life being usually from five to ten years. The life of bronze blades is practically indefinite, or at least as great as that of the ship itself.

Field of Employment.—For the propulsion of war-ships of all classes and of all vessels engaged in deep-sea navigation, the screw propeller may be said to be exclusively employed. It is also used on all tugboats, fast yachts, launches, and like craft, and its use is rapidly extending for bay and river steamers, a field long held by the paddle-wheel as peculiarly its own.

For more detailed information on this subject, reference may be made to the following papers and works: William Froude, in *Transactions Inst. of Naval Architects, London* (vol. xix., p. 47); R. E. Froude, *ibid.* (vol. xxiv., p. 231; vol. xxvii., p. 250; vol. xxx., pp. 390, 406; vol. xxxiii., p. 265); A. G. Greenhill, *ibid.* (vol. xxix., p. 319); Pollard and Dudebout, *Théorie du Navire* (Paris, 1893); Taylor, *Resistance of Ships and Screw Propulsion* (New York, 1893); Durand, *The Resistance and Propulsion of Ships* (New York, 1898). W. F. Durand.

Scripture, Edward Wheeler, Ph. D. (Leipzig): psychologist; b. in Mason, N. H., May 21, 1864; studied at the College of the City of New York and the Universities of Leipzig, Berlin, and Zurich; was fellow at Clark University 1891–92. In 1892 he was made instructor in experimental psychology at Yale University, and in 1898 was appointed director of the psychological laboratory there. His principal works are *Arithmetical Prodigies* (1891); *Thinking, Feeling, Doing* (1895); *The New Psychology* (1897); and various articles in psychological magazines. He is editor of the annual *Studies from the Yale Psychological Laboratory*, containing results of the investigations made there. He has devised numerous psychological apparatus, including a pendulum chronoscope. Howard C. Warren.

Sea Laws: This term is used in general to designate the laws relating to maritime or admiralty matters; but it is more usually and specifically used to designate what are technically known as the *rules of the road*. In the first and broad sense of the word it includes the general admiralty laws regulating the rights of merchants in time of war and peace, the rights of masters of ships and of seamen, the rights of belligerents and neutrals in time of war, etc. For full treatment of these subjects, see Admiralty, Masters of Ships, Rules of the Road, Belligerents, Neutrals, etc.
F. Sturges Allen.

Sea Letter, or **Sea Brief**: a document which is required by the law of nations to be found on board of every neutral ship as one of its papers evidencing its title to neutrality. It specifies the nature and quantity of the cargo, the port whence it was shipped, and the port of its destination. It is analogous to the passport of an individual. See Chitty's *Treatise on the Law of Nations.* F. Sturges Allen.

Search-light: an electric arc-lamp in combination with mirrors or lenses so adjusted as to project the light in a nearly cylindrical beam. The apparatus as a whole comprises the following chief items: (1) The lamp and its focusing mechanism; (2) the projecting mirrors or lenses; (3) the means for controlling the lamp as a whole, and thus for directing the beam where desired.

The lamp is of the ordinary arc type, but must be provided with means for adjusting the arc at the principal focus of the mirror. This may be done automatically, or by direct hand control, or by a combination of the two. The last method may be preferred, as no form of automatic control can be depended on to take care of all contingencies which may arise in the nature of the arc or form of the carbon-points. At the same time, the best forms of regulators will satisfactorily control the arc under all ordinary circumstances, thus dispensing with the close attention necessary with hand control alone.

The lamp may be either inclined or horizontal. With the former the rays of light readily reach the mirror, but a small change in the location of the arc removes it from the principal optical axis of the mirror, and may cause loss of light in the reflected beam. With the latter, the larger positive carbon facing the mirror, the light is to some extent intercepted by the negative carbon; but changes in the location of the arc do not remove it from the optical axis, and only a slight loss in concentration results from a moderate lack of adjustment in the focus. The chief advantage of the horizontal lamp seems to be in its readier adaptation to automatic control than that of the inclined lamp. Both types of lamp are employed in standard forms of search-light.

The optical part of the apparatus consists of a concave mirror, of which there are three types: parabolic in form and of polished metal; parabolic in form and of glass silvered on the convex side; spherical in form and of glass silvered on the convex side. Polished metal is used only for the cheaper kinds of search-lights, because at best its surface is a poorer reflector than silvered glass, and it tarnishes persistently, especially when exposed to sea-air. To some extent there is a tendency in the trade to imply by the term *search-light* an apparatus fitted with a metal mirror, and by *projector* one fitted with a mirror of silvered glass. The Schuckert mirror is of glass, parabolic in form, and silvered on the convex side, the glass being of uniform

thickness. This makes a most excellent reflector, but is difficult to form accurately. The Mangin mirror, which has on the whole met with most favor, is of glass with spherical surfaces, the back surface having the greater radius, as shown in Fig. 1. By this combination of reflection and refraction the aberration is very closely corrected, and a cylindrical beam with a deviation of less than 2 degrees is projected. As between the parabolic and spherical mirrors, the former has the important advantage of a shorter focal distance for the same diameter. In consequence of this the mirror subtends a larger angle at the arc, and thus receives a larger proportion of the light given off, and thus throws a beam of greater intensity, other conditions being equal. The mirror with spherical surfaces has, however, the important advantage of being much more readily ground and polished with geometrical accuracy, and it is this advantage which has led to its more general use.

FIG. 1.

For mounting the lamp and mirror they are placed in a cylinder hung on pivots in a supporting frame, as shown in Fig. 2. The front of the cylinder is covered by thin plane glass for purposes of protection. This frame turns about a vertical pivot in the supporting base of the apparatus, and by a combination of these two movements the motions of the beam of light are under complete control. These movements may be either controlled at the light by hand, or from a distance by mechanical transmission, or in the larger sizes by distant electrical control of motors in the base of the apparatus. The usual range of sizes for search-lights is from 2,000 to 10,000 candle-power, requiring from 10 to 100 amperes of current at a potential difference of about 50 volts. The diameters of mirror and barrel vary, correspondingly, from 8 or 10 to 30 inches.

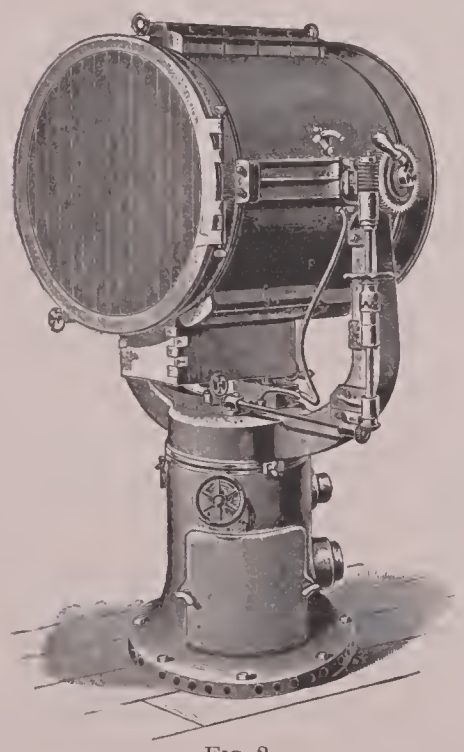

FIG. 2.

The search-light is chiefly useful as an aid to navigation, its immediate purpose being to assist in picking up buoys or range-marks, or in detecting the vicinity of other ships, or of reefs, rocks, and other dangers to navigation. To this end great concentration of light is necessary in order to illuminate the object sufficiently to make it visible at the maximum distance possible, and this is furnished by the arc-lamp and mirror as described. If desired, the lamp may usually be moved slightly out of focus, thus giving a spreading beam and serving for purposes where a more general illumination of lesser intensity is suitable. In the larger and more complete forms one or more lenses are usually provided for producing at will the angle of dispersion or divergence which may be desired. Search-lights are also of high importance as a part of the defensive equipment of war-ships. Against night torpedo-boat attacks they are considered as one of the chief items of defense, rendering them visible at a distance of a mile or more, and thus exposing them to attack from the rapid-fire battery.

On the larger war-ships four, and sometimes more, search-lights are installed at various points, intended to provide defense on all sides, and duplication in case of injury from gun-fire. For navigational purposes alone one light is usually sufficient, located on the pilot-house or bow, and intended especially to project its beam directly ahead and across the bows on either side. W. F. DURAND.

Seaver, EDWIN PLINY, A. M., LL. B.: educator; b. in Northborough, Mass., Feb. 24, 1838; graduated at the Bridgewater (Mass.) Normal School 1857; A. B. and A. M., Harvard College, 1864; LL. B., Harvard Law School, 1868; tutor and assistant professor, Harvard College, 1865–74; head master of English High School, Boston, 1874–80; superintendent of public schools, Boston, since 1880; author of several mathematical text-books.

Seawell, MOLLY ELLIOT: author; b. in Gloucester co., Va., Oct. 23, 1860; was educated chiefly at home; won a short-story prize in 1890, and a $3,000 prize for a story in the New York *Herald* in 1895; she is the author of *Midshipman Paulding* (1891); *Paul Jones* (1892); *Decatur and Somers* (1893); *The Berkeleys and their Neighbors* (1894); *A Strange, Sad Comedy* (1895); *The Sprightly Romance of Marsac* (1896); *The History of Lady Betty Stair's Suitors* (1897); *A Virginian Cavalier* (1898); *The Rock of the Line* (1898); and *The Loves of the Lady Arabella* (1898).

Securities: This term is strictly used to designate property held to secure the payment of a debt or obligation of another; but the term is commonly applied to those forms of property in which investments are usually made, consisting of a debt or obligation of another and stocks in corporations evidenced by bond or bond and mortgage, stock certificate, or instrument of such other form as may be used in any particular case.

Growth of Investment Securities.—The rapid and very great increase in personal property which has taken place during the nineteenth century, and especially in the last fifty years, and its accumulation in the hands of private individuals and corporations, has led to a corresponding increase in the demand for proper security for suitable investment for such funds. On the other hand, the rise and development of the modern industrial system, the invention and development of valuable patents, the establishment of great centers of manufacturing industry with establishments employing enormous fixed capital invested in manufacturing plants, the creation of systems of railway communication, the incurring of enormous national debts by nations in carrying on wars or other operations requiring unusual expenditure of money—these have all added to the forms of securities which are offered to investors with a rapidity equal to the growth in the demand. This has led to a complicated system of securities which admit of a general legal classification, but are confusingly various and different in their details as to names by which they are designated, the methods under which they may be legally issued, the degree of security given by them, the rights of the holders, etc.

The subject of the investment of funds in securities by trustees, charitable institutions, and public corporations, such as savings-banks, trust companies, banks, etc., the investment of whose funds affects the public interest, is specifically and carefully regulated by statute to secure the honest and safe disposition of the funds invested.

The chief securities of Great Britain in which such funds may be invested are the parliamentary stocks of public funds or Government securities of the United Kingdom; real or heritable securities; the stock of the Bank of England and the Bank of Ireland (which are authorized investments for trustees) and the stock of other banks (which are not authorized investments for trustees); Indian stock issued by the Secretary of State in council of India, under the authority of act of Parliament and charged on the revenues of India; securities the interest of which is for the time being guaranteed by Parliament; consolidated stock created by the metropolitan board of works or by the London county council, and debenture stocks created by the receiver for the metropolitan police district; debenture or rent-charge or guaranteed or preference stock of railway companies incorporated by special act of Parliament (only those which have not passed a dividend of less than 3 per cent. per annum on the ordinary stock for the ten years last past being authorized investments for trustees); stock of railway and canal companies leased in perpetuity for a term of not less than 200 years at a fixed rental to another such company as immediately above mentioned; debenture stock of railway companies in India, the interest of which is paid or guaranteed by the Secretary of State in council of India;

annuities of the Eastern Bengal, the East India, and the Sindh, Punjaub and Delhi railways, which are charged on the revenues of India, and also deferred annuities comprised in the registry of holders of India, class D, and annuities comprised in the register of annuitance, class C, of the East Indian Railway Company; the stock of railway companies in India upon which a fixed or minimum dividend is paid or guaranteed by the Secretary of State in council of India, or upon the capital of which the interest is so guaranteed; debenture or guarantee or preference stock of companies in Great Britain and Ireland, especially for the supply of water and incorporated by special act of Parliament or by royal charter (only those which have not passed a dividend of 5 per cent. on their ordinary stock for ten years last past being authorized investments for trustees); nominal or inscribed stock issued by the corporation of a municipal borough (authorized investments for trustees being limited to those which at the last census returned a population exceeding 50,000), and those issued by any county council under the authority of an act of Parliament or a provisional order; nominal or inscribed stock issued by commissioners incorporated by act of Parliament for the supply of water, and having compulsory power of levying rates (authorized investments for trustees being limited to those cases where the rates may be levied over an area having at the last census a population exceeding 50,000, and where the rates levied for each of the ten years last past shall not have exceeded 80 per cent. of the amount authorized to be levied); local loans stock issued under the Local Loans Act of 1887 (3 per cent. stock); exchequer bills; mortgages of freeholds and copyholds; nominal debentures or stock issued under the Local Loans Act.

All of the above, except as noted, are authorized investments for trustees in their discretion, subject to the necessity of obtaining any consent which may be required with reference to the investment of the funds by the instrument, if any, creating the trust.

In the U. S. the securities which are commonly offered for investment of trust funds consist of first mortgages upon real property, municipal bonds, tax certificates, U. S. Government bonds, railway bonds which have not defaulted in payment of interest for a given period, railway stocks which have not passed a dividend for a certain number of years as fixed by statute, trust company stock, savings-bank deposits, canal company bonds. In most, if not all, of the States special legislation has been passed prescribing the forms of personal securities in which trustees may invest their trust funds without being liable for negligence in the event of the money so invested being lost. These laws are various in their provisions, those in some States prescribing a larger list of securities than those in others, but all agreeing in imposing restrictions as to passing of dividends, location of corporation, especially municipal corporations, the proportion of loan to the total value of property, etc.

Besides the securities above, which are those ordinarily used for the permanent and safe investments, there are many other forms of securities of much less stability, such as mining stocks and the stocks of industrial corporations. These and other stocks, such as those of gas companies, water companies, etc., whose value depends upon public franchises which are of a precarious nature or whose value may be destroyed by a grant of other similar franchises, are subject to great fluctuations due to depression in trade, threatened adverse legislation, exhaustion of natural resources, or the like, and are a dangerous form of investment for funds, where a safe and permanent investment is desired. Their value can not be ascertained except by a minute and careful investigation of the assets and resources of the company by which they are issued, and in the case of industrial corporations a thorough investigation of the trade in which the corporation is engaged; and the making of such investigation is but a small safeguard against future fluctuations in price.

Securities may be generally classified as to their character into bonds and other debentures or evidences of debt which are secured by a lien or charge upon property, these being subdivided into those which are secured by a lien upon real estate and those which are secured by a lien upon chattels; bonds and other debentures, or evidences of debt, which are not secured by any lien or charge upon property; and stock certificates or other evidences of ownership of property. They may be classified as to the nature of the corporation or person or other party issuing them into public securities (such as tax certificates, municipal bonds, Government bonds, etc.) and private securities (such as railroad bonds, mortgage bonds, stock certificates, etc.). Securities are generally classified, with respect to the place of issue, as foreign and domestic; with respect to the markets in which they are sold, as domestic and international; with respect to liability (stocks), as limited, unlimited, and non-liability stocks; and with respect to their negotiability or necessary method of sale, as registered, or inscribed, and unregistered.

Debentures.—Broadly speaking, a document which either creates a debt or acknowledges it is called a debenture. In this sense the term is applied to every document, whether payment or discharge of the debt is secured by a charge upon property, or by priority to other creditors, or not. In many cases the debentures are so secured, but the rights of the holders of debentures must be ascertained in every case from the instrument, setting forth the terms upon which it is issued. The term is chiefly used in Great Britain, in the U. S. such instruments being generally called mortgage bonds, or by the specific name designating the particular class of debentures. Debentures so called in England consist chiefly of those issued under acts of Parliament in the nature of mortgage debentures, debentures issued by local authorities under the Local Loans Act, and debentures of private companies or corporations registered under the companies acts. The debentures issued by virtue of the acts of Parliament often confer certain special privileges on the holders, and those issued by private corporations are usually secured by mortgage upon some particular property, or by a charge upon the entire property of the corporation. This latter charge, called a *floating charge*, leaves the company free to manage its own affairs according to the ordinary course of business, and to sell or dispose of its property by sale or mortgage in so doing; but upon the default of the interest or principal, or in the event of an attempt or agreement to wind up the company, the holders of the debentures have the right to enforce their security against the entire property of the company as it then exists, subject to such charges as the company may have placed upon it as a company while a going concern. The debentures issued by countries other than England, except in some special cases, such as the Daira bonds of Egypt, do not customarily give any special privilege to the holder, but are merely governmental promises to pay certain sums at certain times with interest.

Where the debenture is secured by a charge upon the property of the company, so that the company may not treat or use the specific property as free from incumbrances, there must be a mortgage or trust deed made for this purpose; and if the security be upon movable goods, the mortgage or trust deed must be registered as a bill of sale, except in the case of an incorporated company, when it need not be so registered. In the U. S. mortgages against land must be registered to be good against *bona-fide* purchasers for the value, and the necessity for the recording of mortgages or bills of sale of personal property is determined by the specific laws of each State in question.

There is a class of debentures the principal of which is made payable only in the default of payment of interest or winding up of the company issuing the debentures, and these are frequently called *perpetual debentures*. Sometimes the government or corporation issuing debentures reserves the right to redeem them on or before a certain date, or upon the happening of a given event at the borrower's option. As respects the general requirements of a debenture, as regards its being payable at a certain date, registration, negotiability, etc., the laws apply in each case which govern the particular class of instruments to which the debenture in question belongs. Debentures payable to bearer are now subject in Great Britain to a stamp duty of 10 shillings to £100, to be paid by the borrower, and registered debentures are subject to a stamp duty payable on transfer by the transferrer.

Debenture stock, so called, consists of two different kinds: First, that which is issued by British railway companies or other companies whose charter is subject to the Companies Clauses Act of 1863. It places a charge upon the entire property both for principal and interest, and has priority for payment of interest over the payment of dividends or interest on any ordinary shares or stocks. Such debenture stock invests in its holders the right, in the event of interest remaining unpaid for thirty days after it becomes payable, of obtaining the appointment of a receiver in England or Ireland, or a judicial factor in Scotland, and arrears

may be recovered by an action against the company. On the other hand, the principal paid in upon the debenture stock by the purchasers or holders of it does not become payable under any circumstances, neither does the property of the company under any conditions fall into their possession, and the company itself has not the power to redeem the debenture stock, except by a special act of Parliament authorizing this to be done. Such debenture stock has many of the characteristics of the preferred stock, or *preference stock*, as it is called in England, but is most closely analogous to a perpetual annuity, the payment of which may be enforced against the assets of the company, as above mentioned.

The other class of debenture stock is that issued by companies incorporated under the companies acts, and is in the nature of perpetual debentures, secured by a charge against the entire assets of the company both for principal and interest. Stock of this kind is usually issued in the form of so-called perpetual debentures, making the principal payable only upon the default in payment of interest or a winding up of the company. The stock certificates are usually registered, and may be issued to borrower; and it may be provided that any portion of the stock may be transferred, or that any portion not less than a fixed sum, such as £1, may be transferred. Generally speaking, the holder of this form of stock is secured, and stands in the same position as regards the company issuing the stock as the holder of ordinary debentures.

Public and Private Securities.—Public securities are constituted by the obligations given to secure the payment of government or public loans which are usually classed as either external or internal, an *external loan* being that which is raised in part or entirely outside of the country, its principal and interest being payable abroad as well as at home; and *internal loans* being those which are raised, or at least are payable, principal and interest, within the country borrowing. The foreign holder of an internal loan is legally required to present his bond or security within the home country for payment in the same manner as a citizen owner, but not infrequently foreign countries borrowing upon internal loans arrange for the payment of the interest and principal of their loans abroad through private or public banks; but this arrangement is terminable at the option of the borrowing government.

The processes of issuing public loans are generally either by public issue at or above a fixed minimum price or at a fixed price, or by direct sale in gross to one or more banking or financial concerns which hold or dispose of the securities in the same way as any other securities purchased by them. In the case of issues either at a minimum price or at a fixed price, the public or investors compete for the issue either by offer of a price equal to or above the minimum; or, in the case of a fixed price, by application for the securities in excess of the amount really wanted. In the case of issuances at a minimum price, allotments of issues are usually made by filling all tenders above a certain price in full, and filling all tenders at a certain price by a percentage of the amount of the tender. In the case of tenders at a fixed price, the usual method of allotment is based upon a percentage of the amount of the bid, it being quite a general custom for applicants to bid for nominal amounts very much in excess of the amount really desired. Where, however, government loans are issued with the idea of encouraging small lenders or purchasers, a common plan, as in France in the case of the *credit foncier*, is to fill all small tenders in full and to prorate the rest of the loan among the larger applicants.

Government loans may be evidenced either by registered stock or bonds or by bonds payable to bearer, with coupons attached, which latter in effect constitute drafts or checks for the amount of the interest as they become due at the quarterly or semi-annual payments.

Private securities are simply those issued by individuals or private corporations, include those of every description, and each class is governed by rules and laws applicable to itself, which can not be given here except as under other subdivisions of this article.

Domestic and Foreign Securities.—Domestic securities, as respects any particular transaction or body of transactions, are those securities which are issued within the country where the transaction takes place or where the investor is situated.

Foreign securities are those which are issued in countries foreign to the country of the investors. The investing of capital in the securities of foreign countries takes place mostly in those countries which are comparatively old and where capital seeking investment is forced to look to other places and parts for investment more profitable than those afforded to it in the place where the capital is present. The United Kingdom of Great Britain is the largest purchaser of securities of foreign countries, and the total amount there invested in foreign securities was estimated in 1893 to have been about the sum of $8,500,000,000. Of this amount about $1,250,000,000 is in private investments and the rest in foreign government securities or public corporations operating in foreign countries. About $1,125,000,000 is in colonial government securities; about $2,265,000,000 in foreign stocks; about $600,000 in American railroads; about $1,300,000 in the railways of all other countries; and the rest in miscellaneous securities.

Domestic and International Securities.—Domestic securities are those which are ordinarily dealt in only in the country in which they are issued.

The term international securities is customarily used to designate stocks and shares which are simultaneously dealt in upon the markets of different nations, as upon the London market, the exchanges of Germany, New York, etc. The distinguishing feature of such bonds is the opportunity which it affords to the holder or owner to realize upon them in whichever market may be most profitable or best suited for his purpose. Such bonds consist chiefly of the more important and stable railroad stocks, and especially of government bonds, such as those of the French and Italian Governments, and some other governments which are mostly or widely purchased outside of the countries in which they are issued. The bonds of any one government issued have a special market where they are most dealt in, depending more or less upon the political relations, the government securities being mostly held by those countries which are, or are supposed to be, most favorable to the country issuing the bonds. Thus at present (1899) France is one of the largest holders of the Russian bonds formerly held in Berlin, Frankfort, and other German markets, which bonds were previously held in English markets; so also the securities of the South Austrian Railway were formerly so commonly dealt in upon the markets of Vienna, Berlin, Paris, and London as to be a favorite medium of remittance between these markets, and this is now true of the shares of a number of American railroads. As distinguished from these securities which have an international market, the British colonial stocks have their market almost entirely confined to London, and even there they are sometimes not freely salable. These international securities, so called, also furnish an opportunity to the broker for what is called an *arbitrage business*, which enables a large part of the remittances between countries to be conducted without the actual remittance of any form of cash, the effect of which is to equalize the scarcity or plentifulness of money, or, as it is called, the ease of the money market in the countries between which arbitrage dealings are freely conducted. See ARBITRAGE.

Liabilities of Shareholders in Corporations or Companies.—The liabilities of the stockholders of a corporation or company vary according to the laws of the jurisdiction under the laws of which the corporation or company is incorporated or organized, and according to the nature of the particular corporation issuing the shares and the circumstances under which the shares are held or purchased. Companies in this respect are broadly divided into those in which there is an unlimited liability, those in which there is a limited liability, and those in which there is no liability. Corporations in which the stockholders have unlimited liability are now comparatively rare. Those having a limited liability are usually in the nature of banks or banking corporations, where a common provision is that the shareholders, in the event of the winding up of the company or its insolvency, shall be liable up to the face value of the shares which they hold, and in the case of unpaid shares they are also liable, as in the case of any other company, for the difference between the face value of the shares and the amount which has been paid in to the company upon them. This matter is fully treated under the titles of CORPORATIONS and JOINT-STOCK COMPANIES.

Registered and Unregistered Securities.—Unregistered securities are made payable to bearer, and may be transferred either with or without indorsement: and, as respects the liability of the principal upon such securities to the holder of them, they bear many analogies to negotiable bills

and notes. Registered or inscribed stock must be transferred upon the books of the company or party by whom they are issued, in order to constitute a complete sale as to the company, upon a written assignment. This interferes with the freedom of transfer of the securities, and causes greater publicity as to facts of ownership, and for that reason registered stocks are less common in the U. S. and on the Continent of Europe than they are in England, where this interference is less objected to. If an unregistered security be lost, a new bond or certificate can not generally be obtained by the owner except upon giving bonds to secure the issuer against loss; but in the case of the loss of a registered security a new bond or certificate may be readily obtained by the last registered owner in the absence of notice of an unregistered sale.

The Purchase of Listed Securities.—The stocks or bonds or other securities listed upon any stock exchange may be purchased through a broker who is a member of the exchange upon the floor of the exchange in the ordinary course of business by the payment to the broker of such per cent. of the value of the securities to be purchased as may be required either by the broker or by the custom of the exchange and his commission, which latter varies, being usually in the U. S. about one-eighth of 1 per cent. Securities listed on the stock exchange may be sold without accrued interest, when the purchaser receives interest upon the bond or other security only from the time of his purchase; or with accrued interest, when he receives interest from the date of the last payment of interest or the date when the interest was last payable, and this amount is included in the purchase price of the bond or other security to him. In the case of purchase of shares of stock issued by a new company, or of bonds issued by a public or private corporation, the stock or bonds may be sold either through brokers who have not already purchased them, or, where purchased direct from the corporation or party issuing them, by a letter of application and a letter of allotment. A *letter of application* consists of a form which is usually a mere request signed by the subscriber for the allotment for the specified face value of the issue, and is accompanied by a check for payment to the usual amount required in such cases, usually either 5 or 10 per cent. of the amount subscribed for; a *letter of allotment* is in the nature of an ordinary letter, which specifies the price or amount of bonds or shares to be issued to the applicant, the amounts payable, and the dates upon which the payments fall due, and also a receipt for the amount already received from the subscriber. The letters of application and allotment taken together constitute a contract for a valuable consideration, which may be enforced against the subscriber, and he becomes liable for the entire face value of the stock or bonds for which he has so subscribed, and may be compelled to complete his purchase by an action at law. When a part only of the purchase price is paid by the purchaser to the broker who retains the purchased securities and carries them for his customer, the securities are said to be purchased upon a margin, which is the difference between the amount paid toward the purchase price of the security and the purchase price itself. The amount of margin usually required upon the purchase of ordinary stocks or bonds is 10 per cent., varying to as high as 25 per cent. or more, according to the nature of the security purchased, especially as regards its fluctuations in value upon the market. The margin upon which a security is purchased must be kept up by additional deposits if the security depreciate in value; and if it appreciate in value the purchaser may ordinarily demand and receive the excess of his margin so arising over 10 per cent. on the market value. Purchases for investment are not usually made upon a margin, but this form of purchase is customary where stocks are purchased for speculative purposes only. Where the margin is of an inconsiderable amount such transactions are carried on by brokers outside of the stock exchanges, commonly called in the U. S. curbstone brokers and bucket-shop brokers. If in a margin transaction the securities be not actually purchased by the broker the transaction is a gambling transaction, and the purchaser may recover his margin or not, although there be a nominal loss, according to the gambling laws of the jurisdiction where the transaction takes place. A good delivery upon the stock exchange is made when it is such in respect to time, place, and subject of delivery that it can not be refused by the purchaser. A purchaser of securities may reject the security when delivered, upon the ground of its not being a good security, if the security is mutilated or has any other defect upon its face, or if it is marked by the absence of the necessary revenue stamps or absence of proper coupons or irregularity in number, or if the bond be payable only to bearer and the name of the owner is retained upon the bond or other document. In the case of dispute as to what constitutes a good delivery, a decision of the committee or governing board of the stock exchange upon which the security is purchased is conclusive upon the parties. F. STURGES ALLEN.

Seeley, LEVI, A. M.: educator; b. in North Harpersfield, N. Y., Nov. 1, 1847; graduated at the Albany, N. Y., Normal College, 1871; studied in the Universities of Jena and Leipzig 1883–86; M. A., Williams College, 1883; principal of schools in New York State 1871–83, 1886–87; principal of Ferry Hall Seminary and Professor of Pedagogy, Lake Forest University, Lake Forest, Ill., 1887–94; student in the University of Berlin 1894–95; Professor of Pedagogy, New Jersey State Normal School, Trenton, N. J., since 1895. He is the author of *Grubé's Method of Teaching Arithmetic*; *The Grubé Idea*; *The German Common-School System.*

Seguin: the name of a talented musical family of England and the U. S., famous as singers. The first of the name was ARTHUR EDWARD SHELDEN, b. in London, Apr. 7, 1809; his voice was a deep bass, and he began singing in 1828; he continued with great success in concerts and opera. On Oct. 15, 1838, he appeared in New York in Rooke's opera *Amilie*, and formed the Seguin Opera Company, which met with great success all over the country. He died in New York, Dec. 9, 1852. His wife, ANN CHILDE, first appeared as a singer in 1828 at the same performance as her future husband. After her husband's death she retired from the stage and taught music in New York until her death, in Aug., 1888.—Their son EDWARD made his first appearance in Covent Garden, London, with the Pyne and Harrison English Opera Company. He went to New York in Dec., 1860, and sang with the Richings, Parepa-Rosa, Kellogg, Hess, and Emma Abbott companies. His voice was also a deep bass. He died Oct. 9, 1879. His wife, ZELDA HARRISON, whom he married in 1867, was an admired contralto singer, and sang in the same companies with her husband.—The elder Seguin's younger brother, WILLIAM HENRY, b. in 1814, had a light bass voice, and was an admired concert singer. He died in London, Dec. 28, 1850. His wife, Miss GOOCH, a soprano singer, survived him only a few years.
D. E. HERVEY.

Selfe, Sir WILLIAM LUCIUS, K. B.: English judge; b. in London, June 11, 1845; received his college education at Rugby and at Corpus Christi College, Oxford, taking his degree of bachelor of arts in 1868; he then read law in the Inner Temple, and was called to the bar in 1870; he then took up practice as conveyancer and equity draughtsman, and afterward was engaged in the preparation and publication of statutes, including *The Statute Law Revision Bills*; *Revised Edition of the Statutes*; *Chronological Table and Index to the Statutes*; and was also employed as parliamentary draughtsman. He was principal secretary to Lord Chancellor Earl Cairns in 1880, and was appointed judge of the county courts in 1882, sitting in the circuit for East Kent; has been chairman of the East Kent quarter sessions since 1893, and was appointed member of the county-court rules committee in 1894. F. STURGES ALLEN.

Selfridge, THOMAS OLIVER: naval officer; b. in Boston, Mass., Apr. 24, 1804. He entered the Naval Academy in 1818, becoming lieutenant 1827; served in the Mediterranean, the West Indies, and Brazil; became commander 1844; was with the East India squadron 1845–46, on the flag-ship Columbus, and with the Pacific squadron during the Mexican war; took part in the capture of Mazatlan and Guaymas, being so badly wounded at the latter place that he turned over command of his ship and went home; was with the Gulf squadron a short time in 1861, and in 1862–65 had charge of the Marc island navy-yard; was made captain 1855, commodore 1862, rear-admiral 1866; was president of the examining board 1869–70, and lighthouse inspector at Boston; also member of the examining board 1870–71. He is the senior officer of the retired list.—His son, THOMAS OLIVER, also a naval officer, was born in Charlestown, Mass., Feb. 6, 1837. Graduating at the Naval Academy in 1854, he became lieutenant 1860; was attached to the Cumberland when that vessel was sunk by the Merrimac in Hampton Roads; was advanced to lieutenant-commander 1862, serving on the Cairo, which was destroyed by a torpedo in Yazoo river; at the capture of Vicksburg he had charge of a siege-

battery, of the Manitou and the Conestoga, and commanded the Osage in the Red river expedition, inflicting heavy loss on the Confederates at Blair's Plantation; in the bombardments of Fort Fisher he had charge of the Huron, and led a division of landing sailors against the fort: was made commander 1869; between that year and 1873 was engaged in surveying for a canal across the Isthmus of Darien; in 1876 was a member of the international congress at Paris on the question of that canal; commanding the Enterprise, he surveyed the Amazon river 1877–80; was commissioned captain 1881; during subsequent service at the Newport torpedo station he invented a device for protecting ships from torpedoes; was in the Asiatic squadron 1887; became commodore 1894, rear-admiral 1897, and retired 1898.

Sembrich, Marcella: singer; b. in Lemberg, Galicia, in 1858. The name by which she is known is that of her mother's family, her maiden name being Praxede Marcelline Koschanska. Her father was a violinist, and she began the study of the pianoforte at four years of age, and the violin at six. At twelve she went to the conservatory in Lemberg and studied under Wilhelm Stengel, to whom she was afterward married. She became a fine player on both piano and violin. Liszt heard her play both instruments, and then asked her if she could also sing, and on her reply in the affirmative sent her to Madame Marchesi at Paris, by whose advice she began vocal study. She made her *début* in Athens in May, 1877, in *I Puritani*, and since then has been successful everywhere. She made her first appearance in New York Oct. 24, 1883, in *Lucia*, in the Metropolitan Opera-house. She has sung in London and all European capitals. Her voice is a wonderfully flexible and pure soprano, highly cultivated, and her repertory of operas is very large.

D. E. Hervey.

Senn, Nicholas: surgeon; b. in Buchs, Switzerland, Oct. 31, 1844; early removed to the U. S., settling at Ashford, Wis.; was educated at the Fond du Lac grammar school and at Chicago Medical College, where he graduated in 1868; removed to Milwaukee in 1874, and became a recognized authority on intestinal diseases; became Professor of the Principles and Practice of Surgery in the College of Physicians and Surgeons of Chicago in 1885, and Professor of the Principles of Surgery and Surgical Pathology in Rush Medical College 1888; removed to Chicago in 1891; was made surgeon-general of Wisconsin before his removal, and organized the associations of military surgeons of the National Guard of both Wisconsin and the U. S., serving as president of both bodies; was a delegate to the international medical congress at Berlin in 1890; was in the field as a surgeon during the Spanish-American war in 1898. He has published *Four Months among the Surgeons of Europe* (1887); *Experimental Surgery* (1892); *Surgical Bacteriology* (1894); *Pathology and Surgical Treatment of Tumors* (1896); *Principles of Surgery* (1897); and *Tuberculosis of the Genito-Urinary Organs*.

Separation (of husband and wife): in law, the cessation of cohabitation of husband and wife, whether by mutual consent or by act of law. When used alone the word generally denotes a voluntary cessation of the marriage relation made in pursuance of a contract between the husband acting for himself and trustees representing the wife. Such a contract does not affect the validity of the marriage or the legitimacy of children born of the husband and wife during the time of any such contract, since they may at any time agree to live together as husband and wife. In case of an agreement for total separation, however, the husband forfeits his right to bring an action for criminal conversation with the wife, but not his right to proceedings for divorce for adultery on her part.

Separation deeds are now legalized in Great Britain by recent legislation; but an agreement between husband and wife made in contemplation of *future* separation, intended to hold good whenever they shall choose to live separately, is void as being against public policy.

Separation *by law* is usually termed separation *a mensa et thoro*, and is a species of divorce not dissolving the marriage relation, and much less extensive in its effects than a divorce *a vinculo matrimonii*, or one annulling the marriage.

See Alimony and Divorce. See also Bishop's *Commentaries on the Law of Marriage and Divorce*; Schouler's *Treatise on the Law of Domestic Relations*; J. Carter Harrison's *Epitome of the Laws of Probate and Divorce*; John A. Gemmill's *Divorce Practice in Canada*.

F. Sturges Allen.

Service: In law the word *service* is used to designate several very diverse matters, including—(*a*) The acts performed by a person in fulfilling the terms of his employment by another. The term also here includes the acts or deeds to which a parent is entitled at the hands of his child, a husband at the hands of his wife, etc. The rights and duties of persons in such relations and the extent and nature of their service required to be rendered are treated under the titles Contracts, Bailments, Married Women, Damages, Parent and Child, Guardian and Ward, etc. (*b*) The acts which the tenant holding under a lord was bound to perform in fulfillment of the terms and conditions upon which he held his fee or estate. These services were divided into *free* and *base* service in respect to their quality, and into *certain* or *uncertain* service in respect of quantity and time of performance. (See Feudal Tenure.) (*c*) In civil law, a servitude. (*d*) In practice law, such a delivery of a paper, or communication of its contents, as to charge another with legal notice of it. The term is also used with a similar meaning in relation to other matters requiring the delivery or other communication of papers or other matter necessary to render them effective or to give them their proper legal effect.

The most important matters to which service in this last sense of the word pertains is the service of process in actions or proceedings at law, the term *process* here including all those writs, papers, and notices which are necessary or proper to the beginning of an action, suit, or proceeding in law or equity, and the conduct of it to a termination which shall be binding upon the parties to it. No valid suit or proceeding can be maintained against any person or his property except by making legal service of notice of such proceeding upon him, actually or constructively; but what shall constitute such service varies greatly with the nature of the action or proceeding and the purpose to be accomplished by the service. The right to be served with notice of a proceeding as a condition to its validity is recognized at the common law and secured by constitutions and decisions of the courts. When, however, a person has been served with valid notice of an action or proceeding, all subsequent steps and proceedings legally taken are binding upon him so long as no material modification of the original purpose of the action or proceeding is made.

Who may Make Service.—The service of process issued from the court is ordinarily required to be made by the sheriff, as the officer of the court. Where this is the case the service must be made by the sheriff to whom it is addressed, either personally or by his lawfully authorized deputy, and must be made within the limits of the county or district over which his jurisdiction extends. If the sheriff be a party in interest in the action or proceeding there is usually a provision for the substitution of some other person or officer to make such service in his stead. In the case of the federal courts of the U. S., service which is ordinarily made by the sheriff in the State courts is made by a marshal or his deputies, and in the case of actions or proceedings before justices of the peace by a constable. The service of papers subsequent to that which is necessary to the valid beginning of an action or proceeding may frequently be made by an indifferent person, or even by a party in interest; and in those States having a code practice it is usually provided that any person upward of a certain age, as eighteen or twenty-one years, not a party to the action or proceeding or otherwise interested in it may make a valid service of the summons or other paper by which the action or proceeding is instituted, the summons in such cases being a mere notification from the plaintiff or his attorney, and not, properly speaking, a process of court. The statutes may prescribe the age of a person qualified to serve the summons; but in the absence of this it is generally held that he must not be under twenty-one years of age. Lawful service can not be made by a deputy other than one appointed according to the provisions of the law.

Time, Place, and Manner of Service.—In general, service of process or of a notice or other paper in an action or proceeding may be made at any time of the day or night, and on any day except such as are *dies non juridicus*, either at common law or by statute. At the common law legal service can not be made on Sunday; and in addition to this various legal holidays are provided by statute in the States and by Federal statutes, upon which valid service of certain process can not be made. It is also a general rule of the common law that service must not be made at such a time as to interfere unreasonably with the right of a per-

son to celebrate the rites of his religion, or be made in any other way intended to be grossly offensive or prejudicial to the person upon whom service is made, by exposing him to public infamy or the like; and service willfully so made will, generally speaking, be set aside as void and against public policy. Service made without the jurisdiction of the court having jurisdiction in the action or proceeding is invalid, and where a particular method of service is prescribed by court such method must be strictly followed.

The fact that a person is a non-resident does not affect the validity of the service upon him if he be personally served within the jurisdiction of the court in which the action or proceeding is brought; but a substituted service by publication or other reasonable notice prescribed by law may be made so as to be effectual against a non-resident in a proceeding *in rem* or *quasi in rem*, such as an attachment of property, an action for divorce, or the like; and a judgment or conclusion or order of court based upon a service legally so made is binding against the persons served within the limits of the State in which the judgment or order is made. Such a substituted service, however, in order to make valid a judgment affecting the property or person of the defendant, must be accompanied either by his appearance in court or by the seizure of his property within the jurisdiction of the court. In the case of divorce proceedings some of the States recognize the validity of a divorce granted upon such substituted service where the defendant has not appeared in the action, and even where notice of such action was not brought to his knowledge. In other cases it has been held that a decree of divorce rendered without actual service upon the defendant, or without his appearance, is void of effect beyond the jurisdiction of the court in which the decree is rendered.

Service of process issued against a State as a party of record to the action should be made upon the Governor or other chief executive magistrate and the attorney-general. A corporation at the common law was served by proper delivery of the writ or summons to one or more of its officers, and in the case of the corporation not appearing by a writ of distraint against its property; so that a corporation could not be compelled to appear, either at law or in equity, if it had no property upon which distraint could be levied. Service of process and of other papers upon corporations is now regulated by statutes, which provide, in general, that service upon an officer, or upon some designated agent, shall be effectual as service upon the corporation. These provisions are generally made applicable to municipal corporations, such as cities, towns, villages, and counties, service ordinarily being required to be made upon the chief executive officer of the municipality, and in the event of his absence upon the next officer in order of official rank. Service upon foreign corporations, in the absence of special statutes, is governed by the same rules and regulations as that governing service upon domestic corporations; but it is now usually provided that no foreign corporation shall be recognized as having any legal existence in a State unless it shall have, among other things, designated some person within the State upon whom legal service may be made upon the corporation. A partnership is served by service on one of its members, in which case the action or proceeding is binding against all of the copartnership property, and personally also against the member of the copartnership who is served. This rule as to service of copartners is a specific application of the rule that where an action is brought against several defendants jointly service upon one or more of the defendants only will not sustain a judgment *in personam* against those who are not served. Infants, or those who are not of legal age, must be served not only by a personal service upon the infant himself, but also upon some person legally acting as his guardian or next of kin. As regards service upon husband and wife, the common-law rule that valid service of a summons or other process issued against them as husband and wife might be made by service upon the husband alone has been changed in the U. S. by statute, so that the wife must be served in all cases in order to create a foundation for an effectual judgment or conclusion of court affecting the property rights of the wife.

Exemptions from Service.—Certain persons, such as ambassadors and public ministers from foreign nations, are exempt from the jurisdiction of the courts of the country to which they are sent, and are privileged from service of process issued from its courts; but this exemption does not now extend to consuls. Domestic public officers, such as members of Congress and of State Legislatures, judges, some persons in military service, and election officers, are generally exempt from service of process during the session of the executive body or the actual performance of their duties. A similar rule applies to witnesses or other persons who are in the actual performance of their duties, or acting in compliance with process already served upon them; so that they have the right not only to be exempt from service during their actual attendance or compliance to the process to which they are already subject, but they are also privileged for a reasonable time before and after actual attendance, for the purpose of enabling them to come and go to and from the place where attendance is required. The exemption here not only includes freedom from all kinds of civil process, but also from arrest and criminal proceedings. If such a person, however, after the time of his discharge from process, delays unreasonably or deviates from a direct course or journey in return, he waives his privilege.

Persons without the jurisdiction in which service must be made can not be legally served if decoyed into the jurisdiction in order to enable service to be made upon them, such service being fraudulent and invalid.

Return of Process.—When process has been served due return must be made in order to render it effectual to sustain a judgment or other conclusion based upon it; and, in general, a similar proceeding must be had in the case of all other legal notices or papers required to be served in an action or proceeding. In the case of process served by a sheriff or public officer, the return usually consists in the indorsement in writing, on the back of the writ or other process, of the particulars constituting legal service. In the case of papers served by indifferent parties or private individuals, the return is replaced or constituted by the individual's affidavit of service setting forth the facts required by law to constitute effectual service. It is not necessary that the return should be made in any exact language, but any statement that shows that the statutory requirements have been complied with is sufficient. See FOREIGN CORPORATIONS, CITIZEN, DOMICILE, JURISDICTION, SHERIFF.

See Warner on *Service of Papers under the New York Code of Civil Procedure and Statutes*; Piggott's *Service out of the Jurisdiction* (London, 1892); Cooley's *Principles of Constitutional Law.*

F. STURGES ALLEN.

Settlement of Decedents' Estates: This term is used in law to designate the legal disposition of the estates left by deceased persons. Such estates are settled in various ways, depending upon the question as to whether or not the deceased person provided for the disposition of his property.

If the decedent left a will, the proper and necessary method of settlement is to have the will probated, either by the party in possession of the will or by the party entitled to it, and to whom it may be surrendered. A will is said to be *probated* or admitted to probate when it has been established by the testimony of subscribing witnesses, or as many of them as are necessary for that purpose, at the time the will is admitted to record; and it is said to be *admitted to record* when a copy of it, with a copy of the order of the court admitting the same to probate, is recorded in the State and county wherein it was admitted to probate.

The decedent who has made a will is called a *testator* if a male person, or a *testatrix* if a female person. If the maker of a will has appointed a person to carry his will into effect and settle his estate (called an *executor* or *executrix* if a male or a female person respectively), such person is usually vested with such control over and title to the decedent's estate as is specially provided for in the will; and if the will requests that he be not required to give a bond or other security for the proper performance of his trust under the terms of the will, he is customarily not required to give any such security. If, however, the beneficiaries under the will can show any good reason to the court why such a bond should be required, it is at the discretion of the court to require it. If no executor or executrix is appointed by the will, *letters of administration with the will annexed* may be issued to an administrator (called an administrator with the will annexed), who is required to give a bond, and is appointed to settle the estate of the decedent. Such an administrator is also appointed in the event of the executor appointed under a will refusing to serve. If an estate has been previously settled in part by an executor or administrator who becomes for subsequent causes unable to perform the duties of his office, a person is appointed to settle the estate called an *administrator de bonis non*, or if he be appointed upon a will an administrator *de bonis non* with the will annexed. If the

decedent left no will, the court will appoint a person called an *administrator* or *administratrix* to settle the estate, which is called an intestate estate.

In general, the right to administer the estate of a decedent belongs to the oldest and nearest male relative, first to the next of kin, and afterward to the collateral relatives. The term *next of kin* is generally considered to include only those relatives who come within the provisions of the statutes of distribution; but in the construction of wills and settlements the rule is established in Great Britain that the term should be interpreted in ulterior limitations to mean nearest of kin without regard to the statute of distribution. In the U. S., generally, a wife is not included among the next of kin of her husband, or a husband among the next of kin of his wife; but in the construction of wills the term will be interpreted according to the evident intent of the testator.

The duties and rights of executors and administrators in any particular jurisdiction, or in administering any particular estate, are usually particularly prescribed by statute, as well as the procedure to be followed in securing their appointment and discharge; and the statutes must be consulted for specific provisions relating to the subject. See also PROBATE COURT, COURTS, ESTATE, etc.

F. STURGES ALLEN.

Sgambati, sgaăm-baa'tee, GIOVANNI: pianist; b. in Rome, Italy, May 18 (or 28 ?), 1843, the son of an Italian father and an English mother. The boy showed early evidences of musical talent, and after study went to Rome when twelve years old and passed the examination for the Academy of St. Cecilia. In 1866 he settled permanently in Rome. Both Liszt and Richard Wagner took much interest in him. He had become an excellent pianist, and made concert tours in England, Germany, Denmark, and Russia. In 1877 he was appointed Professor of the Pianoforte in the newly founded Liceo di Santa Cecilia, Rome, and has received several decorations from the court. He has composed much piano music, several quintets, a nonet, a concerto in G minor, a suite in B, a symphony in D, and other works in the higher forms, being one of the few Italian musicians who have attempted composition in the classical style. D. E. HERVEY.

Sharp, WILLIAM: author and critic; b. at Garthland Place, Scotland, 1856. He was educated at the University of Glasgow; has been an extensive traveler, having visited the U. S. several times. He was intimate at the exclusive home of the Rossettis in his youth, and in 1882 published the biography of Dante Gabriel Rossetti, which was followed by a biography of Browning. *The Human Inheritance, Transcripts from Nature, and other Poems* (1882), his first volume of verse, has been followed by *Earth's Voices* (1884); *Romantic Ballads* (1888); *Sospiri di Roma* (1891); *Flower of the Vine* (1892); *Vistas* (1894), etc. *Sospiri di Roma* and *Flower of the Vine* have been reprinted in America. He edited the Canterbury Poets Series, and has published several novels.

Sharpless, ISAAC, Sc. D., LL. D.: educator; b. in Chester co., Pa., Dec. 16, 1848; studied at Westtown boarding-school; S. B., Harvard University, 1873; Sc. D., University of Pennsylvania, 1883; LL. D., Swarthmore College, 1889; teacher in Westtown boarding-school 1873–75; tutor, Haverford College, 1875–79; Professor of Mathematics and Astronomy, Haverford College, 1879–85; dean, Haverford College, 1885–87; president of Haverford College since 1887. He is author of text-books on astronomy and geometry; *English Education* (International Educational Series); *A Quaker Experiment in Government*; and numerous papers and addresses.

Shattuck, AARON DRAPER: artist; b. in Francestown, N. H., Mar. 9, 1832; studied art in Boston and at the National Academy of Design; became an Academician in 1861; invented a stretcher-frame with keys for tightening canvases. His paintings include *Study of Grasses and Flowers*; *White Mountains in October*; *Sunday Morning in New England*; *Granby Pastures*; and *Peaceful Days.*

Shaw, ANNIE CORNELIA: artist; b. in West Troy, N. Y., Sept. 16, 1852; studied art in Chicago, where she was elected an associate of the Academy of Design 1873, and became an Academician in 1876. Her best-known paintings are *An Illinois Prairie*; *Ebb Tide on the Coast of Maine*; *Returning from the Fair*; *In the Rye-Field*; *Close of a Summer Day*; *A July Day*; *Fall Plowing*; *Ashen Days*; and *The Russet Year.*

Shaw, CHARLES LEWIS: lawyer and journalist; b. in Perth, Ontario, Feb. 7, 1862, and there received his early education; graduated at Trinity University, Toronto, in 1881; subsequently studied law, was called to the bar, and practiced his profession in Winnipeg; edited the *Nor'wester* and the *Saturday Night*; accompanied Lord Wolseley on the Nile expedition in 1884; was present at the battle of Berber. He has published *Random Reminiscences of a Nile Voyageur*; *Campaigning in the Sudan*; and various short stories. Since 1897 he has edited the *Rat Portage Miner.*

Shaw, EDWARD RICHARD, Ph. D.: educator; b. in Bellport, Long Island, N. Y., Jan. 13, 1856; B. L., Delaware College, 1878; Ph. B., Lafayette College, 1881; A. M., Lafayette College, 1886; Ph. D., University of the City of New York, 1890; traveled and studied school systems in Europe, 1891, 1894, 1896; principal, Union School, Greenport, Long Island, N. Y., 1881–83; principal, high school, Yonkers, N. Y., 1883–92; Professor of Institutes of Pedagogy, School of Pedagogy, New York University, since 1892; dean of the School of Pedagogy, New York University, since 1894. He is author of *Three Studies in Education* (1899); numerous text-books, editions of school texts, magazine and periodical articles, etc.

Shaw, GEORGE BERNARD (*Corno di Bassetto*): author; b. in Dublin, Ireland, July 26, 1856; after receiving slight education, removed to London in 1876, where he in time became celebrated as a critic of the fine arts; became an active agitator of socialism in 1883. His publications include four early novels—*The Irrational Knot*, *Love among the Artists*, *Cashel Byron's Profession*, and *An Unsocial Socialist* (1880–83); *Plays, Pleasant and Unpleasant* (1898); and *The Perfect Wagnerite* (1898). He has edited the *Fabian Essays*, various socialistic tracts, contributed weekly articles on music to the London *Star* and to the *World* from 1888 to 1894, and has since furnished articles on the drama to the *Saturday Review.*

Shelley, HARRY ROWE: organist; b. in Connecticut, June 8, 1858, and when fourteen years old was organist of the Central church, New Haven; entered Yale College and studied music under Prof. Stoeckel; then removed to Brooklyn, N. Y., and studied under Dudley Buck, and later studied in London and Paris. Since his return he had been continuously organist in Brooklyn until May, 1899, when he was appointed organist of the Fifth Avenue Baptist church, New York. He has composed many popular songs and part songs, some orchestral music, *Vexilla Regis* and *The Inheritance Divine*, two sacred cantatas, much organ music, and has edited and compiled several volumes of anthems and pieces for the organ. D. E. HERVEY.

Shepard, IRWIN, A. B., Ph. D.: educator: b. in Marcellus, N. Y., July 5, 1843; educated first in common schools of New York, and later of Michigan; attended the State Normal School, Ypsilanti, Mich., 1860–61; served in the army 1862–65, being granted a congressional medal of honor for gallantry in action in a sortie from Fort Saunders on the night of Nov. 23, 1863; studied at Olivet College 1866–71; A. B., Olivet, 1871; A. M., Olivet, 1874; Ph. D., Olivet, 1893; superintendent of schools, Charles City, Ia., 1871–75; principal of high school, Winona, Minn., 1875–78; superintendent of schools, Winona, 1878–79; president of State Normal School, Winona, 1879–98; secretary of National Educational Association, annually elected 1893–98, and elected permanent secretary 1898; editor of *Proceedings of the National Educational Association.*

Sherwood, MARY ELIZABETH (*Wilson*): b. in Keene, N. H., about 1830; is a patron of literature and art, and is a leader of society; has given public readings. She is the author of *The Sarcasm of Destiny* (1877); *Home Amusements* (1881); *Amenities of Home* (1881); *A Transplanted Rose* (1882); *Manners and Social Usages* (1884); *An Epistle to Posterity* (1897); and *Here, There, and Everywhere* (1898).

Sherwood, WILLIAM H.: pianist; b. in Lyons, N. Y., Jan. 31, 1854; at first a pupil under his father, William Mason, Jan Pychowski, and others in New York; went to Berlin in 1872, and from 1873 to 1875 was organist in the English chapels in Berlin and Stuttgart; studied also with Liszt in Weimar. On returning home he settled in Chicago, and made his first public appearance at the Centennial Exhibition in Philadelphia in 1876. He is one of the founders of the American College of Musicians. He is a fine pianist of the Rubinstein-Liszt school, and has played successfully in many cities. D. E. HERVEY.

Shinn, George Wolfe: clergyman; b. in Philadelphia, Pa., Dec. 14, 1839; was educated at public schools, at the Virginia Theological School, and graduated at the Philadelphia Divinity School in 1863; entered the ministry of the Protestant Episcopal Church, holding rectorates in Philadelphia, Shamokin, and Lock Haven, Pa., Troy, N. Y., and finally became rector of Grace church, Newton, Mass. Besides editing for ten years the *Teacher's Assistant* and a *Prayer-Book and Hymnal for the Sunday-School*, he has published *Manual of Instruction upon the Collects, Epistles, and Gospels for the Christian Year* (1874); *Manual of the Prayer-Book* (1875); *Manual of Church History* (1876); *Stories for the Happy Days of Christmas Time* (1879); *Questions about our Church* (1880); and *Questions that Trouble Beginners in Religion* (1882).

Ship-canals: The Nicaragua Canal Company having ceased operations in 1893, owing to lack of funds, Congress in 1895 appointed a commission of three well-known engineers, known as the Ludlow commission, to report on the feasibility and cost of completing the company's project. After examining the route and the company's engineering data, the commission reported that, while the project was feasible, they could not indorse some important features of the company's plans. Their estimate of the cost of completing the canal was $133,472,893, as against the company's estimate of about $67,000,000. The commission suggested that a more thorough examination might disclose alternative routes free from the objections they urged to the company's route, and they advised the appropriation of $350,000 for further examination and the preparation of final plans and estimates. This recommendation was adopted. A new commission, consisting of Rear-Admiral John G. Walker, Prof. Lewis M. Haupt, C. E., University of Pennsylvania, and Col. P. C. Hains, U. S. A., spent several months in a personal examination, and in Dec., 1897, placed in the field a well-equipped force of 250 men, including 80 engineers, a geologist, a hydrographer, 10 boring outfits, and complete apparatus for determining rainfall, evaporation, flow of streams, and all other phenomena affecting the construction and operation of the canal. An official abstract of the commission's complete report was made public on May 31, 1899. The commission adopted and made estimates for the route from Brito, on the Pacific, to Lake Nicaragua, known as the Childs route, and from the lake to Greytown, on the Atlantic, known as the Lull route, and expressed the belief that the canal may be built across the isthmus on this route for a cost not exceeding $118,113,790. Col. Hains concurred generally in the views of the other members, but his estimate of the cost was $134,818,308. Upon an earlier preliminary report of the commission the Senate had passed a bill authorizing the expenditure of $115,000,000 for building the canal. About the same time the latest official facts with regard to the progress of the Panama Canal began to attract much attention.

In Oct., 1894, a new company was formed to complete the Panama Canal. Its cash capital, all paid in, was $13,000,000. The company determined to make a complete study of the engineering features, and also to begin work on a scale large enough to determine exactly what sort of material would be encountered in completing the excavations and building the dams and locks. At the outset the company abandoned the De Lesseps idea of a sea-level canal and substituted a system of locks. A force of several thousand men was put upon the work at several points, including the Culebra cut. It was evident that the floods of the Chagres river afforded sufficient water for the canal, and an investigation was begun to ascertain the average amount of the Chagres discharge and the possibility of storing it in suitable reservoirs that would both feed the summit-level and hold back the waters in time of flood. This investigation was conducted by 150 engineers and their assistants, and the surveys occupied four years and cost $1,200,000. The work was carried out to the smallest details, including the plans and drawings for every culvert and bridge. At the request of the company, an international technical commission had been appointed to pass upon these surveys and plans. The commission was composed of ten eminent engineers of the U. S., Great Britain, Germany, Russia, and France, and included Gen. H. L. Abbot, Corps of Engineers, U. S. A., and the engineering directors of the Kiel and Manchester Canals. This body was organized in 1896, spent two years in its investigations, and on Dec. 2, 1898, presented a unanimous report indorsing the plans and estimates of cost of the new company. It declared that the work on the canal was then two-fifths completed, that the cost to complete it under the new plans would be $87,000,000, and adding 20 per cent. for contingencies $102,400,000, and the time required for completion would be from eight to ten years.

The prevailing belief in the U. S. that there is need for only one canal and that only one will be built, and the favorable report of the international commission on the Panama project, resulted in a general expression of opinion throughout the country that nothing further should be done to promote the Nicaragua scheme until the whole question of the best canal route under the existing circumstances had been submitted to a competent tribunal. President McKinley was accordingly authorized to appoint a new commission for this purpose. Its members are Rear-Admiral Walker, Col. Hains, and Prof. Haupt (members of the Nicaragua commission which had just handed in its report); ex-Senator Samuel Pasco, of Florida; Alfred Noble, C. E., who was also on the Ludlow commission; George S. Morrison, C. E., of New York; Prof. William H. Burr, of Columbia University; Lieut.-Col. Oswald H. Ernst, U. S. A.; and Prof. Emory R. Johnson, of Pennsylvania.

Robert M. Caffall, chief engineer of the Florida Transpeninsular Ship-canal, reported in 1898 that the most feasible route on the lock system (a tide-water canal being out of the question) was from St. Augustine to the St. John's river, up that river 10 miles, thence to Orange Lake, and thence to the Gulf S. of Wacassassee Bay; total length, 108 miles.

The receipts of the Suez Canal in 1898 were $17,581,200. The cost of maintaining the canal was about $50,000 less than usual. The surplus of receipts over expenditures was $9,757,800. Among the 3,503 vessels passing through the canal were 69 petroleum-ships, many of them carrying oil in bulk. For years the company would not permit these vessels to enter the canal, believing the carrying of oil in bulk to be dangerous.

The patronage of the Kaiser Wilhelm Canal is growing. The number of vessels passing through in the year 1895–96 was 19,960; in the year 1896–97, 23,108. Of these 20,307 were German vessels.

The business of the Manchester Canal is very slowly increasing. The total tonnage in 1896 was 1,828,237; in 1897, 2,065,815. The canal is not deep enough to accommodate many of the larger vessels now building. C. C. Adams.

Shipman, Nathaniel: jurist; b. in Southbury, Conn., Aug. 22, 1828; graduated at Yale College in 1848, then studied law and was admitted to the Connecticut bar in 1850; practiced law in Hartford for twenty-three years; made U. S. district judge in 1873; retained this position until 1892, when he was made circuit judge, which position he still (1899) holds; member of Connecticut House of Representatives 1857.

Shippard, Sir Sydney Godolphin Alexander, D. C. L., M. A., F. R. G. S., K. C. M. G.: South African judge and jurist; b. about 1840; he was educated at King's College School and Oriel and Hartford Colleges, Oxford, after which he read law and was called to the bar at the Inner Temple in 1867; he was attorney-general of Griqualand West 1873–77; was acting recorder of the high court of Griqualand 1877; judge of the Supreme Court of Cape Colony 1884–85; a British commissioner on the Angra Pequena and West Coast claims commission 1884–85, and deputy high commissioner and resident commissioner for the Bechuanaland protectorate and the Kalahari 1885–95. His writings consist chiefly of his judgments while acting as judge of the Supreme Court of Cape Colony. He was knighted in 1887.
F. Sturges Allen.

Ship's Papers: the papers or documents which are required by law to be carried by a vessel to show her ownership, nationality, and cargo, and to show that she has complied with the revenue and navigation laws of the country under whose laws she is registered. These papers are commonly divided into those required by the common law of the country to which the vessel belongs (as the license, clearance papers, crew list, shipping articles, certificate of registry or enrollment, etc.); and those required by international law to be carried by neutral ships to show their title to neutrality, as the parts of property in the ship, the charter-party, bills of sale and of lading, invoices, log-book, bill of health, etc.

Although the absence of any one of the papers proper to

be carried by a ship is not conclusive evidence against the neutrality or other character of good faith of the ship, its absence renders the character of the vessel suspicious; and when the absence is traced to willful destruction (or, as it is technically called, spoliation), the presumption of guilt is nearly conclusive as a ground of condemnation against a ship otherwise entitled to the privileges of a neutral. The use of false or pretended papers is also practically conclusive evidence against the good character of a vessel, and is sufficient to avoid an insurance unless it is expressly stipulated between the insurer and the insured that such papers may be carried. F. STURGES ALLEN.

Shoup, FRANCIS ASBURY: soldier; b. in Laurel, Ind., Mar. 22, 1834; graduated at the U. S. Military Academy in 1855; resigned from the service in 1860; after admission to the Indianapolis bar removed to Florida in 1861. Under orders of the Governor of Florida, he erected a battery at Fernandina; was appointed lieutenant in the Confederate army; was commissioned major of artillery in 1861, and served with Gen. Hardee in the trans-Mississippi department, afterward with Gen. A. S. Johnston at Shiloh; was inspector of artillery under Gen. Beauregard, served as chief of artillery under Gen. Hindman, commanded a division at the battle of Prairie Grove, and was made brigadier-general in 1862. He commanded a Louisiana brigade at Vicksburg, receiving the first attack of the Union forces; surrendered and was exchanged, becoming chief of artillery under Gen. Joseph Johnston; constructed the defensive works on Chattahoochee river; became chief of staff to Gen. J. B. Hood in 1864; after being relieved at his own request, submitted to the Confederate Congress a pamphlet arguing for the enlistment of Negroes in the Confederate army. He became Professor of Applied Mathematics in the University of Mississippi in 1866; studied for the ministry, took orders in the Protestant Episcopal Church, and held rectorates in Nashville, Tenn., Jackson, Miss., and New Orleans; was Professor of Metaphysics in the University of the South. He published *Infantry Tactics* (1862); *Artillery Division Drill* (1864); *Elements of Algebra* (1874); and *Mechanism and Personality* (1889). D. in Columbia, Tenn., Sept. 1, 1896.

Shurtleff, ROSWELL MORSE: artist; b. in Rindge, N. H., June 14, 1838; studied drawing in Buffalo and Boston; enlisted in the army at the outbreak of the civil war; after the war furnished drawings to various periodicals and engravers, subsequently devoting himself entirely to painting, both in oil and water-color; became an associate of the National Academy in 1880. Among his best oil-paintings are *The Wolf at the Door*; *A Race for Life*; *On the Alert*; *Autumn Gold*; *Gleams of Sunshine*; and *A Song of Summer Woods*. His water-colors include *Harvest Time*; *Basin Harbor*; *Lake Champlain*; *The Morning Draught*; and *A Mountain Pasture*.

Siberia: Since the building of the Trans-Siberian Railroad began Russian peasants have been removing in vast numbers to Siberia. This is partly due to the large numbers who have insufficient lands in Russia. The immigration is promoted in every way by the Government. It amounted in 1896 to 200,000 souls, and in 1898 to nearly 400,000. The peasants are settling on the agricultural lands of Western Siberia, and also far E. in the Amur province, and even across the border in Northern Manchuria. As the railroad has advanced its freight and passenger business has much surpassed expectations, and in 1899 the Government opened a further credit of £42,626,889 to improve the western and central sections, the disbursement to extend over a series of years and to include the laying of new and heavier rails and increasing the speed of trains. The rails in 1899 had been laid beyond Irkutsk and Lake Baikal. Of the 490,000 tons of freight carried in 1898 more than 320,000 tons were cereals. The Russo-Chinese Bank, established in 1896 for the development of commercial relations between Russia and China, obtained a permit from the Chinese Government to build a railroad through Manchuria, and a company, nominally Chinese, was organized to construct the road, which is now building. The line leaves the Trans-Siberian at Nertschinsk E. of Lake Baikal and is to terminate at Vladivostok, the route being comparatively straight and passing through Tsitsikar. A branch will extend S. to Port Arthur. The Amur section of the main road presents large technical difficulties, and its completion may not be hastened now that connection with Vladivostok through Manchuria is assured. The railroad is giving a great impetus to Siberian agriculture, mining, and other industries. Before the central section was opened in 1897 there was no important movement of raw product east. Since then meat and other produce have been shipped in large quantities to Tomsk, Krasnoyarsk, Irkutsk, and other cities. The new leather-works in the government of Tomsk will tan most of the skins from the Western Siberian steppes. Oil-refining is making rapid progress. In 1897 more than 2,500 tons of butter was exported to Western Europe, and wheat-raising has greatly increased.

The prospect of the completion of the railroad is changing Vladivostok from merely a naval station and naval port to a busy center of trade. In 1898 there was not an unoccupied stone building or dwelling in the town, which then had about 15,000 inhabitants. Seven-eighths of the business men are Russians. The harbor will be kept open in winter by means of an ice-breaker. The imperial Government is expending 2,000,000 rubles improving the port of Alexandrovski, on the mainland opposite the island of Saghalien, so that Russian squadrons may recoal there. A survey has been made of the navigability of the rivers in the Amur district, and it is found that the Amur is navigable for about 2,000 miles; the Shilka and Ingoda, 660; the Sungari and its tributaries, 1,320; the Ussuri, 660; and the Selenga, 660. The streams in the Amur basin are deepest. The Government is developing steam-navigation on Baikal, one of the largest fresh-water lakes. It has very few good natural harbors. In 1899 Vice-Admiral Makarov was instructed to attempt, with his ice-breaker, to open the route in the Kara Sea and to keep it open for the steamers engaging that summer in the trade between Siberia and Europe. It is hoped, with the use of these machines, to keep the ice from greatly impeding navigation on this Arctic route and enable vessels to make two round trips in the season. The attempts to establish a commercial route between Western Europe and Western Siberia began in 1870, and the results have been encouraging. As yet the Yenisei has been a more prominent factor than the Ob in these enterprises. In July, 1899, a commission appointed by the czar was devising plans to abolish the Siberian exile system.
C. C. ADAMS.

Sicard, MONTGOMERY: naval officer; b. in New York city, Sept. 30, 1836; graduated at the Naval Academy in 1855, became master 1858, and lieutenant 1861; participated in the bombardment and passage of Forts St. Philip and Jackson and the Chalmette batteries 1862, and took part in the destruction of the Confederate flotilla; passed the Vicksburg batteries 1862; was promoted to lieutenant-commander the same year, serving in the South Atlantic blockading squadron 1864–65; engaged in the several attacks on Fort Fisher 1864–65, and took part in the bombardment of Fort Anderson; served at the Naval Academy, in the North Atlantic squadron, and in the Pacific fleet 1865–71; was made commander 1870; was on ordnance duty at New York and at Washington 1870–78, when he joined the North Atlantic squadron, and in 1879 was assigned to special duty at Washington; was in charge of the Boston navy-yard 1880, and made head of the ordnance bureau at Washington 1881, and advanced to captain; was subsequently stationed at the Brooklyn navy-yard, commanded the North Atlantic squadron, and was made rear-admiral 1897; became president of the naval strategy board 1898, and was retired the same year. D. in Westernvill, N. Y., Sept. 14, 1900.

Sicily: In 1895 Dr. Olinto Marinelli made a study of the distribution of population in relation to distance from the sea. He drew lines of equal distance from the coast at intervals of 5, 10, and 20 kilometers, etc. He ascertained the number of inhabitants in each zone and distinguished three principal zones, viz.: the coast zone, within 5 kilometers (3·1 miles) of the shore, containing 702 persons to the square mile; an intermediate zone, between 5 and 10 kilometers, with 262 to the square mile; and the inland region, with 199 to the square mile. Elevation, malaria, history, water, soil, and other factors influence the distribution of population. Sicily is the largest producer of sulphur, but consumption for years did not keep pace with production, and the closing of many mines in the past decade brought much suffering upon working people. The most important sulphur-mining district is in the center of Sicily, near Caltanissetta, where there are 567 mines, more than one-third of which are not now in operation. The U. S. consumes about one-third of the Sicilian sulphur product, and increased demand in the U. S. has improved the industry. About half the imports

to the U. S. are used in the preparation of wood-pulp for paper-making. The fruit industry has been considerably crippled by new tariffs imposed by the U. S. C. C. A.

Sierra Leone: A protectorate was declared in 1896 over a large area of the Hinterland, fertile and rich country, producing rice, rubber, kola, gum, kernels, and palm-oil in abundance. The area is 30,000 sq. miles. A railroad is in operation from Songotown to Freetown (30 miles), and across the Ribbi river to Rotofunk (30 miles), and 80 miles, to Bo, are under construction. The road and telegraph were opened on Apr. 4, 1899, between Freetown and Waterloo. The cost of the road will be $1,500,000. The colony had only a small public debt before borrowing money to build this line, which is expected to brighten the commercial prospects. The imports from the U. S. in 1897 were leaf tobacco, flour, kerosene, and lumber, valued at $230,000; exports to the U. S. were hides, kolanuts, coffee, and ginger, valued at $25,652. C. C. A.

Siloti, Alexander: pianist; b. near Charkow, Southern Russia, Oct. 10, 1863. From 1875 to 1882 he was a pupil in the conservatory in Moscow, where he studied under Nicholas Rubinstein, Tschaikowski, and others. The following three years he studied with Liszt, remaining with that master until his death, though he had already played in public as early as 1880. His first professional visit to the U. S. was in 1898, making his first appearance in Brooklyn in January, and in New York at the Waldorf-Astoria and in Mendelssohn Hall on Feb. 9 and 16. He is one of the young Russian school, and is possessed of a wonderful technic and an unusual stretch of hand. He reconstructed Tschaikowski's symphonic poem *Vovoyode*, after the composer had destroyed it. D. E. Hervey.

Simmons, Franklin, A. M.: sculptor; b. in Webster, Me., Jan. 11, 1842; during the civil war made many life-size medallions of members of the cabinet and officers of the army and navy, which were cast in bronze, most of them being purchased by the Union League of Philadelphia; settled permanently in Rome, Italy, in 1868; received the honorary degree of A. M. from Bates College and from Colby University. His sculptures include statues of Roger Williams, William King, Oliver P. Morton, and Henry W. Longfellow; *Medusa*; *Jochebed with the Infant Moses*; *Grief and History*, surmounting the naval monument at Washington; *Galatea*; *Penelope*; *Washington at Valley Forge*; and *The Seraph Abdiel*, from *Paradise Lost*. His portrait busts embrace those of Abraham Lincoln, William T. Sherman, David D. Porter, James G. Blaine, and Gen. Grant.

Sims, Winfield Scott: inventor; b. in New York city, Apr. 6, 1844; graduated at the Newark, N. J., high school in 1861; served in the Thirty-seventh New Jersey Regiment during the civil war, afterward applying himself to the invention of electric apparatus, producing various devices in electro-magnets; constructed an electric motor for light work in 1872, weighing 45 lb. and having a battery of 20 half-gallon Bunsen cells, by means of which he was able to propel an open boat 16 feet long, with six persons on board, at the rate of 4 miles an hour; was first to apply electricity for the propulsion of torpedoes, his device of a torpedo being a submarine boat with a cylindrical hull of copper and with conical ends, furnished with a screw propeller and a rudder, the power being electricity generated on shore or on shipboard, by means of which the torpedo is propelled, guided, and exploded; subsequently devised a boat with a speed of 18 miles an hour, and to carry a 250-lb. charge of dynamite.

Singer, Otto: musician; b. in Sora, Saxony, July 26, 1833; educated in Dresden, and later in Leipzig until 1865, and after a short residence in Weimar with Liszt went to New York in 1867. In 1873 he went to Cincinnati as assistant musical director, under Theodore Thomas, of the first May Musical Festival, in that year. He composed the cantata *The Pilgrim Fathers* for the festival of 1876, and *Festival Ode* for the opening of the music-hall in 1878. He remained with the Cincinnati College of Music until 1892, when he returned to New York, where he died Jan. 3, 1894. He was an earnest and aggressive disciple of Liszt and Wagner both in his compositions and piano performances. He conducted various singing societies, and in addition to the cantata mentioned he composed some sonatas for the pianoforte and a concerto. D. E. Hervey.

Skelton, Sir John, K. C. B., LL. D.: historian: b. in Edinburgh in 1831; educated at St. Andrews and Edinburgh Universities; practiced as a lawyer from 1854 to 1868, when he was appointed secretary of the board of supervision, of which he was made chairman in 1892; was first vice-president of the local government board for Scotland, retiring in 1897, in which year he was knighted; published in 1876 a treatise on pauperism, and in 1890 a manual on public health; wrote for the Scotch magazines under the signature "Shirley." Among his published works are *Nuga Critica*, essays (1862); *A Campaigner at Home* (1865); *The Impeachment of Mary Stuart* (1876); *Essays in Romance* (1878); *Crookit Meg* (1880); *Maitland of Lethington and the Scotland of Mary Stuart* (1887); *Mary Stuart* (1893); *Table-Talk of "Shirley"* (1895 and 1897). D. in Edinburgh, July 20, 1897.

Skinner, Charles Rufus, A. M., LL. D.: educator; b. in Union Square, N. Y., Aug. 4, 1844; educated in common schools, at Mexico Academy, and Clinton Liberal Institute; prepared for Hamilton College, but did not enter; A. M., Hamilton College, 1889; LL. D., Colgate University, 1895; member of board of education, Watertown, N. Y., 1874–83; member of New York Assembly from Jefferson County, 1877–81; Representative in Congress for Jefferson, Lewis, and Herkimer Counties, 1881–85; deputy State superintendent of public instruction, New York, 1886–92; supervisor of teachers' institutes and training classes, New York State, 1892–95; elected State superintendent of public instruction, New York, 1895, and re-elected in 1898; president of the National Educational Association 1896–97; author of *Arbor Day Manual*, and numerous addresses and reports on educational subjects.

Sladen, Douglas Brooke Wheelton: author: b. in London, England, 1856. Having received education at Cheltenham and Oxford, in 1879 he went to Australia, where he became Professor of History in the University of Sydney, and published a number of volumes of poetry, among them being *Frithjof and Ingebjorg* (1882); *Australian Lyrics* (1883, 1888); *A Poetry of Exiles* (1884); *A Summer Christmas* (1885); *In Cornwall and Across the Sea* (1885); *Edward, the Black Prince*, a drama (1886); and *The Spanish Armada* (1888). Returning to London, he produced anthologies of Australian and Canadian poets. He has visited nearly every part of the world, and has been an indefatigable writer. Among his prose works are *The Japs at Home* (1894); *On the Cars and Off*, sketches of Canadian travel (1894); and *A Japanese Marriage*, a novel (1895). He has done much toward the permanent establishment of the London Authors' Club, of which he is honorary secretary.

Slivinski, Joseph: pianist; b. in Warsaw, Dec. 15, 1865; pupil at the conservatory, and later in Vienna under Leschetizki, and next under Anton Rubinstein in St. Petersburg. He is a fine pianist. He made a professional visit to the U. S. in 1894.

Slocum, William Frederick, LL. D.: educator; b. in Grafton, Mass., in 1851; A. B., Amherst College, 1874; studied in Germany 1874–75; B. D., Andover Theological Seminary, 1878; LL. D., University of Nebraska, 1894; LL. D., Amherst College, 1893; pastor of Congregational churches—Amesbury, Mass., 1878–83, Baltimore, Md., 1883–88; president of Colorado College, Colorado Springs, Col., since 1888; president of State board of charities and corrections and State board of pardons of Colorado, and writer on sociological and educational subjects.

Small, Albion Woodbury, Ph. D.: educator; b. in Buckfield, Me., May 11, 1854; prepared for college at Portland, Me., high school; A. B., Colby University, 1876; student in Newton Theological Institution 1876–79; student in University of Berlin 1879–80, University of Leipzig 1880–81; Ph. D., Johns Hopkins University, 1889; Professor of History and Political Economy, Colby University, 1881–88; reader in history, Johns Hopkins University, 1888–89; president of Colby University 1889–92; head Professor of Sociology, University of Chicago, since 1892. He is author of *Outline of the French Revolution*; *Introduction to the History of European Civilization*; *The Beginnings of American Nationality*; *Introduction to the Science of Sociology*; *Introduction to the Study of Society* (with George E. Vincent); and many sociological monographs; editor of *American Journal of Sociology*.

Smeerenberg: a former remarkable village on Amsterdam island, off the northwest coast of Spitzbergen, whose ruins still testify to the great extent of the whaling and fishing interests in those waters in the seventeenth century.

The town contained the principal establishments for trying out oil, cooperage, etc. The place was within 10 degrees of the north pole. Hundreds of ships and more than 10,000 men visited it annually. There were many shops, bakeries, and drinking-places, and brick houses for the laborers. The failure of the shore fisheries about 1640 drove the Dutch to more remote waters, and Smeerenberg was gradually abandoned. About 1,000 fishermen were buried in its cemetery. See Greely's *Handbook of Arctic Discoveries.*

Smiley, William Henry, A. B.: educator; b. in Maplewood, Mass., Apr. 28, 1854; prepared for college at Melrose, Mass., high school; A. B., Harvard University, 1877; master of New Salem Academy, New Salem, Mass., 1877–80; instructor in St. John's School, Boston, 1880–82; instructor in Jarvis Hall, Denver, Col., 1882, and master there 1883–86; instructor in Denver high school, district No. 1, 1886–92, and principal there since 1892; author of articles in educational journals; president of the secondary department of the National Educational Association in 1895.

Smith, David Eugene, Ph. D.: educator; b. in Cortland, N. Y., Jan. 21, 1860; graduated at Cortland State Normal School; Ph. B. 1881, Ph. M. 1884, Ph. D. 1887, Syracuse University; honorary M. Pd., State Normal College, Ypsilanti, Mich., 1898; practiced law 1882–84; teacher of mathematics, Cortland State Normal School, 1884–91; Professor of Mathematics in the Michigan State Normal College 1891–98; principal of the State Normal School, Brockport, N. Y., since 1898. He is author of translation of Klein's *Famous Problems of Geometry* (1897); translation of Fink's *History of Elementary Mathematics* (1899); *History of Modern Mathematics* (1896); joint author of *Beman and Smith's Series of Mathematics* (1896–).

Smith, Horace: English magistrate, law-writer, and litterateur; b. in London, Nov. 18, 1836; educated at King's College, London, and Trinity Hall, Cambridge; called to the bar in 1862, and in 1881 made recorder of Lincoln, having held in the intermediate time the positions of counsel to the mint, revising barrister on the midland circuit, and secretary to the Oxford bribery commission. He is best known for his treatise on the *Law of Negligence* (2d Am. ed. 1887); *Manual of the Law of Landlord and Tenant* (joint author with Thomas S. Sowden, 1871); and as the editor of *Addison on Contracts*; *Addison on Torts*; *Roscoe's Criminal Evidence*; and *Russell on Crimes.* He has published also several volumes of poems and interludes.

Smith, Rev. Walter C., M. A., LL. D.: poet; b. in Aberdeen, Scotland, in 1825; educated at Aberdeen University and New College, Edinburgh; ordained minister of the English Presbyterian church in Islington, London, in 1850; afterward a minister of the Free Church of Scotland in Orwell (Kinross), Roxburgh (Edinburgh), Tron (Glasgow), and High church (Edinburgh). In 1867 he was arraigned for heresy alleged to be expressed in his lectures on the "Sermon on the Mount," but the General Assembly dismissed the charges. In 1893 he was moderator of the Assembly. He is best known as a poet, his chief works being *The Bishop's Walk* (1861); *Hymns of Christ and the Christian Life* (1867); *Olrig Grange* (1872); *Borland Hall* (1874); *Hilda* (1878); *Raban* (1881); *North-Country Folk* (1883); *Kildrostan* (1884); *Thoughts and Fancies for Sunday Evenings* (1887); *A Heretic* (1891).

Smock, John Conover, Ph. D.: geologist; b. in Holmdel, N. J., Sept. 21, 1842; graduated at Rutgers College in 1862, and was tutor in chemistry there 1865–67; became Professor-elect of Mining and Metallurgy in 1867, holding the chair 1871–75, meantime studying at the Berg-Akademie and at the University of Berlin; was assistant in charge of the New York State Museum 1885–89; received the degree of Ph. D. from Lafayette College in 1882; was manager of the American Institute of Mining Engineers 1875–77; was associated with Prof. George H. Cook in preparing the annual reports of the Geological Survey of New Jersey for 1871–84, and in the volumes on *The Geology of New Jersey* (1868), and the *Report on Clay Deposits*; issued, as a bulletin of the State museum, *On Building-Stones in New York* (1888).

Snider, Denton Jaques; author; b. in Mt. Gilead, O., Jan. 9, 1841; graduated at Oberlin College in 1862; after teaching for a time, became a traveling lecturer on general literature. Among his works are *A System of Shakespeare's Dramas* (1877); *Delphic Days* (1880); *A Walk in Hellas* (1882); *Agamemnon's Daughter* (1885); *An Epigrammatic Voyage* (1886); *Commentary on Goethe's "Faust"* (1886); and *Commentary on Shakespeare's Tragedies* (1887).

Snow, Francis Huntington, LL. D.: educator; b. in Fitchburg, Mass., June 29, 1840; prepared for college at Fitchburg high school; graduated at Williams College 1862, Andover Theological Seminary 1866; A. B. 1862, A. M. 1865, Ph. D. 1881, Williams College; LL. D. 1890, Princeton; has rendered consecutive service to the University of Kansas, Lawrence, Kan., since Sept., 1866, as follows: Professor of Mathematics and Natural Science 1866–70, Professor of Natural History 1870–89, Professor of Botany and Entomology and president of the university faculties 1889–90, chancellor of the university since 1890. He is author of a large number of scientific and educational papers and addresses. In 1886 the State of Kansas appropriated $50,000 for the erection of a natural history building, to furnish a suitable home for the collection of birds, insects, and fossils which had been secured through the personal efforts of Mr. Snow in summer expeditions to Western Kansas, Colorado, and New Mexico. This building was named the Snow Hall of Natural History.

Snyder, Zachariah Xenophon, Ph. D.: educator; b. in Reagantown, Pa., Aug. 31, 1850; prepared for college in Mount Pleasant (Pa.) Classical Institute; graduated A. B. and S. B. at Waynesburg College, Pennsylvania, 1876; received Ph. D. degree 1887. After graduation taught in public schools; instructor in mathematics, Waynesburg College, 1881–82; superintendent of public schools, Greensburg, Pa., 1884–88; superintendent of public schools, Reading, Pa., 1888–90; president of State Normal School, Indiana, Pa., 1890–92; president of Colorado State Normal School, Greeley, Col., since 1892. He is author of educational essays and addresses, several printed in the *Proceedings* of the National Educational Association.

Sobat River: a right tributary of the White Nile, S. of Fashoda, very little known, except in its lower course, until 1898. A reconnoissance by Anglo-Egyptian gunboats showed the river to be a good navigable stream. At a distance of 212 miles from its junction with the White Nile it becomes two rivers, that flowing from the E. being called Adura (in its upper reaches, the Baro), and the S. river, shown on the maps as the Juba, being known locally as the Pibor. The gunboats ascended the Adura 30 miles, and natives say it is navigable for a greater distance. The Pibor is navigable for 75 miles. The Sobat flows through an immense alluvial plain, swampy near the river, with flat grasslands stretching to the horizon beyond. There are no hills, but extensive woods vary the landscape. The river current is 2½ miles an hour, the depth is more than 20 feet throughout, and the width is from 150 to 200 yards. C. C. A.

Socor'ro: town of Colombia; in the department of Santander, of which it was formerly the capital; on a plateau, 40 miles S. S. W. of Bucaramanga; 4,120 feet above the sea (see map of South America, ref. 2–C). It was founded in 1540 on the site of an Indian city, and was removed to its present site in 1681. In 1781 it was the center of a formidable revolt, and it was the first place in New Granada to declare for independence in 1810. Hand-woven mantles and "Panama" hats are exported. Pop. about 18,000. H. H. S.

Socorro: city; capital of Socorro co., N. M.; on the Rio Grande river, and the Atch., Top. and S. Fé Railroad; 75 miles S. by W. of Albuquerque; 178 miles N. of El Paso, Tex. (for location, see map of New Mexico, ref. 12–R). It is engaged in mining and smelting gold, silver, and lead, raising cattle, sheep, and goats, agriculture, fruit-culture, and lumbering; and contains 6 churches, 3 public-school buildings of brick (cost $25,000), State School of Mines (cost $50,000), 2 national banks with combined capital of $100,000, and 2 weekly newspapers. The city has an excellent climate that is highly recommended for persons in the early stages of consumption. When discovered by the Spaniards, the site was occupied by an Indian pueblo. The place was settled by Franciscan fathers, was destroyed and abandoned in 1650, and was again settled in 1765, 1794, and 1804. Pop. (1880) 1,272; (1890) 2,295; (1900) 1,512.

END OF VOLUME TEN.